Aegean Sea bottom trawl giant red shrimp fishery

Pre-assessment Report

Conformity Assessment Body (CAB)	Global Trust Certification Ltd, an NSF International company
Assessor/Assessment team	Lead Assessor, Vito Romito (P2 and P3) Assessor, Giuseppe Scarcella (P1 and P3)
Fishery client	MSC Italy
Assessment Type	Pre-assessment
Report Code	Pre-39.1
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1.1 List of Figures

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2   Glossary

AIS Automatic identification system
CA Consequence Analysis (RBF)
CFP Common Fisheries Policy
CPU Catch per Unit of Effort
CSA Consequence Spatial Analysis (RBF)
EEZ Exclusive Economic Zone
EFCA European Fisheries Control Agency
ETP Endangered, threatened and protected species
EU European Union
FCR Fisheries Certification Requirements
GES Good Environmental Status
GFCM General Fisheries Commission for the Mediterranean
GSA Geographical Sub-Area
LTL Low Trophic Level
MCRS Minimum Conservation Reference Size
MEDAC Mediterranean Advisory Council
MIPAAF Italian Ministry of Agriculture and Forestry
MLS Minimum Landing Size
MSC Marine Stewardship Council
PI Performance indicator
PISG Performance Indicator Scoring Guidepost
PRI Point of Recruitment Impairment
PSA Productivity-Susceptibility Analysis (RBF)
RBF Risk-Based Framework
SG Scoring Guidepost
SI Scoring Issue
SIC Sites of Important Communities
SPZ Special Protection Zone
STECF Scientific, Technical and Economic Committee for Fisheries
TAC Total allowable catch
UoA Unit of Assessment
VME Vulnerable marine ecosystems

3 Executive summary

3.1 Names and brief description of assessors/authors

This MSC pre-assessment report was drafted by the following team:

Assessment Team Members
Lead Assessor, P2, and traceability: Vito Romito
P1 Assessor: Giuseppe Scarcella
P3 was shared among the two assessors

Vito Romito has 10 years of expertise in fisheries certification. He's an ISO14001 Certified Lead Auditor and MSC FCR v.2.0 and FCP v.2.1 approved Fisheries Team Leader for SAI Global with extensive experience in ecosystems effects of fisheries. Vito received a BSc (Honours) in Ecology and a MSc in Tropical Coastal Management from Newcastle University (U.K.), in between which he worked for a year in Tanzania, carrying out comparative biodiversity assessments of pristine and dynamited coral reef ecosystems around the Mafia Island Marine Park. For five years he worked at Global Trust Certification/ later SAI Global as Lead Assessor for all the fishery assessments in Alaska, Iceland and Louisiana. Vito has also carried out several IFFO forage fisheries assessments in Chile, Peru, Europe and other various pre-assessments in Atlantic and Pacific Canada. To date, Vito has headed and conducted dozens of assessments involving 40+ different species including salmonid, groundfish, pelagic, flatfish, crustacean and cephalopod species in Europe, North and South America, and SE Asia. For three years, as a senior fisheries consultant and then manager with RS Standards Ltd., he was involved in the development and testing of a Data Deficient Fisheries framework and v.2.0 fisheries standard for the ASMI Alaska RFM Scheme, and IFFO RS Improver/FIP projects related to South East Asia multispecies bottom trawl fisheries. Vito re-joined the SAI Global Fisheries Team in 2018 and has since been involved as lead assessor and ecosystem expert in MSC and other fisheries assessment projects in the Baltic Sea, Canada, US East Coast, Alaska, Louisiana and Italy.

Dr. Giuseppe Scarcella is an experienced fishery scientist and population analyst and modeller, with wide knowledge and experience in the assessment of demersal stocks. He is author and co-author of more than 50 scientific papers in peer reviewed journals and more than 150 national and international technical reports, most of them focused on the evolution of fish assemblages in artificial habitats and stock assessment of demersal species. He holds a first-class degree in Marine Biology and Oceanography (110/110) from the Unversità Politecnica delle Marche, Italy, and a Ph.D. in marine Ecology and Biology from the same university, based on a thesis "Age and growth of two rockfish in the Adriatic Sea". In 2008 he was offered a job as project scientist in several research programs about the structure and composition of fish assemblage in artificial reefs, off-shore platform and other artificial habitats in the Italian Research Council – Institute of Marine Science of Ancona (CNR-ISMAR). During the years of employment at CNR-ISMAR he has gained experience in benthic ecology, statistical analyses of fish assemblages' evolution in artificial habitats, fisheries ecology and impacts of fishing activities, stock assessment, otholith analysis, population dynamics and fisheries management. During the same years he attended courses of uni-multivariate statistics and stock assessment. He is also actively participating in the scientific advice process of FAO GFCM in the Mediterranean Sea. At the moment he is member of the Scientific, Technical and Economic Committee for Fisheries for the European Commission (STECF). Giuseppe has been involved in several MSC and RFM assessments globally as a stock assessment expert.

3.2 Brief explanation of the process applied and summary of assessment activities

This MSC pre-assessment was carried out primarily remotely as desktop type assessment. The assessment team organised conference calls with various stakeholders as part of the remote "site visits" portion of the assessment, to collect additional information to what was publicly available and to better understand the dynamics of the fishery.

3.3 Main strengths and weaknesses of the client's operation

Strengths
- P3. The fishery has a management system structured under the general EU CFP framework with general objectives and means for stakeholder participation in the management process.

Weaknesses
- P1. Although there are some basic data on target catches and some MEDIT survey/stock structure information, stock status is unknown, and the stock is not managed via target, limit or other reference points.
- P2. There is a severe lack of catch information for this fishery that hinders the understanding of the UoA impacts on non-target and ETP species. One area of concern is the potential bycatch of sharks.
- P2. Habitat impacts are poorly known but could be better understood if fishery distribution and effort maps where made available.
- P3. The lack of fishery specific objectives has been identified. This issue affects indicators in all 3 principles.
- P3. Enforcement information for these fishing operations in the Aegean Sea are lacking.
- Traceability and issues are largely unknown.

3.4 Extent to which the fishery is or is not consistent with the MSC Fisheries Standard

The fishery is largely inconsistent with the MSC standard and is not recommended for full assessment. The gaps encountered in this fishery report are explained further in the pages below.

4   Report details

4.1   Aims and constraints of the pre-assessment

This pre-assessment does not attempt to duplicate a full assessment against the MSC Fisheries Standard. A full assessment involves a group of assessment team members and public consultation stages that are not included in a pre-assessment. A pre-assessment provides a limited and provisional assessment based on a restricted set of information provided by the client, other stakeholders, and/or available on the internet. In the case of this fishery the available data was extremely limited so that some of the findings have only been derived through risk assessment means and should be viewed only as approximate and uncertain.

4.2   Version details

The MSC process applied for this fishery is summarised by the table below.

Table 1. Fisheries program documents versions.

Document	Version number
MSC Fisheries Certification Process	Version 2.2
MSC Fisheries Standard	Version 2.01
MSC General Certification Requirements	Version 2.4.1
MSC Pre-Assessment Reporting Template	Version 3.2

5 Unit(s) of Assessment

5.1 Unit(s) of Assessment

5.1.1 Determination of fishery's status with respect to scope of the MSC Fisheries Standard

The fishery entering assessment meets the MSC Scheme scope requirements in FCP v2.2 7.4:

- The various target species assessed under Principle 1 are neither amphibians, reptiles, birds, nor marine mammals.
- The fishery does not use destructive fishing practices such as poisons or explosives.
- The fishery is not conducted under a controversial unilateral exemption to an international agreement.
- The fishery includes a mechanism for resolving disputes and disputes do not overwhelm the fishery.
- This is not an enhanced fishery, nor an introduced species-based fishery.
- Forced labour requirements have not been verified at this stage.

5.1.2 Possible Unit(s) of Assessment

Included in Table 2 below are possible Unit(s) of Assessment if the fishery were to proceed to full assessment including a justification for choosing them.

The fishery in question includes a number of Italian bottom trawl vessels originating from GSA 16 (Strait of Sicily, port of reference Mazara del Vallo) where an established bottom trawl fishery for giant red shrimp (*Aristaeomorpha foliacea*) exists, but operating/fishing in Aegean Sea (GSA 22 and 23) waters. The fishery is essentially managed under Italian regulation and EU Fisheries Common Policy.

Table 2. Unit(s) of Assessment (UoA)

UoA 1	Description
Species	Giant red shrimp (*Aristaeomorpha foliacea*)
Stock	Giant red shrimp in the Aegean Sea
Fishing gear type(s) and, if relevant, vessel type(s)	Bottom Trawling (OTB) Vessels: Motopesca Twenty One Motopesca Twenty Two Motopesca Sofocle Motopesca Socrate Motopesca Ciclamino Port of reference: Mazara del Vallo (TP).
Client group	MSC Italy
Other eligible fishers	Not defined
Geographical area	Eastern Mediterranean FAO Division 37.3.1, Aegean Sea
Harvest method/gear	Bottom trawl
Justification for choosing the Unit of Assessment	UoA defined by the Client

6 Traceability

6.1 Traceability within the fishery

Traceability information for this fishery is largely unknown as the assessment team was not able to speak with any fishers or fishery producer organisations, or management agency representatives since such parties did not make themselves available for a conference call.

Notwithstanding the above, we note the following. As part of EU COUNCIL REGULATION (EC) No 1224/2009, Article 58 on traceability[1], several requirements apply to Italian fisheries. These traceability requirements include the following:

1.   Without prejudice to Regulation (EC) No 178/2002, all lots of fisheries and aquaculture products shall be traceable at all stages of production, processing and distribution, from catching or harvesting to retail stage.

2.   Fisheries and aquaculture products placed on the market or likely to be placed on the market in the Community shall be adequately labelled to ensure the traceability of each lot.

3.   Lots of fisheries and aquaculture products may be merged or split after first sale only if it is possible to trace them back to catching or harvesting stage.

4.   Member States shall ensure that operators have in place systems and procedures to identify any operator from whom they have been supplied with lots of fisheries and aquaculture products and to whom these products have been supplied. This information shall be made available to the competent authorities on demand.

5.   The minimum labelling and information requirements for all lots of fisheries and aquaculture products shall include:

   (a) the identification number of each lot; (b) the external identification number and name of the fishing vessel or the name of the aquaculture production unit; (c) the FAO alpha-3 code of each species; (d) the date of catches or the date of production; (e) the quantities of each species in kilograms expressed in net weight or, where appropriate, the number of individuals; (f) the name and address of the suppliers; (g) the information to consumers provided for in Article 8 of Regulation (EC) No 2065/2001: the commercial designation, the scientific name, the relevant geographical area and the production method; (h) whether the fisheries products have been previously frozen or not.

6.   Member States shall ensure that the information listed in points (g) and (h) of paragraph 5 is available to the consumer at retail sale stage.

7.   The information listed in points (a) to (f) of paragraph 5 shall not apply to fisheries and aquaculture products imported into the Community with catch certificates submitted in accordance with Regulation (EC) No 1005/2008.

8.   Member States may exempt from the requirements set out in this Article small quantities of products sold directly from fishing vessels to consumers, provided that these do not exceed the value of EUR 50 per day. Any amendment to this threshold shall be adopted in accordance with the procedure referred to in Article 119.

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[1] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32009R1224&from=EN

9. Detailed rules for the application of this Article shall be adopted in accordance with the procedure referred to in Article 119.

Table 3. Traceability within the fishery.

Factor	Description
Will the fishery use gears that are not part of the Unit of Certification (UoC)? If Yes, please describe: - If this may occur on the same trip, on the same vessels, or during the same season; - How any risks are mitigated.	No, this is very unlikely.
Will vessels in the UoC also fish outside the UoC geographic area? If Yes, please describe: - If this may occur on the same trip; - How any risks are mitigated.	Yes, these vessels fish in Italian waters to but never on the same trip.
Do the fishery client members ever handle certified and non-certified products during any of the activities covered by the fishery certificate? This refers to both at-sea activities and on-land activities. - Transport - Storage - Processing - Landing - Auction If Yes, please describe how any risks are mitigated.	Unknown. The fish caught appears to be landed in the nearest port and then flown to Italy for sale.
Does transhipment occur within the fishery? If Yes, please describe: - If transhipment takes place at-sea, in port, or both; - If the transhipment vessel may handle product from outside the UoC; - How any risks are mitigated.	Unknown, but probably not.
Are there any other risks of mixing or substitution between certified and non-certified fish? If Yes, please describe how any risks are mitigated.	Unknown, more information is required.

7   Pre-assessment results

7.1   Pre-assessment results overview

7.1.1   Overview

The key limitations of this fishery have been briefly summarised in earlier pages, but the general lack of information about this fishery affects all components of this assessment. Details resulting from this pre-assessment are shown in the following pages in the form of:

- Recommendations,
- Summary of potential conditions by Principle, and
- Summary of Performance Indicator level scores

7.1.2   Recommendations

Key recommendations resulting from this pre-assessment include:
- The need to collect fishery data from GSA 22 and 23 that is not merged to that of GSA 16
- The need for regulations that apply specifically to the (entire) trawl fleet operating in GSA 22 and 23, which is now governed by only basic rules that may have little to no positive effect on the target stock and the ecosystem.
- The need to verify logbook information through fishery independent means
- The need to develop a management plan specific for the activities occurring in GSA 22 and 23

7.2   Summary of potential conditions by Principle

Table 4. Summary of potential Performance Indicator level scores.

Principle of the Fisheries Standard	Number of PIs with draft scoring ranges <60
Principle 1 – Stock status	0
Principle 2 – Minimising environmental impacts	5
Principle 3 – Effective management	2

7.3   Summary of Performance Indicator level scores

The summary table of performance indicators is shown below.

Table 5. Summary of Performance Indicator level scores.

Performance Indicator	Draft scoring range	Data deficient?
Principle 1 – Stock status		
1.1.1 – Stock status	60 – 79	Yes
Rationale or key points		
The Risk Based Framework (RBF) has been used to score this PI, because there are no reference points available, either derived from analytical stock assessments or using empirical approaches.		
1.1.2 – Stock rebuilding	NA	Not applicable.
Rationale or key points		
Not applicable.		
1.2.1 – Harvest Strategy	60 – 79	Not applicable.
Rationale or key points		
The harvest strategy is loosely defined as a set of measures aimed mostly at limiting days at sea and supported by a data collection system and some applicable MEDIT survey information. However, the rules for specifying the management measures are not responsive to the state of the stock.		
1.2.2 – Harvest control rules and tools	60 – 79	Not applicable.
Rationale or key points		

Table 5. Summary of Performance Indicator level scores.

Performance Indicator	Draft scoring range	Data deficient?
In the present fishery the harvest control rules are a set of management measures including mesh size and temporal limitations imposed by Italian authorities to limit effort. There is also a decommissioning plan on the capacity. However, such evidences are not directly indicating that the tools are effective in achieving the exploitation levels required under the HCR as this is not really defined.		
1.2.3 – Information and monitoring	60 – 79	Not applicable.
Rationale or key points		
Some relevant information derived from catch monitoring of the EU fleet composition, as well as abundance of the target stock and the stock structure from trawl survey are available. The catches from non-EU vessels in GSA 22 and 23 are not fully monitored.		
1.2.4 – Assessment of stock status	≥80	Not applicable.
Rationale or key points		
Because the RBF is used to score PI 1.1.1, this PI is not scored and is awarded a default score of 80.		
Principle 2 – Minimising environmental impacts		
2.1.1 – Primary Outcome	≥80	No
Rationale or key points		
No main or minor primary species have been identified for this UoA. However, the preliminary scores provided are dependent on the determination we have made, which has been primarily derived from the lack of information on this fishery and the evaluation of secondary species instead of primary species.		
2.1.2 – Primary Management	≥80	Not applicable.
Rationale or key points		
No main or minor primary species have been identified for this UoA. However, the preliminary scores provided are dependent on the determination we have made, which has been primarily derived from the lack of information on this fishery and the evaluation of secondary species instead of primary species.		
2.1.3 – Primary Information	≥80	Not applicable.
Rationale or key points		
No main or minor primary species have been identified for this UoA. However, the preliminary scores provided are dependent on the determination we have made, which has been primarily derived from the lack of information on this fishery and the evaluation of secondary species instead of primary species.		
2.2.1 – Secondary Outcome	60 – 79	Yes
Rationale or key points		
No catch profile exists for this fishery or has been provided by the fishermen representative organisations. Because of this, the assessment team was unable to derive a list of non-target species or bycatch regularly associated with this fishery. Due to the lack of information, the assessment team used CPUE information from a study from Mytilineou et al., 2006 to derive a list of species potentially affected by the fishery. The secondary main species identified were the following: Blackbelly rosefish *Helicolenus dactylopterus*, Gulper shark *Centrophorus granulosus*, Shortnose greeneye *Chlorophthalmus agassizii*, red shrimp *Aristeus antennatus* and Silver roughy or Mediterranean slimehead *Hoplostethus mediterraneus*. Due to the absence of stock assessment information these species were assessed using the RBFS's PSA. The MSC score for the 5 scoring elements would be 75 (pass with condition). Specifically, the gulper shark and the shortnose greeneye achieved a score of less than 80.		
2.2.2 – Secondary Management	<60	Not applicable.
Rationale or key points		
Management measures indirectly affecting the secondary species in question are limited and include: a limitation of the number of fishing vessel licenses for Italian vessels, reduction of fishing days allowed, 40-50mm trawl net mesh size, DCRF requirements, VMS/AIS on board, and spatial restrictions (Italian vessels operating in GSA 22-23 are not allowed inside 6 nm from the Greeks coast and 12 nm from the Turkish coast). Due to the lack of information on secondary species in the Aegean sea or the presence of stock assessments, status information, suitable biologically based limits, or specific management measures or strategies that may directly affect these species in the areas and depths fished by the deep water red shrimp fishery, we cannot determine that there are measures in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.		
2.2.3 – Secondary Information	<60	Not applicable.

Table 5. Summary of Performance Indicator level scores.

Performance Indicator	Draft scoring range	Data deficient?
Rationale or key points		
Since the RBF has been used to score PI 2.2.1 for the UoA, qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species. However, the unavailability of catch data or other surrogates, or management measures for the species identified (or indeed for additional or other species that may be routinely caught in this fishery) does not allow the assessment team to determine that information is adequate to support measures to manage main secondary species.		
2.3.1 – ETP Outcome	<60	No
Rationale or key points		
A number of ETP shark and ray species, here treated as group for scoring purposes (i.e. 1 scoring element), have been identified as potentially at risk from the Unit of Assessment. These species have been singled out because they occur at depths where the fishery under assessment is known to operate, between 500 and 800 metres. These species include: Electric ray *Tetronarce nobiliana,* Sharpnose sevengill shark *Heptranchias perlo,* Bluntnose sixgill shark *Hexanchus griseus,* Angular Rough Shark *Oxynotus centrina,* Sawback Angelshark *Squatina aculeata*, Sandy Skate *Leucoraja circularis,* Common Skate complex *Dipturus batis* spp., Smalltooth Sand Tiger *Odontaspis ferox*, White Skate *Rostroraja alba and* Tope Shark *Galeorhinus galeus.* The above shark and ray species have been caught in very small numbers, due to their rarity, in MEDITS surveys of the Mediterranean conducted over the past few decades. All of the species are considered to be very rare, with some considered to be extinct in the Aegean Sea (e.g. Sawback Angelshark). Based on their rarity, the relative chance of the deep-water red shrimp fishery capturing these elasmobranchs is probably small. However, for the same reasons, it is possible that even small accidental catches of these animals may hinder their recovery. Logbook data (including information on fishing activities, catch data, incidental catches, release and/or discarding of sharks species listed either in Annex II or Annex III of the SPA/BD Protocol, as detailed in Recommendation GFCM/42/2018/2[2]) and observer coverage information documenting catches and discards of elasmobranchs would enable a more equitable determination of the likelihood of impact of the fishery on this group of species. However, this data does not appear to be available. Accordingly, the assessment team does not have enough evidence to determine that known direct effects of the UoA are likely (> 70th %ile) to not hinder recovery of ETP species.		
2.3.2 – ETP Management	<60	Not applicable.
Rationale or key points		
These bottom trawlers do not use excluder devices that may exclude large animals such as sharks (or large fish) from the catch (Fabio Fiorentino pers. comm.). It is unclear at this stage, due to lack of data, if the overall trawl effort in GSA 22 and 23 may be low, medium or high in respect to the impacts it may produce on the shark species described here. Specific to management measures for the protection of sharks in the Aegean we note that there are no concrete measures aside from the ones highlighted above (for secondary species) that may have limited to inconsequential effects to the catches of shark species identified here.		
2.3.3 – ETP Information	<60	Not applicable.
Rationale or key points		
The unavailability of reliable catch data, incidental catches, release and/or discarding of sharks species, coupled to the lack of an observer program to capture information, or other surrogates to estimate the UoA related mortality on ETP species (or indeed to clearly understand which species may be routinely caught in this fishery), does not allow the assessment team to determine that qualitative information is adequate to estimate the UoA related mortality on ETP species.		
2.4.1 – Habitats Outcome	60 – 79	No
Rationale or key points		
The commonly encountered habitats in the UoA are sandy and muddy habitats. We note that no fishing effort maps have been provided by industry or were reported available by scientists from the CNR (noting however that there is a working progress to compile fishing effort and CPUE data for this fishery in the Aegean and may be published in 2021). Due to the lack of data the fishery is assumed to operate primarily in the same regions reported in Garofalo et al. (2007) in the South-eastern Aegean Sea and South of Crete at the depths (500-800 m) (but potentially other regions as well) indicated in the bathymetry of Figure 7. Given the nature of the common encountered habitats identified here, the UoA is unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or		

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[2] http://www.fao.org/gfcm/decisions/ar/

Table 5. Summary of Performance Indicator level scores.

Performance Indicator	Draft scoring range	Data deficient?
irreversible harm. However, the UoA is not highly unlikely to reduce structure and function of these habitats due to many uncertainties in available data. The scientist we interviewed also highlighted that if damage was done to important VMEs such as deep water corals, damage would be done once only - after the vessel trawled over a certain section of the seabed, following which the vessel would not trawl new areas but continue to trawl existing (i.e. cleaned) grounds. That however does not mean that damage to these species and habitats may have not been made in the first place by "cleaning the fishing grounds" since bottom trawlers are known to directly produce a reduction in the coral coverage on the swept bottoms through damage and abrasion. Due to the lack of fishing effort and distribution data we cannot determine whether an actual overlap between the fishery and these VMEs fishery may occur nor determine with confidence that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm.		
2.4.2 – Habitats Management	60 – 79	Not applicable.
Rationale or key points		

There are a few management measures available geared towards habitat protection. These measures (mainly EC regulation 1967/2006) include:

- A prohibiting the use of towed dredges and trawl nets at depths beyond 1000 m[3].
- VMS/AIS active on board.
- The vessels working in GSA 22-23 are not allowed inside 6 nm from the Greeks coast and 12 nm from the Turkish coast.
- Fisheries Restricted Areas (none active or proposed in the Aegean).

Considering available management measures and that the impacts of the fishery on sandy and muddy habitat types is not considered significant, we can determine that there are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance. However, we also consider the potential for additional risks of bottom trawl fisheries on deep sea habitats as highlighted by Clark at al 2016 and Watling (2014) and the fact that the assessment team is not aware of any additional management measure geared towards minimising the effects of trawling on seabed habitats. For example, the fishery does not use rolling bobbins (elevating the net from the seafloor), semi pelagic trawl doors (flying above the seabed) or other mechanisms to decrease / minimise the abrasion of the gear type upon the seabed and various habitats. Accordingly, we cannot determine that there is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.

2.4.3 – Habitats Information	60 – 79	Not applicable.
Rationale or key points		

Due to the lack of fishing effort maps of the red shrimp fishery within GSA 22 and 23 that would enable the understanding of the actual fishery footprint in relation to existing habitats and VMEs we cannot determine that the nature, distribution and vulnerability of the main habitats in the UoA are known at a level of detail relevant to the scale and intensity of the UoA.

2.5.1 – Ecosystems Outcome	60 – 79	No
Rationale or key points		

If at all similar to North Western Ionian Sea food webs *A foliacea* should be part of a complex system of energy and biomass exchanges characterized the investigated food webs indicating an important benthic-pelagic coupling. *A. foliacea* does not appear to be a keystone species in the Mediterranean ecosystem in terms of being a key prey or predator species. Also, because animals like elasmobranchs, which have been recognised in this assessment as being potentially affected by and potentially important to this the UoA (i.e. secondary and ETP species), feed on many different species and could switch prey relatively easily (e.g. cephalopods, molluscs, fish and other crustacean species), we consider that the UoA is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. Additional information on the fishery would be needed for higher scores.

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[3] https://gfcm.sharepoint.com/CoC/Decisions%20Texts/REC.CM_GFCM_29_2005_1-e.pdf?originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlcG9pbnQuY29tLzpiOi9nL0NvQy9FVjBBBcG1qUzh6NUNqU2J5dNtU0c0SUJ1cDdGGbjJMTU5PcmNfLVk5S0t3ZVpBP3J0aW1lPXBWeW52ZkdIMkVn

Table 5. Summary of Performance Indicator level scores.

Performance Indicator	Draft scoring range	Data deficient?
2.5.2 – Ecosystems Management	60 – 79	Not applicable.
Rationale or key points		

The ecosystem management measures mirror the same lack of, identified for secondary, ETP species and habitats. Furthermore, it is unclear at this stage if the overall trawl effort in GSA 22 and 23 may be low, medium or high in respect to the impacts it may produce on ecosystem elements, structure and function so far identified. Overall, considering the general lack of information on this fishery, and due to lack of more specific management evidence, we cannot determine that there is a partial strategy in place, if necessary, which takes into account available information and is expected to restrain impacts of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.

Performance Indicator	Draft scoring range	Data deficient?
2.5.3 – Ecosystems Information	60 – 79	Not applicable.
Rationale or key points		

Information is adequate to identify the key elements of the ecosystem. However, due to a lack of more specific ecosystem information on deep sea ecosystem communities and dynamics, and more generally the general lack of information associated with this fishery, we cannot determine that information is adequate to broadly understand the key elements of the ecosystem.

Principle 3 – Effective management		
3.1.1 – Legal and customary framework	≥80	Not applicable.
Rationale or key points		

Italy has an effective national legal system and binding procedures listed within comprehensive suite of fisheries legislation that is updated to implement commitments under the EU's CFP and the under the GFCM.
This stock would appear to be a single jurisdiction in that it occurs in and is fished in the Aegean Sea. However, the fact that Italian vessels from GSA 16 fish outside of Italy in Greek waters of GSA 22 and 23 under effective Italian legislation, makes the determination of jurisdictional category complex. The fishery is managed within the context of the CFP and the Italian national system for fisheries management. The GFCM has the authority to adopt binding recommendations for fisheries conservation and management in its area of application and plays a critical role in fisheries governance in the region. In particular, its measures can relate to the regulation of fishing methods, fishing gear and minimum landing size, the establishment of open and closed fishing seasons and areas, and fishing effort control. Disputes in the fishery may be settled at two levels, the EU level and the national level in Italy. There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2.

Performance Indicator	Draft scoring range	Data deficient?
3.1.2 – Consultation, roles and responsibilities	60-79	Not applicable.
Rationale or key points		

The EC through the CFP sets the framework for fisheries management, which is then implemented by the Italian ministry (implements the CFP and GFCM binding recommendations). MEDAC is a multi-stakeholder group that feeds advice into these complementary processes, however we note that non EU countries currently operating in the Aegean Sea are not part of MEDAC's consultative processes. In Italy, Federpesca and Federcoopesca are industry bodies representing the Italian catching sector as members of MEDAC. The functions and relationships between these management, industry and advisory groups are explicitly defined and understood by key areas of responsibility. The reform of the CFP placed a greater emphasis on regionalization and sea basin-level management, enhancing the role of the MEDAC at regional level and developing Fisheries Local Action Group (hereafter FLAG) at local level (in Sicily), along with the development of the Better Regulation Guidelines ensures more effective consultation and is a recent improvement in performance.

Performance Indicator	Draft scoring range	Data deficient?
3.1.3 – Long term objectives	≥80	Not applicable.
Rationale or key points		

The CFP Basic Document requires that member states apply the precautionary approach to fisheries management, and aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield (Recital (6), Art. 2) . The maximum sustainable yield exploitation rate shall be achieved by 2015 where possible and, on a progressive, incremental basis at the latest by 2020 for all stocks (Art. 2). The GFCM General Agreement adopt recommendations on conservation and management measures aimed at ensuring the long-term sustainability of fishing activities, in order to preserve the marine living resources, the economic and social viability of fisheries and aquaculture.

Performance Indicator	Draft scoring range	Data deficient?
3.2.1 – Fishery specific objectives	<60	Not applicable.
Rationale or key points		

Table 5. Summary of Performance Indicator level scores.

Performance Indicator	Draft scoring range	Data deficient?
No GFCM plans have been adopted for shrimp caught in the Aegean Sea (GSA 22) although some have been adopted in other GSAs. The Italian ministerial decree n. 26510 (2018) adopted a management plan for the stocks in GSA 16 (Sicily Strait) that include *A. foliacea* vessels/fishing operations. The plan does not specify a minimum landing size for red shrimp but included the objective to reduce fishing effort though reduction of fishing days in 2019 (reduce 6% from the 2015-17 average) and 2020 (reduce 5% from the 2015-17 average). Harvest control rules were also potentially predicted for the 2021-2023. Also, according to the Italian Ministerial Decree n.13128 of 30/12/2019, a fishing ban for trawling fisheries is implemented in each Italian GSA. Such temporal closure is applicable also to the Italian vessels operating in the Aegean Sea that are registered in GSA 16, where a closure of 30 days is implemented in accordance with regional authority. According to the above, it is not clear if fishery specific objectives can be said to be broadly consistent with achieving the outcomes expressed by MSC's Principles 1 in an implicit manner. This is partially highlighted by the gaps identified in P1 (and P2).		
3.2.2 – Decision making processes	<60	Not applicable.
Rationale or key points		
Italy (but not GFCM) developed a management plan for fisheries in GSA 16 which partially affects fishing activities in GSA 22 and 23. This represents somewhat of a formulation of a decision-making processes that result in measures (e.g. fishing effort restrictions) and strategies (data collection, scientific advice, effort restriction, etc.) to achieve some fisheries objectives (effort reduction). However, it is not evident to date that either MIPAAF and GFCM have identified or responded to serious issues specific to this fishery prosecuted in the Aegean Sea by Italian (and likely Egyptian and Turkish) vessels. There are a number of P1 and P2 issues that may be only addressed though targeted measures in the geographical area they occur in, as opposed to being only loosely and indirectly addressed through measures available for *A. foliacea* caught in GSA 16.		
3.2.3 – Compliance and enforcement	60 – 79	Not applicable.
Rationale or key points		
Monitoring, control and surveillance in the fishery is conducted by the EU member states through their national enforcement bodies. The European Fisheries Control Agency (EFCA), established in 2005, coordinates the EU member state's fisheries control and inspection activities and provides assistance in the application of the CFP. The Mediterranean is one of the area subject to the Joint Development Plan (JDP) inspection framework of ECFA. The Italian Coastguard manages monitoring control and surveillance of Italian vessels. Relevant statistics on sanctions and inspections are not available for the UoA but only for the whole Italian fleets on "Ecomafie" report 2018. Therefore, it is not possible to demonstrate the efficacy of the MCS mechanism, but it is possible just to infer an expectation of efficacy. Due to the lack of specific evidence or information from stakeholders, we cannot determine, at this stage that there is no evidence of systematic non-compliance.		
3.2.4 – Management performance evaluation	60 – 79	Not applicable.
Rationale or key points		
The EU CFP is reviewed in connection with the major revisions of its basic regulations every tenth year. In 2009, the Commission analysed the functioning of the CFP based on the Green Paper on the Reform of the Common Fisheries Policy. Enforcement is member states is reviewed by the EFCA, which in turn was audited by the Internal Auditing Service (IAS) in September 2018. In terms of scientific advice, the mechanism in place to evaluate some parts of the fishery-specific management system are the scientific working groups (both in the framework of SAC-GFCM and STECF) evaluating the status of the stocks. However, key parts of the management system such as those needed to set up specific measure for the Aegean Sea activities do not appear to have been evaluated, based on the lack of fishery specific measures.		

7.4 Principle 1
7.4.1 Principle 1 background

7.4.1.1 Biology of the giant red shrimp

Aristaeomorpha foliacea (giant red shrimp) was first described in the early nineteenth century by Risso in the Ligurian Sea. Together with *Aristeus antennatus* (blue and red shrimp) the two red shrimp are the only species of the family Aristeidae found in the Mediterranean. The systematic classification is: phylum Arthropoda, class Malacostraca, subclass Eumalacostraca, superorder Eucarida, order Decapoda, sub-order Dendrobranchiata, superfamily Penaeoidea (Perez Farfante and Kensley, 1997).

A. foliacea is a large-sized decapod crustacean with a scarlet red coloured, firm though flexible and light exoskeleton and black eyes. In mature females the dorsal part of the abdomen is darker due to the black colour of the mature ovaries. The pleon (abdomen) is slightly keeled along the dorsal midlines of the third segment, becoming pronounced on the following three segments and ending in a sharp posterior point (Bianchini, 1999). Other important morphological characteristics are long pleopods, a carapace with antennal, hepatic and branchiostegal spines, very short upper antennal flagella, strong posteromedian spines on the third to sixth abdominal segments, a telson with four small movable lateral spines, an open telicum and secondary sexual dimorphism with regards to body size and the length of the rostrum. Adult females are larger and have a longer rostrum, which extends far beyond the antennal scale. In males the rostrum is short and does not exceed the tip of the antennular peduncle. The rostrum has 6 to 12 upper teeth, including 2 teeth on the carapace (Fischer et al., 1987; Carpenter and Niem, 1998).

Geographical distribution

The giant red shrimp *Aristaeomorpha foliacea* has a wide geographic distribution. The species has been reported to occur in the Mediterranean, the Atlantic, the Indian Ocean, the western Pacific (Perez Farfante and Kensley, 1997) and South Africa (Bianchini, 1999). Historically red shrimp were found in the Mesozoic basin of Tethys, which extended from the Indian Ocean to the present-day Caribbean Sea, including areas which became the Mediterranean Sea (Cau et al., 2002). In the Mediterranean Sea the distribution of giant red shrimp is patchy in nature, with the highest abundances found in the central-eastern basins (Politou et al., 2004).

In the Central Mediterranean there is a longitudinal segregation between the two species of red shrimp: *A. antennatus* decreases in abundance from the western to the eastern Mediterranean whilst the opposite is true for *A. foliacea* (Bianchini and Ragonese, 1994; Cau et al., 2002; D'Onghia et al., 1998; Company et al., 2004; Guillen, 2012). In Tunisian waters the relative abundance of the two species has been reported to be 50% *A. foliacea* and 50% *A. antennatus* at La Galite and 80% *A. foliacea* and 20% *A. antennatus* on the nearby Sentinelle Bank (Ben Meriem, 1994). In Spanish waters, the Gulf of Lions and the Ligurian Sea *A. antennatus* outnumbers individuals of *A. foliacea* (Cau et al., 2002); in the Central Mediterranean, eastern Ionian Sea and waters around Greece *A. foliacea* is dominant (Politou et al., 2004; Ragonese, 1995; Cau et al., 2002). A number of hypotheses have been proposed to explain this pattern, including differences in hydrological conditions (Ghidalia and Bourgeois, 1961; Orsi and Relini, 1985; Bianchini, 1999; Politou et al., 2004), differences in productivity between the Mediterranean basins (Politou et al., 2004) and different levels of fishing pressure being exerted across the Mediterranean; *A. antennatus* is more resilient to overfishing than *A. foliacea* (Matarese et al., 1997; D'Onghia et al., 2003; Politou et al., 2004).

A. foliacea is a deep-water benthopelagic shrimp with a reported depth distribution of 120-1300 m, generally on muddy bottoms (Fischer et al., 1987). The species aggregates in submarine trenches and canyons along the continental slope (Ragonese et al., 1997; Bianchini, 1999) and peaks in abundance at 300-800 m depths (Ragonese et al., 1997 and references therein; Politou et al., 2004

A. foliacea migrates nocturnally into the water column in the Strait of Sicily and as a result fishers using bottom trawl gear prefer to target the species in daylight (Bianchini et al., 1998; Bianchini, 1999). These daily vertical migrations of up to 200-300 m from the bottom (Maurin and Carries, 1968) are related to the feeding behaviour of this species, which feeds both on benthic and pelagic organisms (Rainer, 1992; Pipitone et al., 1994; Bello and Pipitone, 2002). Bianchini et al. (1998) reported a size-dependent difference in the diel behaviour of *A. foliacea*, with small-sized shrimp seeming to undergo more pronounced migrations into the water column during the night-time.

In addition to such diel migrations, evidence for season movements related to reproductive behaviour has been recorded. An increased abundance of males prior to the spawning season on the upper slope has been attributed to the movement of mature individuals from deep canyons in order to mate (D'Onghia et al., 1998; Belcari et al., 2003). Once spawning has taken place, males are once again displaced to deeper waters (Cau et al., 1987).

Life history dynamics

The maximum body length of females according to FAO species identification guides is 225 mm (59 mm carapace length) and that of males 170 mm (45 mm carapace length). Females commonly measure 170-200 mm body length and males 130-140 mm (Fischer et al., 1987; Carpenter and Niem, 1998). For the Strait of Sicily a length range of 16-74 mm and a median carapace length of 36 mm has been reported (Cau et al., 2002; Ragonese et al., 2004).

The young of the year recruiting in spring are immature, with only a few individuals reproducing during their first year. Gonadic development begins in winter and individuals become sexually mature in the second summer (Bianchini, 1999; Politou et al., 2004). Once they have reached maturity male giant red shrimp have a protracted reproductive capacity and are ready to mate throughout the year, whilst females mature seasonally (Bianchini, 1999; Perdichizzi et al., 2012). In the Strait of Sicily maturation of female *A. foliacea* and subsequent spawning occurs from spring until autumn, with a marked maturity peak in summer-autumn (Ragonese et al., 2004).

A. foliacea gather in shoals during the mating and spawning season (Bianchini, 1999), however only very limited information on the location of such spawning areas is available. Ragonese and Bianchini (1995) collected samples over a wide area of the Strait of Sicily and found mature females to be concentrated in the deeper waters between the Malta and Adventure banks and in particular to the west of the Maltese Islands (GSA 15). An analysis of 2003-2007 Maltese MEDITS data confirmed that the highest concentrations both by number and by weight of mature *A. foliacea* individuals was found to the North of Gozo at a depth of ~400-600 m and to the west of the Maltese Islands at a depth of 600-800 m (Knittweis and Dimech, 2009).

Giant red shrimp are dioecious animals and no systematic cases of hermaphroditism have been described. The colour, size and structure of the ovary is used to assess the maturity of female *A. foliacea* (Levi and Vacchi, 1988), whilst fused petasma, a shortened rostrum, and the presence of emi-spermatophores inside the terminal ampullae are the macroscopic features which distinguish a mature male individual (Bianchini, 1999).

Levi and Vacchi (1988) found the smallest female with ripe ovaries caught in the Strait of Sicily to measure 42 mm length. Bianchini (1999) reported males reaching maturity at 30-33 mm carapace length and undergoing the transition between a long and short rostrum in the 31-32 mm length range; females developed spermatophores in the 30 mm size class and all females larger than 40 mm carapace length had spermatophores. However, although spermatophores are present in all large females, the proportion of mature individuals in a given size class never reaches 100%, even during the reproductive periods (Bianchini, 1999). Ragonese et al. (2004) report a length at 50% maturity of 30-33 mm carapace length for males and of 42 mm for females. The most recent maturity ogive available was estimated by CNR-IAMC based on 2009 data, with a length at 50% maturity for females of 37.17 mm carapace length / a slope g of 0.541 and a length at 50% maturity of 27.41 mm carapace length / a slope g of 0.988 in males (STECF 11-14, 2011).

Penaeoid shrimps do not brood fertilised eggs and instead release them directly into the sea (Bauer, 1991). Information on larval and postlarval stages is scarce and in particular distribution patterns remain almost completely unknown (Cau et al., 2002). It is likely that larvae develop as epipelagic plankton and that hydrological conditions affect recruitment and thus year class strength in giant red shrimp (Bianchini, 1999).

The only description of *A. foliacea* larval stages is given by Heldt (1955), who was able to identify several morphological characteristics which distinguish *A. foliacea* larvae from A. antennatus larvae: a projecting anterior part of the carapace and different relative antenna lengths at Protozoea stages II and III; longer uropods at the Protozoea stage III, absence of pterigistomian spines and a longer A2 endopodite compared to the exopodite and a different telson shape at the Mysis stage.

Recruitment

The recruitment of juvenile *A. foliacea* in the Central Mediterranean takes place in spring (Ragonese et al., 2004) when individuals have reached a size of 25-31 mm carapace length (Garofalo et al., 2011; Figure 5).

Giant red shrimp recruits have been found dispersed widely at depths of 500-700 m in the Strait of Sicily: based on 1994-2004 south Sicily (Italy, GSA 16) MEDITS and GRUND data Garofalo et al. (2011) carried out a persistence analysis, which found *A. foliacea* recruits were only spatially structured in five years over the eleven year study period. The two stable nursery areas identified are located in the middle of the Strait and on average supported 30% of the total number of juveniles in the years studied.

Giant red shrimp sex ratios can vary between areas, seasons and depending on the depth sampled (D'Onghia et al., 1998; Bianchini, 1999; Belcari et al., 2003). For the Mediterranean as a whole, females have been reported to be slightly more abundant than males (Cau et al., 2002; Belcari et al., 2003; Can and Aktas, 2005), although a dominance of males has been reported from Greek waters (Cau et al., 2002; Papaconstantinou and Kapiris, 2003; Politou et al., 2004).

Survey and assessment information

Based on data from eight seasonal trawl surveys carried out in 1985-1987 a sex ratio of 53% females was reported for giant red shrimp in the Strait of Sicily (Ragonese and Bianchini, 1995). An analysis of GRUND and MEDITS survey data collected in the Central Mediterranean in 1994-2002 revealed a proportion of giant red shrimp females in the whole population of 0.43-0.49 (Ragonese et al., 2004) and a later analysis of 1994-2004 GRUND and MEDITS survey data showed that sex ratios oscillated without any apparent pattern around the expected value of 0.5 during this period (Ragonese et al., 2012). A more recent estimate based on an analysis of Maltese 2009-2011 commercial fisheries monitoring data from GSA 15 gave an average overall catch (including both landings and discards) sex ratio of 0.46 (MRRA, unpublished data).

With regards to sex ratio by size, there is an almost complete separation of sexes for mature individuals, with females being more abundant in the large size classes and males being more abundant in the middle size classes (Bianchini, 1999; Politou et al., 2004; Ragonese et al., 2012).

Although no relationship between sex ratio and depth has been found for the Strait of Sicily (Bianchini, 1999; Ragonese et al., 2012), it has been hypothesised that males become more abundant with depth and that during the mating season males migrate from the deeper canyons to shallower depths (D'Onghia et al., 1998; Belcari et al., 2003).

Ragonese et al. (1994) used Bhattacharya's method as implemented in the COMPLEAT ELEFAN package (Gayanilo et al., 1988; 1994), complemented with information on survey season and reproductive patterns to estimate a maximum age of 4 years for female and 5 years for male giant red shrimp.

Cau et al. (2002) calculated growth curves for females based on 1994-1999 MEDITS data using Modal class Progression Analysis (MPA) as implemented in the FAO FiSAT software, and estimated a maximum age of 5 years for individuals from the Strait of Sicily.

Based on age slicing using the LFDA routine with growth parameters estimated by CNR-IAMC (2009), the maximum estimated age in the exploited female *A. foliacea* standing stock during the period 2006-2009 estimated by STECF 11-14 (2011) was 6 years.

More recently, Ragonese et al. (2012) hypothesized that the longevity parameters for males estimated by classic length frequency distribution analysis may have been underestimated due to reduced growth and an aggregation of older individuals in the larger size classes after the onset of sexual maturity. Based on the Author's analyses a higher maximum age of 7-10 years for adult male giant red shrimps in the Central Mediterranean was proposed.

Ragonese et al. (1994) analysed a two-year time series of *A. foliacea* length frequency distributions from the Strait of Sicily and estimated an annual instantaneous natural mortality (M) of 0.4 for females. Although the authors stated that values for males are likely to be similar, no estimate was given for males. Other estimates of natural mortality over the species lifespan in the Central Mediterranean are 0.5 for females (Bianchini, 1999), 0.4 for females (Ragonese et al., 2004) and 0.4-0.6 for males (Ragonese et al., 2012).

Giant red shrimp are opportunistic carnivores and scavengers (Bianchini, 1999). The first study on the feeding behaviour of *A. foliacea* found a high diversity in consumed prey types, including pelagic, benthic and benthopelagic organisms in the Ligurian Sea (Brian, 1931). This pattern was later confirmed for the Central Mediterranean: stomach content analysis of giant red shrimp found both strictly benthic and pelagic prey (Bello and Pipitone, 2002). The most widely accepted explanation is that *A. foliacea* undergoes diel migrations related to its feeding behaviour, feeding on benthic organisms during the day and preying in the water column at night (Bianchini, 1999; Rainer, 1992; Bello and Pipitone, 2002).

Diet and feeding habits

The most important food sources of giant red shrimp in the Strait of Sicily are crustaceans (49%), bony fish (21%), cephalopods (9%), siphonophores (5%), gastropods (5%), bivalves (3%), polychaetes (1%), unidentified prey (7%) and foraminiferans (Bello and Pipitone, 2002). The precise dietary importance of the latter is difficult to estimate because foraminiferans may be unintentionally ingested when feeding on benthic prey (Rainer, 1992; Cartes, 1995). Common benthopelagic decapods ingested by *A. foliacea* in the Strait of Sicily are Plesionika and Pasiphaea spp., in particular Pasiphaea sivado (Bianchini, 1999). Cephalopods have a higher relative importance in the diet of *A. foliacea* compared to giant red shrimp from other areas and as a result it is likely that *A. foliacea* contributes significantly to the mortality of juvenile cephalopods of species such as Heteroteuthis dispar in Central Mediterranean food webs (Bello and Pipitone, 2002).

Diet composition is size related in *A. foliacea*. Significant differences were found with regards to the number of cephalopods eaten by small compared to large-sized giant red shrimp in the Strait of Sicily, only medium and large shrimp were able to prey on larger cephalopods (Bello and Pipitone, 2002). Bianchini (1999) found that larger individuals consumed more cephalopods, shrimps and siphonophores, while small specimens consumed a larger proportion of benthic mollusks and foraminifera. In the Greek Ionian Sea a similar positive trend of ingesting larger prey with increased size has been observed for female giant red shrimp, whilst immature individuals have a higher occurrence of epibenthic prey in their foreguts (Kapiris, 2012). Large shrimp are likely to be more efficient predators because of their increased swimming ability and larger mandibles.

In addition to the influence of somatic growth on feeding habits, giant red shrimp change their feeding behaviour seasonally. In the Strait of Sicily there are seasonal differences in prey type, with siphonophores of the family Diphyidae consumed mainly in spring and benthic gastropods an important food source in autumn (Bianchini, 1999). In the Greek Ionian Sea giant red shrimp have an increased feeding activity in spring-summer, which is likely related to the increased reproductive activity in this season (Kapris, 2012). In winter *A. foliacea* has the highest stomach fullness, but the ingested food has a lower quality (Bianchini, 1999; Kapiris, 2012).

Population Structure

Despite the commercial importance of *A. foliacea*, only very little information is available on population structure, larval mixing and migration patterns. Based on the bathymetry of the Strait of Sicily, Bianchini (1999) hypothesized that giant red shrimp in the Strait of Sicily have two main distribution zones, one on the eastern side and one on the western side of the Sicilian Channel, connected with a passage to allow for the movement of individuals. However, Marcias et al. (2010) carried out a study on the genetic connectivity between giant red shrimp populations from Sardinia and the Strait of Sicily and found no significant genetic variability between the populations sampled. The Authors thus concluded that *A. foliacea* in the western and central Mediterranean forms one large panmictic stock.

According to the results of STCOKMED project (Fiorentino et al., 2013) the stock configuration of *A. foliacea* in the Mediterranean sea is composed by 4 clusters representing the best hypothesis of stock structure as obtained from MEDIT data, as it is based on the highest mean Cohen's Kappa and the higher Holistic Acceptability Index (HAI=0.84). Results are based on 6 biological indicators and 4 thematic layers. According to the semi-quantitative robustness index (RI=2.4) the 4-units configuration is ranked as reliable, thus it is selected and reported in the **Error! Reference source not found.**. The spatial pattern of stock units appears however rather fragmented in the eastern side, especially in the Aegean (GSA 22-23) were the UoA is located. Probably GSA22 is more a transition area where the species seems not or poorly present in the northern part. For this reason, it is proposed to consider the GSA22 as belonging to the same cluster as GSA23, 24 and 25. The most suitable proposed configuration is thus based on 3 stock units.
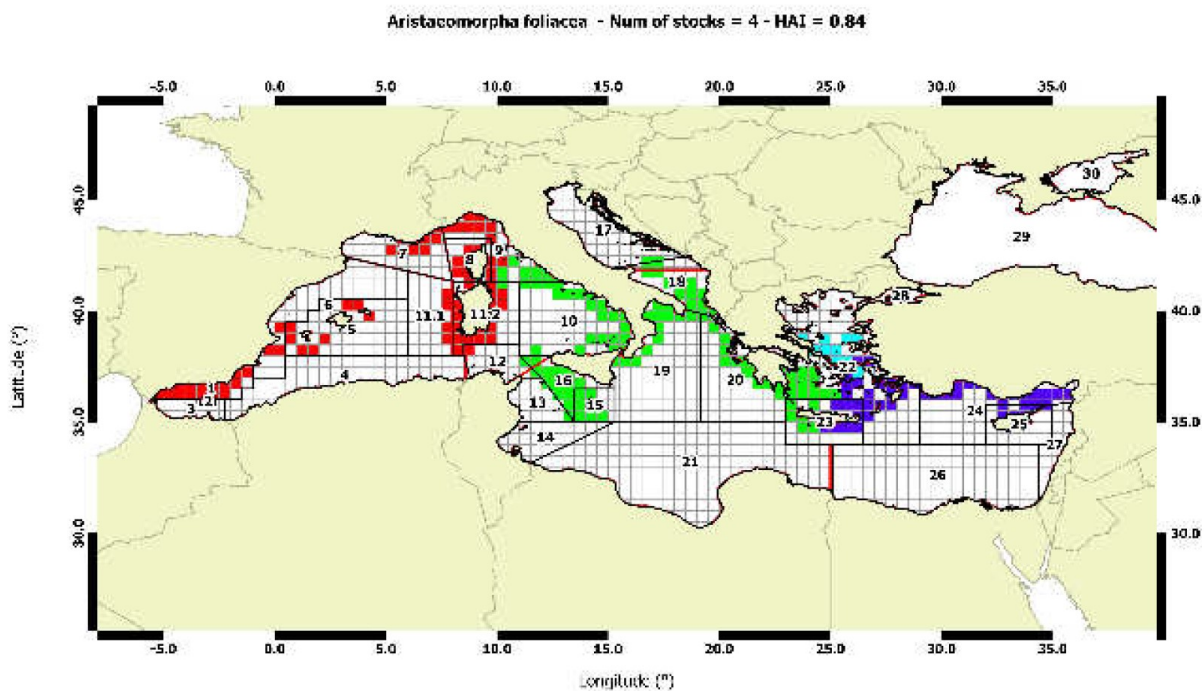
Figure 1. Giant red shrimp. Configuration of four stock units with the overlay of the GFCM GSAs.

7.4.1.2   Exploitation of Giant red shrimp in the Aegean Sea

Unfortunately, there is a lack of information about the catches of *A. foliacea* in the Aegean Sea. According to Garofalo et al. (2007), a spatial extension of the trawling activity of the Mazara del Vallo (Southern Sicily) fleet targeting red shrimp, allowed a comparison of catch rates from fishing grounds with different exploitation history. Highest catch rates were observed around the Maltese and in the easternmost region (also Aegean

Sea) fishing grounds of the Mediterranean which are being exploited since 2004 (**Error! Reference source not found.**).
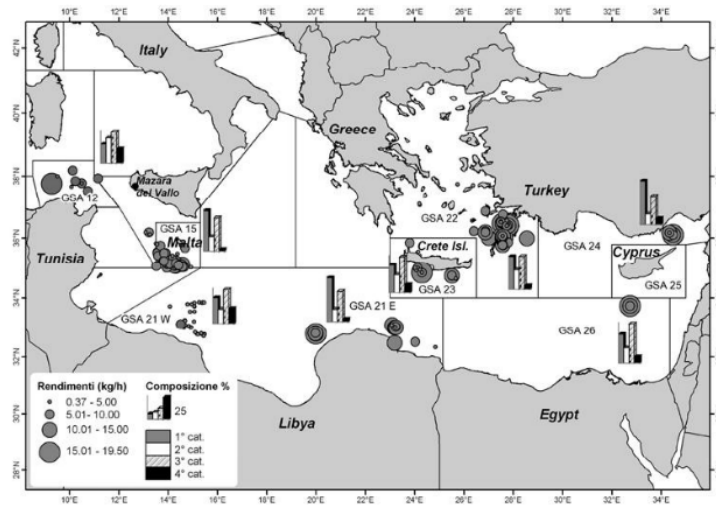
Figure 2. CPUE and percentage of commercial categories of red shrimps in the different GSAs exploited by Mazara del Vallo trawlers (2004-2006).

Fishery independent information regarding the state of the giant red shrimp stock in GSAs 22-23 can be derived from the international bottom trawl survey MEDITS, which has been carried out in since 1994 (see: (http://www.sibm.it/MEDITS%202011/principaledownload.htm). In the study from Guijarro et al., 2019, MEDITS data of *A. foliacea* from the Aegean (Aegean Sea including the waters around Crete and Cyprus) are presented (**Error! Reference source not found.**).
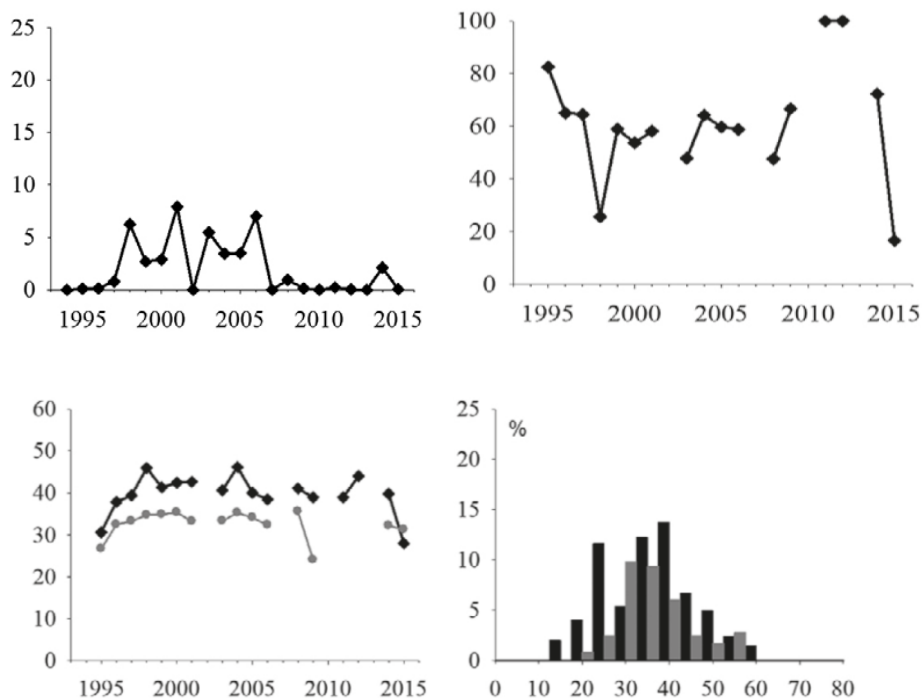
Figure 3. Trends in biomass index (kg km^{-2}; left upper panel), sex ratio (as percentage of females, right upper panel), mean length by sex (mm, carapace length, left bottom panel) and average length frequency distributions (right bottom panel) of *A. foliacea* between 1994 and 2015 for the Aegean area (including Crete

and Cyprus) sampled during the MEDITS. Females are shown in black and males in grey. Source: Guijarro et al., 2019 - http://scientiamarina.revistas.csic.es/index.php/scientiamarina/article/view/1831

Considering the lack of a reliable evaluation of the stock status in respect to any reference point, the RBF approach is going to be employed in accordance with Table 3 of FCR v2.0 SA7.7.6.

7.4.1.3   Management regulation and data collection of Italian vessels working in the Aegean Sea

The management regulations implemented by Italy are determined by the EU regulations (mainly EC regulation 1967/2006):

- Codend mesh size of trawl nets: 40 mm (stretched, diamond meshes) till 30/05/2010. From 1/6/2010 the existing nets have been replaced with a cod end with 40 mm (stretched) square meshes or a cod end with 50 mm (stretched) diamond meshes
- Towed gears are not allowed within three nautical miles from the coast or at depths less than 50 m when this depth is reached at a distance less than 3 miles from the coast. The vessel working in GSA 22-23 are not allowed inside the 6 nm from the Greeks coast and 12 nm from the Turkish coast.
- Landing obligation of species with MCRS.
- VMS/AIS active on board.

The Electronic recording and reporting system (ERS) is used to record, report, process, store and send fisheries data (catch, landing, sales and transhipment) and is active in the EU vessels active in GSA 22-23. The key element is the electronic logbook where the master of a fishing vessel keeps a record of fishing operations. The record is then sent to the national authorities, which store the information in a secure data base. Technical files for ERS system developers of EU countries are moved to the Master Data Register.

According to the Italian Ministerial Decree n.13128 of 30/12/2019, a fishing ban for trawling fisheries is implemented in each Italian GSA. Such temporal closure is applicable also to the Italian vessels operating in the Aegean Sea but are registered in GSA 16, where a closure of 30 days is implemented in accordance with regional authority. Moreover, according to the Italian Management Plan for trawl fisheries (n. 26510 of 28.12.2018) additional mandatory temporary interruption of 22 days for the year 2020 is implemented in operation of the GSA within which the enrolment office falls (i.e. GSA 16), for vessels larger than 24 m (as the present UoA).

During 2019, the Italian administration continued with the plan to reduce fishing days. The plan, implemented by Executive Decree No 26510 of 28 December 2018, further increased the temporary stop days, already planned across Italy, adapting them proportionally to the overfishing situation of each GSA.

According to article 3 of the Ministerial Decree n.13128 of 30/12/2019, the vessels practicing the target capture of deep-sea shrimp (as, Mediterranean red shrimp - *Aristaeomorpha foliacea*) that are equipped with refrigeration equipment and / or freezing of the fish, as well as a specific trawling system suitable for achieving depths greater than 300 meters - can choose to carry out the interruption period temporary mandatory, also in Maritime Compartments other than those of registration, cumulatively at the end of the fishing season of recalled fish species. For this purpose, the owner concerned must communicate it prior to the Maritime Authority of the port of registration of the unit itself, within two days prior to the beginning of the aforementioned interruption period. During the fishing season for deep-water shrimp, by-catches are permitted also of other species. Such catches can only be marketed if made with authorized and regular tools, i.e. within the permitted times and places. In any case, the prawns of depth must constitute the prevailing share, in live weight, of the reported total landed only to the species referred to in point 2 of Annex III to Regulation (EC) no. 1967/2006, as referred to in Annex IX to Regulation (EU) no. 2019/1241. In addition, it is always forbidden, on Saturdays, Sundays and holidays, to exercise the fishing with the following gears: "otter trawls", "rapid trawlers" and "twin nets divergent ". However, a partial derogation from this provision, by

reason of the respective operational peculiarities, is applied for the units authorized to Mediterranean fishing and for those that practice the deep-sea shrimp fishing, the mandatory recovery of the aforementioned days of Saturday, Sunday and holidays is allowed on an annual basis, by applying the compensation criterion between fishing and non-fishing periods, as inferable and certifiable through the current systems of remote monitoring (VMS, ERS). The shipowners concerned, at the end of each measure of fishing, proceed to deposit the documents on board with the competent Maritime Authority. Finally, the days of Saturday and Sunday are not eligible for the recovery of any days of inactivity caused by adverse weather conditions.

By analysing VMS data, it is possible to obtain the fishing days of the fleet equipped with this tracking system (as the UoA) and, by crossing fishing data with engine power data, it is possible to obtain estimated effort in Number of Fishing Days × kW. Studying the trend of the bottom trawling fishing effort in the period 2015–2019 (the blue line on **Error! Reference source not found.** represents the linear data trend), shows a clear gradual decline, with obvious long-term effects. This decline has been accentuated by the strategies to further reduce fishing days implemented in 2019. The vessels of the UoA belong to GSA 16 and a similar pattern of decreasing can be assumed also for the activity carried out in GSA 22-23 (Fabio Fiorentino pers. comm.).
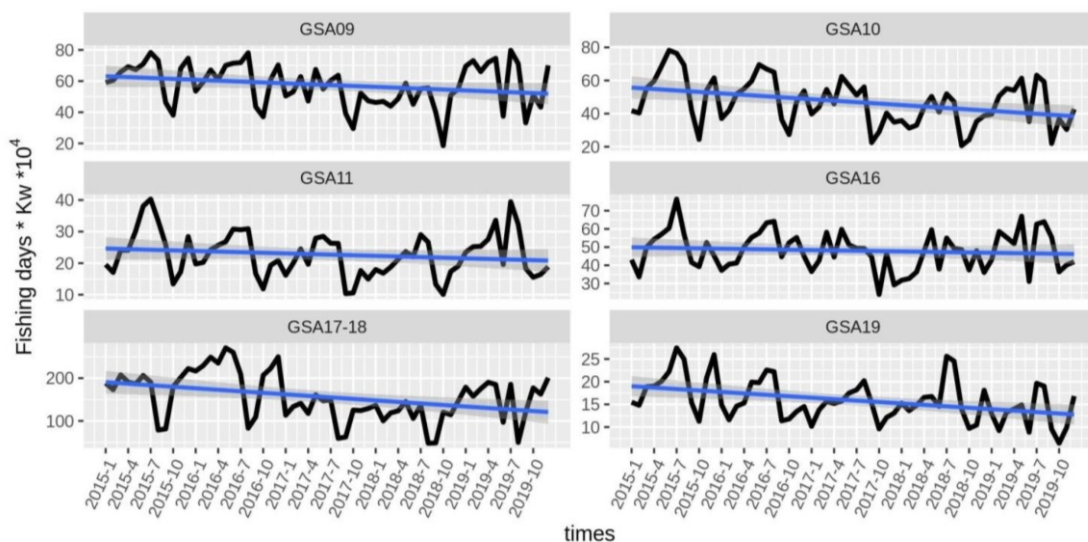
Figure 4. Changes over time in fishing days by GSA between 2015 and 2019. Source: Italian 2019 fleet report.

7.4.2   Catch profiles
Catch profiles are reported in **Error! Reference source not found.**

7.4.3   Total Allowable Catch (TAC) and catch data
There is not a Total Allowable Catch (TAC) agreed for the present stock.

Table 6. Total Allowable Catch (TAC) and catch data					
TAC	Year		2019	Amount	NA
UoA share of TAC	Year		2019	Amount	NA
UoA share of total TAC	Year		2019	Amount	NA
Total green weight catch by UoC	Year (most recent)		2019	Amount	Unknown as it is aggregated to the catches of GSA 16.
Total green weight catch by UoC	Year (second most recent)		2018	Amount	Unknown, as above.

7.4.3.1 Principle 1 references

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7.4.4 Principle 1 Performance Indicator scores and rationales
PI 1.1.1 – Stock status

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue	SG 60	SG 80	SG 100
a	**Stock status relative to recruitment impairment**		
	Guide post	It is **likely** that the stock is above the point where recruitment would be impaired (PRI).	It is **highly likely** that the stock is above the PRI.	There is a **high degree of certainty** that the stock is above the PRI.
	Met?	**NA**	**NA**	**NA**

Rationale

The Risk Based Framework (RBF) has been used to score this PI, because there are no reference points available, either derived from analytical stock assessments or using empirical approaches.
The results of the RBF assessment were:
CA Score: 60
PSA Score: 79

A score of 70 is therefore awarded for this PI.

b	**Stock status in relation to achievement of Maximum Sustainable Yield (MSY)**		
	Guide post		The stock is at or fluctuating around a level consistent with MSY.	There is **a high degree of certainty** that the stock has been fluctuating around a level consistent with MSY or has been above this level over recent years.
	Met?		**NA**	**NA**

Rationale

The Risk Based Framework has been used to score this PI.

References

Please refer to the P1 background section and references therein, and the CA and PSA tables in Section 8.3 of this report.

Stock status relative to reference points

	Type of reference point	Value of reference point	Current stock status relative to reference point
Reference point used in scoring stock relative to PRI (SIa)	NA	NA	NA
Reference point used in scoring stock relative to MSY (SIb)	NA	NA	NA

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing
Draft scoring range	60-79
Information gap indicator	Information sufficient to score PI using the RBF. We note however that information is not sufficient to score the PI without the RBF approach as stock information is very limited.
Data-deficient? (Risk-Based Framework needed)	Yes

PI 1.1.2 – Stock rebuilding

PI 1.1.2		Where the stock is reduced, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	**Rebuilding timeframes**			
	Guide post	A rebuilding timeframe is specified for the stock that is the **shorter of 20 years or 2 times its generation time**. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.		The shortest practicable rebuilding timeframe is specified which does not exceed **one generation time** for the stock.
	Met?	NA		NA
Rationale				
According to Table PF1 of MSC GCRv2.0, if the RBF is used to score PI 1.1.1, this PI is not scored.				
b	**Rebuilding evaluation**			
	Guide post	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within the specified timeframe.	There is **evidence** that the rebuilding strategies are rebuilding stocks, **or it is likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the **specified timeframe**.	There is **strong evidence** that the rebuilding strategies are rebuilding stocks, **or it is highly likely** based on simulation modelling, exploitation rates or previous performance that they will be able to rebuild the stock within the **specified timeframe**.
	Met?	NA	NA	NA
Rationale				
According to Table PF1 of MSC GCRv2.0, if the RBF is used to score PI 1.1.1, this PI is not scored.				
References				
NA				
Overall Performance Indicator (PI) Rationale				
NA				
Draft scoring range		NA		
Information gap indicator		NA		

PI 1.2.1 – Harvest strategy

PI 1.2.1	There is a robust and precautionary harvest strategy in place		
Scoring Issue	SG 60	SG 80	SG 100
	Harvest strategy design		
a Guide post	The harvest strategy is **expected** to achieve stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy **work together** towards achieving stock management objectives reflected in PI 1.1.1 SG80.	The harvest strategy is responsive to the state of the stock and is **designed** to achieve stock management objectives reflected in PI 1.1.1 SG80.
Met?	Yes	No	No

Rationale

MSC defines a harvest strategy as 'the combination of monitoring, stock assessment, harvest control rules and management actions, which may include a Management Plan (MP) or an MP (implicit) and be tested by MSE' (MSC – MSCI Vocabulary v1.1).

Also, since the RBF was used in PI 1.1.1, informal approaches are assessed against PI 1.2.1 according to MSC GCRv2.0 (GSA2.4) MSC defines assessment of data-deficient fisheries against this indicator should consider how elements of the harvest strategy combine to manage impact, such that susceptibility is maintained at or below acceptable levels given the productivity of the species.

- *The assessment should factor in the likelihood of changes within the fishery that could potentially lead to an increase in the risk of impact from fishing activity over time.*
- *Teams should further consider how elements of the strategy are combining to ensure that the fishery is moving in the desired direction or operating at a low risk level and that qualitative or semi-quantitative objectives are being achieved.*
- *There should be evidence that the expected objectives are being achieved. Evidence may be demonstrated through local knowledge or research.*
- *CABs should determine the extent to which there is a feedback and learning mechanism to inform the harvest strategy on an ongoing basis. Depending on the scale of the fishery this could be through informal stakeholder processes that are based on local knowledge of the fishery or any other less subjective review process.*

The monitoring of the catches of the target stock is carried out with electronic recording and reporting system (ERS) used to record, report, process, store and send fisheries data (catch, landing, sales and transhipment) and is active in the EU vessels active in GSA 22-23. The key element is the electronic logbook where the master of a fishing vessel keeps a record of fishing operations. The record is then sent to the national authorities, which store the information in a secure data base. Technical files for ERS system developers of EU countries are moved to the Master Data Register. However, it is not clear if other non-EU vessels exploiting the same area are recording the catches of the target stock. Also, fishery independent data are available from MEDITS trawl survey. Stock assessments of the target species are not routinely carried out due to the uncertainty in stock configuration that at the moment is further investigated in the framework of MEDUNITS project (Fabio Fiorentino pers. comm.). The Italian regulations summarized in 7.4.1.3 specific for fishing vessels registered in the Sicilian maritime compartments, which are authorized to target deep-sea shrimp, have as objective to recover the stocks within biological safety limits in agreement with CFP requirements, which is always considered in the preamble of Ministerial or Directorial decrees (e.g.: DM 0013128 30/12/2019; http://impresapesca.it/sitonuovo/disposizioni-in-materia-di-interruzione-

PI 1.2.1	There is a robust and precautionary harvest strategy in place

temporanea-delle-attivita-di-pesca-esercitate-mediante-lutilizzo-di-attrezzi-trainati-reti-a-strascico-a-divergenti-otb-r/decreto_min-_n-_13128_del_30_dicembre_2019/) issued yearly and regulating the temporal fishing ban also for the UoA vessels.   The CFP requirements are in accordance with MSC objectives reflected in PI 1.1.1 SG80.

PSA analysis demonstrates that the stock has high productivity. Although vertical and areal overlaps with the gears are high, selectivity is estimated to be medium. Post-capture mortality was scored as high, since survival of post-capture specimens is clearly high. The elements of the harvest strategy listed above are keeping effort in the fishery stable or decreasing in the case of the Italian fleet (see **Error! Reference source not found.**). Thus, the HS can maintain the stock at high level of biomass and can manage the impact on the stock, in general with management objectives reflected in PI 1.1.1 SG80. Therefore, SG60 is met. However, the rules for specifying the management measures are not responsive to the state of the stock and there is no evidence that they work towards achieving stock management objectives reflected in PI 1.1.1 SG80. Thus, SG80 and 100 are not met.

	Harvest strategy evaluation			
b	Guide post	The harvest strategy is **likely** to work based on prior experience or plausible argument.	The harvest strategy may not have been fully **tested** but evidence exists that it is achieving its objectives.	The performance of the harvest strategy has been **fully evaluated** and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.
	Met?	Yes	No	No

Rationale

In Italy, the performance of the harvest strategy has not been fully evaluated. However, the evidence that the fishery is active since many years in the area and the availability of MEDITS data as are plausible argument that the HS is likely to work. Therefore, only SG 60 is met. However, there is not a clear evidence that the HS is achieving its objectives. Therefore, SG 80 and 100 are not met.

	Harvest strategy monitoring			
c	Guide post	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Yes		

Rationale

For EU vessels monitoring is in place on the catches and abundance at sea respectively, which are monitored with ERS and with research vessel surveys (MEDITS). In addition, most of the vessels targeting giant red shrimp have active VMS on board, which is used to monitor if the HS is working in terms of days at sea. Therefore SG 60 is met.

	Harvest strategy review			
d	Guide post			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			No

PI 1.2.1	There is a robust and precautionary harvest strategy in place		

Rationale

There is no evidence that all the elements of the harvest strategy are periodically reviewed. Therefore SG 100 is not met.

	Shark finning			
e	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	NA	NA	NA

Rationale

The target stock is not a shark. This SI is not applicable.

	Review of alternative measures			
f	Guide post	There has been a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of the target stock, and they are implemented, as appropriate.
	Met?	NA	NA	NA

Rationale

Definition of 'unwanted catch' per MSC requirements (SA3.1.6): the term 'unwanted catch' shall be interpreted by the team as the part of the catch that a fisher did not intend to catch but could not avoid, and did not want or chose not to use
In the present fishery unwanted catches of target species are considered negligible (Fabio Fiorentino pers. comm.). Hence this PI is scored as not applicable.

References

Please refer to the P1 background section and references therein.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	More information sought *Information about new management measures implemented recently that would change the scoring*

PI 1.2.2 – Harvest control rules and tools

PI 1.2.2	There are well defined and effective harvest control rules (HCRs) in place		
Scoring Issue	SG 60	SG 80	SG 100
a HCRs design and application			
a Guide post	**Generally understood** HCRs are in place **or available** that are **expected** to reduce the exploitation rate as the point of recruitment impairment (PRI) is approached.	**Well defined** HCRs are **in place** that **ensure** that the exploitation rate is reduced as the PRI is approached, are expected to keep the stock **fluctuating around** a target level consistent with (or above) MSY, or for key LTL species a level consistent with ecosystem needs.	The HCRs are expected to keep the stock **fluctuating at or above** a target level consistent with MSY, or another more appropriate level taking into account the ecological role of the stock, **most** of the time.
Met?	Yes	No	No

Rationale

Since the RBF was used in PI 1.1.1, informal approaches are assessed against PI 1.2.2 according to MSC GCRv2.0 (GSA2.5.2) In informally managed fisheries, CABs should assess the extent to which there are management tools and measures in place that are consistent with ensuring that susceptibility of the target species to removal is no higher than that which would cause the risk to the target species to be above an acceptable risk range. Measures could be spatial, temporal, or changes to gear overlap.

Assessments should also consider measures in place to respond to changes in the fishery, for example, by reducing the susceptibility of target species when the fishery is not heading in the direction of its objectives.

In the present fishery the harvest control rules are a set of management measures as reported in 7.4.1.3. These include temporal limitations imposed by Italian authorities. There is also a decommissioning plan on the capacity (see STECF 19-13[4]). Therefore, there are measures available to respond to changes in the fishery (effort reduction) and HCRs can be regarded as 'generally understood' considering that they have been applied in some way by the Italian management plan for bottom trawl fisheries.

According to MSC GCRv2.0 (GSA2.5.2) HCRs should be regarded as only 'generally understood' as required to achieve a 60 score in cases where they can be shown to have been applied in some way in the past, but have not been explicitly defined or agreed.

The present fishery shows a low susceptibility risk in term of aereal overlap and selectivity, and the measures in place (e.g. temporal fishing ban) as well as the self-implemented move on rules (the vessels change fishing grounds when the CPUE goes below a certain threshold; Fabio Fiorentino pers. comm.) reduce the susceptibility of target species. Thus, SG 60 is met.

However, it is clear that the HCR are not well defined and have not been explicitly agreed, also the MP does not clearly state what actions will be taken at what specific trigger reference point levels. Therefore SG 80 and 100 are not met.

| **b** | **HCRs robustness to uncertainty** | | |

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[4] https://stecf.jrc.ec.europa.eu/reports/balance/-/asset_publisher/3rBi/document/id/2635874?inheritRedirect=false&redirect=https%3A%2F%2Fstecf.jrc.ec.europa.eu%2Freports%2Fbalance%3Fp_p_id%3D101_INSTANCE_3rBi%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-2%26p_p_col_pos%3D1%26p_p_col_count%3D2

PI 1.2.2			There are well defined and effective harvest control rules (HCRs) in place		
	Guide post			The HCRs are likely to be robust to the main uncertainties.	The HCRs take account of a **wide** range of uncertainties including the ecological role of the stock, and there is **evidence** that the HCRs are robust to the main uncertainties.
	Met?			No	No

Rationale

There is no evidence that the HCRs are taking into account any uncertainty. Therefore, SG 80 and 100 are not met.

	HCRs evaluation			
c	Guide post	There is **some evidence** that tools used **or available** to implement HCRs are appropriate and effective in controlling exploitation.	**Available evidence indicates** that the tools in use are appropriate and effective in achieving the exploitation levels required under the HCRs.	**Evidence clearly shows** that the tools in use are effective in achieving the exploitation levels required under the HCRs.
	Met?	Yes	No	No

Rationale

The main tools to implement the HCRs is the effort reduction and mesh size regulation. Taking into account, the reduction of fishing days (see **Error! Reference source not found.**) there is some evidence that the tools are appropriate and effective in limiting the impact on the population size, taking into account the PSA score. Therefore, SG 60 is met.

However, such evidences are not directly indicating that the tools are effective in achieving the exploitation levels required under the HCRs. Therefore, SG 80 and 100 are not met.

References

Please refer to the P1 background section and references therein.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	More information sought *Information about new HCRs implemented recently that would change the scoring*

PI 1.2.3 – Information and monitoring

PI 1.2.3	Relevant information is collected to support the harvest strategy		
Scoring Issue	SG 60	SG 80	SG 100

a	Range of information			
	Guide post	**Some** relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	**Sufficient** relevant information related to stock structure, stock productivity, fleet composition and other data are available to support the harvest strategy.	A **comprehensive range** of information (on stock structure, stock productivity, fleet composition, stock abundance, UoA removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	No	No

Rationale

Some relevant information derived from the monitoring of the catches and the EU fleet composition, as well as abundance of the target stock and the stock structure from trawl survey are available. This meets the requirements at SG60. However, as confirmed during the interviews with scientist's information about the catches from non-EU vessels as well as their fleet composition is not available. Therefore, SG 80 is not met.

b	Monitoring			
	Guide post	Stock abundance and UoA removals are monitored and **at least one indicator** is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and UoA removals are **regularly monitored at a level of accuracy and coverage consistent with the harvest control rule**, and **one or more indicators** are available and monitored with sufficient frequency to support the harvest control rule.	**All information** required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent **uncertainties** in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Yes	No	No

Rationale

The data required by the harvest control rule (mainly effort) are monitored with high frequency with the Vessel Monitoring System (VMS, see Figure 4). The information of abundance from trawl survey together with size and weight composition of the survey catch (see **Error! Reference source not found.**) is available. The monitoring of the catches of the target stock in the UoA is carried out with electronic recording and reporting system (ERS). Therefore SG 60 is met.

However, according to the information provided during the stakeholder meetings the use of the reporting system (ERS) for the catches of the UoA is not completely implemented. In addition, the understanding of some of the uncertainties in the data is incomplete (e.g. stock unit) and some of the data are potentially missing (see 1.2.3a),

PI 1.2.3	Relevant information is collected to support the harvest strategy

thus it is not possible to conclude that UoA removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule. Therefore SG 80 is not met.

c	Comprehensiveness of information			
	Guide post		There is good information on all other fishery removals from the stock.	
	Met?		No	

Rationale

The catches from non-EU vessels are not fully monitored. Therefore SG 80 is not met.

References

Please refer to the P1 background section and references therein.

Overall Performance Indicator (PI) Rationale	
Rationale is provided for each Scoring Issue.	
Draft scoring range	60-79
Information gap indicator	Information sufficient to score PI

PI 1.2.4 – Assessment of stock status

PI 1.2.4	There is an adequate assessment of the stock status		
Scoring Issue	SG 60	SG 80	SG 100
a	Appropriateness of assessment to stock under consideration		
	Guide post		The assessment is appropriate for the stock and for the harvest control rule.	The assessment takes into account the major features relevant to the biology of the species and the nature of the UoA.
	Met?		NA	NA

Rationale

If the RBF is used to score PI 1.1.1, this PI is not scored and is awarded a default score of 80 (see MSC FCP 2.1: PF1.1.2 & Table PF1).

b	Assessment approach		
	Guide post	The assessment estimates stock status relative to generic reference points appropriate to the species category.	The assessment estimates stock status relative to reference points that are appropriate to the stock and can be estimated.	
	Met?	NA	NA	

Rationale

If the RBF is used to score PI 1.1.1, this PI is not scored and is awarded a default score of 80 (see MSC FCP 2.1: PF1.1.2 & Table PF1).

c	Uncertainty in the assessment		
	Guide post	The assessment **identifies major sources** of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a **probabilistic** way.
	Met?	NA	NA	NA

Rationale

If the RBF is used to score PI 1.1.1, this PI is not scored and is awarded a default score of 80 (see MSC FCP 2.1: PF1.1.2 & Table PF1).

d	Evaluation of assessment		
	Guide post			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			NA

PI 1.2.4	There is an adequate assessment of the stock status		
Rationale			

	Peer review of assessment		
e	Guide post		The assessment of stock status is subject to peer review.	The assessment has been **internally and externally** peer reviewed.
	Met?		NA	NA

Rationale
If the RBF is used to score PI 1.1.1, this PI is not scored and is awarded a default score of 80 (see MSC FCP 2.1: PF1.1.2 & Table PF1).

References
NA

Overall Performance Indicator (PI) Rationale
Rationale is provided for each Scoring Issue.

Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

7.5 Principle 2
7.5.1 Principle 2 background

MSC Principle 2

Principle 2 of the MSC standard sets requirements for fishing operations that allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends. Principle 2 is designed to specifically assess the outcome, management and information aspects relating to all the key ecosystem components: primary and secondary species (i.e. unwanted catch that may be managed or unmanaged), Endangered, Threatened, or Protected (ETP) species, habitats and ecosystems. Each P2 species is considered within only one of the primary species, secondary species or ETP species components. Primary and Secondary Species above making up more than 5% of the overall catch profile of a UoA are classified as Main, while anything below it is classified as Minor. However, if a minor species is defined "less resilient" as per MSC specifications, these species are classified as Main.

P2 Scoring Elements

The following table presents the scoring elements identified for principle 2.

Table 7. Scoring elements.

Component	Scoring elements	Designation	Data-deficient
e.g. P1, Primary, Secondary, ETP, Habitats, Ecosystems	e.g. species or stock (SA 3.1.1.1)	Main/Minor?	Yes/No?
P2. Secondary species	Blackbelly rosefish *Helicolenus dactylopterus*	Main	Yes, PSA Used
P2. Secondary species	Gulper shark *Centrophorus granulosus*	Main	Yes, PSA Used
P2. Secondary species	Silver roughy or Mediterranean slimehead *Hoplostethus mediterraneus*	Main	Yes, PSA Used
P2. Secondary species	Shortnose greeneye *Chlorophthalmus agassizii*	Main	Yes, PSA Used
P2. Secondary species	Red shrimp *Aristeus antennatus*	Main	Yes, PSA Used
P2. ETP species	Shark and rays group including: Electric ray *Tetronarce nobiliana,* Sharpnose sevengill shark *Heptranchias perlo,* Bluntnose sixgill shark *Hexanchus griseus,* Angular Rough Shark *Oxynotus centrina,* Sawback Angelshark *Squatina aculeata*, Sandy Skate *Leucoraja circularis,* Common Skate complex *Dipturus batis* spp., Smalltooth Sand Tiger *Odontaspis ferox*, White Skate *Rostroraja alba and* Tope Shark *Galeorhinus galeus*	NA	No
P2. Habitats	Sandy and muddy bottoms usually located in submarine trenches and canyons along the continental slope.	Commonly encountered habitats	No
P2. Habitats	No minor habitats identified	Minor habitats	No
P2. Habitats	Deep-water corals	VMEs	No

Non target species (Primary/Secondary species)

No catch profile exists for this fishery or has been provided by the fishermen representative organisations in time for the writing of this report. Because of this, the assessment team was unable to derive a list of non-target species or bycatch regularly associated with this fishery, and classified in the MSC standard as primary and secondary species,

depending on whether they are managed with reference points (i.e. primary species) or without (i.e. secondary species). Due to the lack of information, the assessment team used CPUE information from a study from Mytilineou et al., 2006[5]. This study was carried out to evaluate red shrimps fishing grounds in the southern part of the eastern Ionian Sea, in order to collect important information for the Greek waters, where no deep-water fishery exists. This area is currently the closest area (with some information) to the Unit of Assessment in the Aegean Sea. Data for the study was collected during two experimental trawl surveys carried out in September 2000 and July–August 2001. Two commercial trawlers were used, a Greek and an Italian one, during the first and second survey, respectively. As part of the sampling exercises, 37 stations were selected with a relative abundance of red shrimp. The cod-end mesh size of both trawls was 40 mm (stretched), while the one currently used by the fishery in the Unit of Assessment (apparently) uses a 50 mm mesh size. In contrast the MEDIT survey uses a mesh size of 20 mm. Given the proximity of the Southern Ionian Sea to the Aegean Sea, the similar mesh size utilised in the study and by commercial boats today, and the similar depth fished (500- 700 m) we used the information they collected in the study as a proxy for bycatch / associates species catch in the current UoA, as it if that was a "similar fishery". The assessment team also spoke with researchers of the CNR which highlighted that typical catches of *A. foliacea* in the Aegean Sea are caught mostly above the 600 m depth. According to that, we used the Mytilineou et al., 2006 information collected for depth stratum 500–700 m to establish a proxy species profile. The majority of species they caught at that depth in terms of CPUE were:

1. Giant red shrimp *A. foliacea* (11–14 kg/h, representing 17–23% of the total catch)
2. Blackbelly rosefish *Helicolenus dactylopterus* (10 – 11 kg/h, % of total catch not reported)
3. Gulper shark *Centrophorus granulosus* (6.5 – 10.4 kg/h, % of total catch not reported)
4. Shortnose greeneye *Chlorophthalmus agassizii* (4.6 – 8.1 kg/h, % of total catch not reported)
5. Silver roughy or Mediterranean slimehead *Hoplostethus mediterraneus* (4 – 5.2 kg/h, % of total catch not reported)

Cephalopods' proportion was reported as always negligible, ranging between 0.1% and 1% of the total catch.

Considering fishermen information received after the first draft of this report, the red shrimp (*Aristeus antennatus*) was also added as an additional common species caught in this fishery.

Given that the information above does not give precise percentage information (i.e. % of total catch by weight for all species) and taking into account the uncertainty here, we use the precautionary approach and assume that blackbelly rosefish, gulper shark, shortnose greeneye and red shrimp and silver roughy are all Main species. Furthermore, because these species are not subject to stock assessments or managed using reference points and do not appear to be managed in any other explicit manner they are assessed here as Main Secondary species, as per MSC requirements.

The scores resulting from the PSA tables completed to risk assess the 5 Main Secondary species are shown below. The MSC score for the 5 scoring elements would be 75 (pass with condition).

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[5] https://link.springer.com/article/10.1007/s10750-005-1318-7

Family name	Scientific name	Common name	Species type	Fishery descriptor	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level	Density Dependance	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	Weighted PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost
Sebastidae	*Helicolenus dactylopterus*	Blackbelly rosefish	Vertebrate	Bottom trawl	2	3	1	1	1	2	3		1.86	1	3	3	3	1.65	2.48		86	Low	≥80
Centrophoridae	*Centrophorus granulosus*	Gulper shark	Vertebrate	Bottom trawl	2	3	3	2	2	3	3		2.57	1	3	3	2	1.43	2.94		75	Med	60-79
Trachichthyidae	*Hoplostethus mediterraneus*	Mediterranean slimehead	Vertebrate	Bottom trawl	2	2	1	1	1	1	3		1.57	1	3	3	3	1.65	2.28		91	Low	≥80
Chlorophthalmidae	*Chlorophthalmus agassizii*	Shortnose greeneye	Vertebrate	Bottom trawl	1	2	2	1	1	1	3		1.57	3	3	3	3	3.00	3.39		62	Med	60-79
Aristeidae	*Aristeus antennatus*	Red shrimp	Invertebrate	Bottom trawl	1	1	1			1	3	1	1.33	3	3	2	3	2.33	2.68		82	Low	≥80

Aside from the above, no Main Primary, Minor Primary or Secondary minor species have been identified in this assessment.

Discards

In the Mediterranean, bottom trawlers are responsible for the bulk of discards (generally more than 40 percent), whereas discard rates for pelagic trawlers and purse seiners are generally lower (mostly less than 15 percent and between 2 and 15 percent of total catch, respectively)[6].

Generally, in all subregions, the most commonly discarded groups of species are benthic invertebrates (e.g. gastropods, porifera, cnidarians, echinoderms), elasmobranch species with no commercial value, but also non-commercial individuals of target fish, crustaceans and cephalopods species. Annual absolute values of incidental catches of vulnerable species are not available, therefore this report collects information on the relative importance of different types of fishing gear and the main species affected.

- Sharks, rays and skates, which occur in the shallow coastal shelves of the Mediterranean, are mainly affected by bottom trawlers targeting demersal fish and invertebrate species.
- Longlines (both pelagic and demersal) have a significant impact on sharks, sea turtles and seabirds.
- Static nets also incidentally catch a conspicuous number of sea turtles.

Data from literature indicate that sea turtles (around 80 percent) and elasmobranchs (around 16 percent) show the highest percentages of reported incidental catch among the vulnerable groups. Seabirds and marine mammals, on the contrary, are apparently the groups with the lowest number of incidental catch events (around 4 percent of the total) (SOMFI 2018)[7].

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[6] http://www.fao.org/3/ca2702en/CA2702EN.pdf

[7] http://www.fao.org/3/ca2702en/CA2702EN.pdf

7.5.1.1 ETP Species

Based on the MSC v2.01 Fisheries Standard, Endangered, Threatened or Protected (ETP) species are:

1. Species that are recognised by national ETP legislation;
2. Species listed in the binding international agreements given below:
   a. Appendix 1 of the Convention on International Trade in Endangered Species (CITES), unless it can be shown that the particular stock of the CITES listed species impacted by the UoA under assessment is not endangered.
   b. Binding agreements concluded under the Convention on Migratory Species (CMS), including:
      i. Annex 1 of the Agreement on Conservation of Albatross and Petrels (ACAP);
      ii. Table 1 Column A of the African-Eurasian Migratory Waterbird Agreement (AEWA);
      iii. Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS);
      iv. Annex 1, Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS);
      v. Wadden Sea Seals Agreement;
      vi. Any other binding agreements that list relevant ETP species concluded under this Convention.
3. Species classified as 'out-of scope' (amphibians, reptiles, birds and mammals) that are listed in the IUCN Redlist as vulnerable (VU), endangered (EN) or critically endangered (CE).

Species that are recognised by national ETP legislation

EU level
The main EU legislation in force for the protection of ETP species is set out in two Directives: the "Habitats Directive" (92/43/EEC)[8] and the "Wild Birds Directive" (2009/147/EC)[9]. The species protected in these Directives are listed in Annexes which assign varying levels of protection, dependent on the conservation status of each species.

The Habitats Directive sets out protection measures for over 1,000 different animal and plant species. Annex II of the Habitats Directive lists about 900 species which require designation of Special Areas of Conservation (SACs) to protect their core areas of habitat. Whilst under Annex IV over 400 species are listed which are subject to strict protection across their entire natural range within the EU. Annex V species lists over 90 species for which Member States must ensure that their exploitation and taking in the wild is compatible with maintaining them in a favourable conservation status.

The Birds Directive protects all of the 500 wild bird species naturally occurring in the European Union (Article 1). It covers the protection, management and control of these species and lays down rules for their exploitation. It applies to the birds, their eggs, nests and habitats. Annex 1 lists 194 species and sub-species that are particularly threatened. Member states must designate Special Protection Areas (SPAs) for their survival and for all migratory bird species. Annex 2 specifies the 82 bird species that may be hunted and sets out restrictions on when this may occur in order to protect them when they are vulnerable; during their return migration to nesting areas, reproduction and raising of chicks. Annex 3 lists 26 species that, with certain restrictions, are excluded from the general prohibition on the deliberate killing, capture or trade or destruction of their nests.

Please refer to **Error! Reference source not found.** for the species identified under such legislation.

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[8] https://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm
[9] https://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm

The assessment team has also considered ETP legislation from Greece although the fishery does not appear to be prosecuted under any agreement between Italy and Greece, or in respect to any significant ETP regulation or rule established to manage the effort of Italian vessels and their effect in the Aegean Sea. In this respect, these vessels are carrying out their activities under Italian flag and rule as an extension to the activities that they would be carrying out in Italian waters. This was confirmed during calls with scientists of the CNR and the GFCM in October and November 2020. The national ETP legislation relevant for this assessment is illustrated below.

LAW 157/1992[10]: RULES FOR THE PROTECTION OF HOMEOTHERMAL WILDLIFE AND FOR VENATORY COLLECTION on wildlife protection (mammals and birds) and hunting limitations.
Species which may interact geographically with the UoAs under assessment include marine mammals and seabirds as well as species already indicated by EU legislation, conventions and international agreements. Please refer to **Error! Reference source not found.** for the species identified under such legislation.

The protection of biodiversity in the marine environment in Italy is based above all on the ratification laws of the Washington Conventions (Law No. 874 of 19 December 1975) and of the Berne Convention (Law No. 503 of 5 August 1981, amendments to Annexes I , II and III of the Convention which entered into force in Italy on 6.3.1998). Subsequently, with the Barcelona Convention (ratified by Italy with laws 30/79, 979/82, 349/86 and 394/91), the signatory countries were asked to develop specific strategies for the conservation of biological diversity and the sustainable use of Mediterranean marine resources. The Contracting Parties to the Convention and its six protocols have therefore adopted an Action Plan for the Mediterranean, the Mediterranean Action Program (MAP), oriented towards cooperation and sustainable development in the area. The protocol relating to Specially Protected Areas and biodiversity in the Mediterranean (Med SPA), ratified by Italy on 7 September 1999, provides for actions for the conservation of threatened species listed in Annex II to the protocol itself[11], shown below. We also note that the 2018 GFCM recommendation for the for the conservation of sharks and rays in the GFCM area (number GFCM/42/2018/2[12]) references the list of sharks in the following protocol. The species that may potentially interact with the fishery in question are specified below in **Error! Reference source not found.**. Species listed in the protocol that were unlikely to interact with fishery due to different geographical distribution, were not included.

PROTOCOL 323/3/1999[13] CONCERNING SPECIALLY PROTECTED AREAS AND BIOLOGICAL DIVERSITY IN THE MEDITERRANEAN
Relevant species protected under this protocol include fish, sharks and rays, reptiles, birds and marine mammals. Please refer to **Error! Reference source not found.** for the species identified under this protocol.

Greek Presidential Decree 67/81 on the protection of native flora and fauna[14]
This is the primary regulation in Greek waters for the protection of native flora and fauna. Table 8 lists shark and rays, turtle, marine mammal and seabird species protected under this regulation.

Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention, 1979).
This Convention aims to ensure the conservation of migratory species land, sea and air throughout their distribution. Binding agreements concluded under the Convention on Migratory Species (CMS), including:

- Annex 1 of the Agreement on Conservation of Albatross and Petrels (ACAP): None of the 31 species of albatross and petrels listed in Appendix 1[15] occur in the Central or Eastern Mediterranean.

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[10] https://www.minambiente.it/sites/default/files/legge_11_02_1992_157.pdf

[11] http://www.reteribes.it/interna.asp?idPag=11

[12] http://www.fao.org/gfcm/decisions/en/

[13] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:322:0003:0017:EN:PDF

[14] https://www.frontiersin.org/articles/10.3389/fmars.2017.00347/full

[15] https://www.acap.aq/

- Table 1 Column A of the African-Eurasian Migratory Waterbird Agreement (AEWA): Because not all AEWA species are relevant to the Mediterranean basin, the 2018 SPA/RAC Mediterranean List of endangered or threatened seabird species[16] was used as Mediterranean specific list of species to cross reference and isolate AEWA Table 1, Column A listed species[17]. Accordingly, the AEWA listed species that may overlap geographically and interact with the selected UoAs include the following species and populations:

1) *Larus audouinii* (Audouin's Gull) Mediterranean/N & W coasts of Africa
2) *Sternula albifrons albifrons* (Little Tern) West and East Mediterranean

- Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS): Not geographically relevant to the UoA under assessment.
- Annex 1, Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)

ACCOBAMS

The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS)[18] is a legal conservation tool based on cooperation. Its purpose is to reduce threats to cetaceans notably by improving current knowledge on these animals. The Agreement Area consists of all the maritime waters of the Black Sea, the Mediterranean and the contiguous Atlantic area West of the Straits of Gibraltar. ACCOBAMS is the first Agreement binding the Countries of these sub-regions to work together for cetacean conservation. The Delphinidae species that have geographical overlap with the UoAs in question are shown in **Error! Reference source not found.**.

We note that larger whales in the 2017 ACCOBAMS list[19] are considered highly unlikely to interact with the UoAs under assessment although we note that the risk of vessel collision could be a cause of injury or mortality.

- Wadden Sea Seals Agreement: Not geographically relevant to the UoAs under assessment.

- Any other binding agreements that list relevant ETP species concluded under the CMS: Species under Appendix 1 of the CMS have been included (see **Error! Reference source not found.**).

GFCM recommendation for the for the conservation of sharks and rays in the GFCM area

In 2018, the GFCM recommendation for the for the conservation of sharks and rays in the GFCM area (number GFCM/42/2018/2[20]) was published, updating the previous GFCM decision GFCM/36/2012/3. The shark species that may potentially interact with the fishery in question are listed below.

Table 8. ETP species in the assessment area. Note, The IUCN classification uses Mediterranean stocks, as opposed to European or Global stocks of any given species, if more precise data (i.e. at the Mediterranean level) were available. RE = Regionally Extinct, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened, LC = Least Concern, DD = Data Deficient.

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[16] http://www.rac-spa.org/node/1711
[17] https://www.unep-aewa.org/sites/default/files/instrument/agreement_text_english_final.pdf
[18]
https://accobams.org/about/introduction/#:~:text=ACCOBAMS%20was%20signed%20on%20November,on%20June%201st%2C%202001.&text=ACCOBAMS%20is%20the%20first%20Agreement,work%20together%20for%20cetacean%20conservation.
[19] https://www.accobams.org/wp-content/uploads/2017/01/ACCOBAMS_Text_Agreement_English.pdf
[20] http://www.fao.org/gfcm/decisions/en/

Species	National and EU legislation					Agreements				CITES App. 1	Red List (RE, CR, EN, VU, NT, LC, DD)	
	Law 157/1992	Greek Presidential Decree 67/81	Protocol 323/3/1999	EU Habitats Directive	EU Birds Directive	Bern Convention Appendix II	ACCOBAMS	CMS / Bonn Conv. App. I	AEWA	CITES App. 1	IUCN Red List[21]	Italy Red list[22]
Marine Mammals												
Mediterranean monk seal *Monachus monachus*	X	x	x	Annex II	-	-	-	x		x	EN	DD
Rough-toothed dolphin *Steno bredanensis*	X		x	-	-	x	x	-	-	-	LC	-
Risso's dolphin *Grampus griseus*	X		x	-	-	x	x	-	-	-	DD	DD
Bottlenose dolphin *Tursiops truncatus*	X	x	x	Annex II	-	x	x	x	-	-	LC	NT
Striped dolphin *Stenella coeruleoalba*	X	x	x	-	-	x	x	-	-	-	VU	LC
Short-beaked common dolphin *Delphinus delphis*	X	x	x	-	-	x	x	-	-	-	EN	EN
False killer whale *Pseudorca crassidens*	X		x	-	-	x	x	-	-	-	NT	-
Killer whale *Orcinus orca*	X		x	-	-	x	x	-	-	-	DD	-
Long-finned pilot whale *Globicephala melas*	X		x	-	-	x	x	-	-	-	DD	DD
Cuvier's beaked whale *Ziphius cavirostris*	x		x	-	-	x	x	x	-	-	DD	DD
Sperm whale *Physeter macrocephalus*	x		x	-	-	x	x	-	-	x	EN	EN
Minke whale *Balaenoptera acutorostrata*	x		x	-	-	x	x	-	-	x	LC	-
Humpback whale *Megaptera novaeangliae*	x		x	-	-	x	x	x	-	x	LC	-
Seabirds												
European shag (*Phalacrocorax aristotelis*)	x	-	x	-	Annex 1	x	-	-	-	-	LC	LC
Audouin's gull (Ichthyaetus audouinii)	x	-	x	-	Annex 1	x	-	x	x	-	LC	NT
Mediterranean gull (*Ichthyaetus melanocephalus*)	x	-	-	-	Annex 1	x	-	x	-	-	LC	LC
Scopoli's shearwater (*Calonectris diomedea*)	x	-	x	-	Annex 1	-	-	-	-	-	LC	LC

Species	National and EU legislation					Agreements				CITES App. 1	Red List (RE, CR, EN, VU, NT, LC, DD)	
	Law 157/1992	Greek Presidential Decree 67/81	Protocol 323/3/1999	EU Habitats Directive	EU Birds Directive	Bern Convention Appendix II	ACCOBAMS	CMS / Bonn Conv. App. I	AEWA	CITES App. 1	IUCN Red List[21]	Italy Red list[22]
Storm petrel (*Hydrobates pelagicus*)	x	-	x	-	Annex 1	-	-	-	-	-	LC	NT
Little tern (*Sternula albifrons*)	x	-	x	-	Annex 1	x	-	-	x	-	LC	EN
Lesser crested tern (*Thalasseus bengalensis*)		-	x	-	-	-	-	-	-	-	LC	-
Sandwich tern (*Thalasseus sandvicensis*)	x	-	x	-	Annex 1	x	-	-	-	-	LC	VU
Marbled duck *Marmaronetta angustirostris*	x	-	-	-	Annex 1	-	-	x	-	-	VU	EN
Ferruginous duck *Aythya nyroca*	x	-	-	-	Annex 1	-	-	x	-	-	LC	EN
Fish, sharks and rays												
European sturgeon *acipenser sturio*	x	-	x	Annex II	-	x	-	x	-	x	CR	RE
Basking shark *Cetorhinus maximus*	x	-	x	-	-	x	-	x	-	-	EN	DD
Great white shark *Carcharodon Carcharias*	x	-	x	-	-	x	-	x	-	-	CR	DD
Giant devil ray (*Mobula mobular*)	x	x	x	-	-	x	-	x	-	-	EN	EN
Electric ray *Tetronarce nobiliana*	x	x	-	-	-	-	-	-	-	-	DD	LC
Sharpnose sevengill shark *Heptranchias perlo*	x	x	-	-	-	-	-	-	-	-	DD	DD
Bluntnose sixgill shark *Hexanchus griseus*	x	x	-	-	-	-	-	-	-	-	DD	LC
Oceanic Whitetip Shark *Carcharhinus longimanus*	x	-	-	-	-	-	-	x	-	-	EN	-
Angelshark *squatina squatina*	x	-	-	-	-	-	-	x	-	-	CR	CR
Common Guitarfish *Rhinobatos rhinobatos*	x	-	-	-	-	-	-	x	-	-	EN	CR
Shortfin Mako *Isurus oxyrinchus*	x	-	-	-	-	-	-	-	-	-	CR	DD
Porbeagle *Lamna nasus*	x	-	-	-	-	-	-	-	-	-	CR	DD
Smooth Hammerhead *Sphyrna zygaena*	x	-	-	-	-	-	-	-	-	-	CR	DD
Angular Rough Shark *Oxynotus centrina*	x	-	-	-	-	-	-	-	-	-	CR	DD
Sawback Angelshark *Squatina aculeata*	x	-	-	-	-	-	-	-	-	-	CR	CR
Smoothback Angelshark *Squatina oculata*	x	-	-	-	-	-	-	-	-	-	CR	CR

Species	National and EU legislation					Agreements				CITES App. 1	Red List (RE, CR, EN, VU, NT, LC, DD)	
	Law 157/1992	Greek Presidential Decree 67/81	Protocol 323/3/1999	EU Habitats Directive	EU Birds Directive	Bern Convention Appendix II	ACCOBAMS	CMS / Bonn Conv. App. I	AEWA	CITES App. 1	IUCN Red List[21]	Italy Red list[22]
Sandy Skate *Leucoraja circularis*	x	-	-	-	-	-	-	-	-	-	CR	DD
Maltese Skate *Leucoraja melitensis*	x	-	-	-	-	-	-	-	-	-	CR	NT
Common Skate complex *Dipturus batis* spp	x	-	-	-	-	-	-	-	-	-	CR	DD
Spiny Butterfly Ray *Gymnura altavela*	x	-	-	-	-	-	-	-	-	-	CR	DD
Smalltooth Sawfish *Pristis pectinata*	x	-	-	-	-	-	-	-	-	x	CR	-
Common Sawfish *Pristis pristis*	x	-	-	-	-	-	-	x	-	x	CR	-
Sand Tiger *Carcharias taurus*	x	-	-	-	-	-	-	-	-	-	CR	DD
Smalltooth Sand Tiger *Odontaspis ferox*	x	-	-	-	-	-	-	-	-	-	CR	DD
White Skate *Rostroraja alba*	x	-	-	-	-	-	-	-	-	-	EN	CR
Blackchin Guitarfish *Rhinobatos cemiculus*	x	-	-	-	-	-	-	-	-	-	CR	CR
Scalloped Hammerhead *Sphyrna lewini*	x	-	-	-	-	-	-	-	-	-	DD	-
Great Hammerhead *Sphyrna mokarran*	x	-	-	-	-	-	-	-	-	-	DD	-
Tope Shark *Galeorhinus galeus*	x	-	-	-	-	-	-	-	-	-	VU	CR
Turtles												
Loggerhead sea turtle (*Caretta caretta*)	x	x	x	Annex II	-	x	-	x	-	-	VU	EN
green sea turtle (*Chelonia mydas*)	x	-	x	Annex II	-	x	-	x	-	x	EN	-
leatherback sea turtle (*Dermochelys coriacea*)	x	-	x	Annex IV	-	x	-	x	-	x	VU	-
hawksbill sea turtle (*Eretmochelys imbricata*)	x	-	x	Annex IV	-	x	-	x	-	-	CR	-

Bycatch of Vulnerable or ETP Species

The 2018 State of Mediterranean and Black Sea Fisheries (SoMFi) report[23], defines incidental catch of vulnerable species as a subset of bycatch which includes species that, for some reason, are considered vulnerable (i.e. long-lived vertebrates with low reproductive rates such as marine mammals, but also sea turtles, seabirds and elasmobranchs). The SOMFI report also highlights that data on incidental catch of vulnerable species are widely reported in most Mediterranean countries (as strandings and interviews), but there are no systematic monitoring and data collection systems: monitoring programmes are lacking for many fishing gear, countries or/and subregions, and most of the

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[23] http://www.fao.org/gfcm/publications/somfi/2018/en/

existing studies only cover small spatial scales. Therefore, the collection of data (e.g. number, size, areas, fishing gear) on the incidental catch of vulnerable species is key to understanding the nature and extent of the issue and can be considered as a first step toward developing and implementing adequate management measures aimed at reducing interactions.

Although the data is highly uncertain, and considering that vessels catches from red shrimp trawler vessels fishing in Aegean waters may be reported and aggregated to catches for other GSAs (e.g. Sicilian GSAs), the SOMFI report highlights that the highest group of vulnerable species bycatch in the Eastern Mediterranean is elasmobranchs. Marine mammals as well as turtles are mainly affected by coastal fisheries using trawl gear. Seabirds would generally be caught as bycatch in longline, gillnet and some trawlers but the highest risk is from passive gears. Scientists at the CNR as well as GFCM staff reported that seabirds, marine mammals and turtles would not be likely affected by the deep-water fishery under assessment. However, a range of deep-water sharks and skates may well be affected.

Gillnet, trammel net, longline and bottom trawl fisheries are considered a major threat for the survival of sharks and ray populations in the Mediterranean and the Black Sea (SOMFI, 2018). In terms of biodiversity, the historical species richness of Chondrichthyans within the Mediterranean Sea was estimated to be between 29 and 57 species[24] per 100 km^2.

Bonanomi et al. 2017[25] indicated that trawl is considered the most detrimental fishing gear for numerous elasmobranchs and chimaeras and that the North West Pacific, North East Atlantic and Mediterranean Sea have historically been the most exploited areas by trawl fisheries with a consequent high rate of Chondrichthyes bycatch. Recently, the trend has expanded in the Central Pacific and Southern Atlantic, but little information has been provided due to unassessed fisheries or poor research. Shelby et al 2015[26] conducted a meta-analysis of elasmobranch bycatch in global commercial longline, trawl, purse-seine and gillnet fisheries in order to obtain a general perspective of bycatch patterns, and to expose knowledge gaps and identify management and research priorities. One of the highlights from the study was the large bycatch of rays in the Mediterranean and the fact that deep sea bycatch is problematic because discards are likely to be dead.

Ferretti and Myers 2006[27] report that the shrimp trawl fishery is one of the most wasteful extractive practices in the oceans. Target fish usually represent less than 20 % of the total catch and a big portion of the by-catch is systematically discarded at sea. Their publication continues to say that in the Italian waters, about 13 elasmobranch species are being taken with this practice; constituting 20% of the total catches. The chondrichthyan (elasmobranchs and chimaeras) bycatch of a multi-species trawl fishery in Greece was 14.5% of the total catch, of which 63% was discarded (Damalas et al 2011[28]).

Technological modifications of for this kind of gear, such as excluder devices, to reduce the by-catch fraction of the production, are particularly widespread around the world but are not in use in this fishery. There are many studies globally which show a) considerable bycatch of sharks in shrimp fisheries (although very little evidence is available for deep water fisheries) and b) that the use of excluder devices has been generally proven to be effective (to different

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24   https://www.intechopen.com/books/marine-ecology-biotic-and-abiotic-interactions/overview-on-mediterranean-shark-s-fisheries-impact-on-the-biodiversity

25   https://www.intechopen.com/books/chondrichthyes-multidisciplinary-approach/fisheries-bycatch-of-chondrichthyes

26   https://www.sciencedirect.com/science/article/abs/pii/S0308597X14003546

27   https://www.researchgate.net/publication/276848993_By-catch_of_sharks_in_the_Mediterranean_Sea_available_mitigations_tools

28   https://www.sciencedirect.com/science/article/abs/pii/S0165783610003371

degrees) for the exclusion of shark species in the catch profile. Some of these studies include Brewer at al 2006[29], Scott et al. 2012[30], Brčić et al 2016[31], Garstin et al 2018[32] and Campbell et al 2020[33].

Some information about (relatively) deep-water fisheries and their effect on shark bycatch is available. One study surveyed the use of a shark excluding device in the Mediterranean when targeting nephrops at around 400 m depth (Brčić et al 2016). Another study by Graham et al. 2001[34] analysed changes over two decades in relative abundance of sharks and rays on Australian South East Fishery trawl grounds in upper continental slope trawling grounds (200–650 m depth). Another study by Simpfendorfen and Kyne (2009)[35] described the limited potential for recovery resulting from overfishing for deep-sea sharks, rays and chimaeras which recorded at maximum depths ranging from 400-2400 m.

However, specific to the red shrimp deep-water fishery in the Aegean sea we do not know what elasmobranchs species maybe caught due to absence of catch data, but are aware that the risks may include bycatch of juvenile and adult species, as well as disruption and decrease of natural habitats at various life stages. This was also confirmed from the conference calls the assessment team lead with key stakeholders of the fishery under assessment in October and November 2020. Despite the lack of bycatch or observer data for this specific fishery or region in the Mediterranean, it is likely that bottom trawl pose a higher risk to rays and benthic sharks. In terms of the ETP elasmobranch species identified, the risk would appear to be higher for the following species.

Table 9. Risk of shark and rays bycatch by the *A. foliacea* bottom trawl fishery in Aegean Sea. Information and references within this table were sourced from the IUCN Red List pages for each of this species (mostly Mediterranean stocks).

Species	Is it benthic?	Risk of capture of adult individuals by the UoA at the depths where the bottom trawl gear operates (500-800m)? Additional information if risk is detected.
Basking shark *Cetorhinus maximus*	No. The IUCN describes it as a marine neritic and oceanic species, a planktivorous coastal-pelagic species named for its habit of swimming slowly at the surface but also known for vertical migrates to depths of 1,264 m.	Potentially small, especially when feeding. We note however that the IUCN indicates the species is still taken as bycatch by trawl, trammel nets, and set-net fisheries, and becomes entangled in pot lines.
Great white shark *Carcharodon Carcharias*	No. The IUCN describes it as a marine neritic and oceanic species. The White Shark is pelagic and most commonly occurs in temperate continental shelf waters but also ranges into estuaries and the open ocean, and occurs to depths of 1,200 m	Possibly small since IUCN information indicates that it is caught as bycatch mostly in inshore fisheries in a range of gears, such as longlines, setlines, gillnets, trawls, hand-held rod and reel, and fish-traps; and that it is rarely caught in offshore pelagic fisheries.
Giant devil ray *Mobula mobular*	No. The IUCN describes it as a marine neritic and oceanic species. The Giant Devilray is a pelagic species that resides in coastal and continental shelf waters. It spends the majority of its time in less than 50 m of water but occasionally dives to depths of 1,112 m.	Bycatch mortalities of the Giant Devilray have been reported in a range of gears in the Mediterranean including drifnet, longlines, coastal trawls, seines and pelagic trawlers.
Oceanic Whitetip Shark *Carcharhinus longimanus*	No. The IUCN describes it as a marine neritic and oceanic species. This is one of the most widespread oceanic-epipelagic sharks, ranging across entire oceans in tropical and subtropical waters. It is normally found in surface waters, although it has been recorded to 152 m.	No, the risk of overlap with this gear type and operational depth would appear small. Oceanic Whitetip Shark is primarily taken as bycatch in large pelagic longline and purse seine fisheries targeting tuna and swordfish. It is also caught in pelagic gillnets, hand-lines and occasionally pelagic and even bottom trawls.
Angelshark *squatina squatina*	Yes. The IUCN describes it as a marine neritic and intertidal species. This is a temperate-water bottom-	No, the risk of overlap with this gear type and operational depth would appear small. However, the IUCN reports that angelsharks are highly

[29] https://www.sciencedirect.com/science/article/abs/pii/S0165783606002797
[30] https://www.tandfonline.com/doi/abs/10.1080/02755947.2012.678962
[31] https://www.sciencedirect.com/science/article/pii/S0165783615300448
[32] https://www.bycatch.org/articles/effectiveness-modified-turtle-excluder-device-ted-reducing-bycatch-elasmobranchs-atlantic
[33] http://era.daf.qld.gov.au/id/eprint/7256/
[34] https://www.publish.csiro.au/MF/MF99174
[35] https://www.cambridge.org/core/journals/environmental-conservation/article/limited-potential-to-recover-from-overfishing-raises-concerns-for-deepsea-sharks-rays-and-chimaeras/C0228E27E2C30E6E347A9E4EAB12B91F

	dwelling species found over the continental shelf, occurring on or near the bottom from close inshore (five metres) in the intertidal or subtidal zone to at least 150 m depth. The Angelshark prefers muddy or sandy substrates and may penetrate estuaries and brackish water.	susceptible to bycatch in trawls because they predominantly lie on the seafloor. Benthic trawl effort has increased in both intensity and efficiency on the shelf and slope area of the Mediterranean Sea over the last 50 years.
Electric ray *Tetronarce nobiliana*	Yes. The IUCN describes it as a marine neritic and deep benthic species. The Great Torpedo Ray occurs at depths of zero to 800 m. Juveniles are mainly benthic on soft substrates and coral reef habitats at depths of 10–150 m, and sometimes considerably deeper (up to 350 m). Adults specimens were captured in MEDITS surveys throughout the depth range surveyed (10–800 m), but mostly at depths of 200–500 m.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be resident in Greece (East Aegean Is., Kriti, Greece (mainland)). The population trend is stable and is considered Least Concern. Historically, this electric ray was valued for its liver oil, which was used in lamps prior to the use of kerosene oil. Presently, it is occasionally caught incidentally by bottom trawls and line gear in commercial and recreational fisheries. It is usually discarded at sea, resulting in limited data on catches, and discard survival is unknown.
Sharpnose sevengill shark *Heptranchias perlo*	Yes. The IUCN describes it as a marine neritic and deep benthic species. This demersal to semi-pelagic deepwater shark occurs over the upper continental slope. It is most often taken at depths of 300–600 m, but sometimes in water as deep as 1,000 m. The Sharpnose Sevengill Shark may aggregate near seamounts.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be resident in Greece (mainland). There are insufficient data on current or past catches for inferring population trends and is classified as data deficient by the IUCN. This shark is relatively uncommon throughout its range. In the Gulf of Gabès, it is sporadically reported by a variety of demersal fisheries south of Sicily. This shark is taken as bycatch in deepwater bottom trawl and longline fisheries.
Bluntnose sixgill shark *Hexanchus griseus*	Yes. The IUCN describes it as a marine neritic and deep oceanic and benthic species. This species has a wide bathymetric and geographic range, suggesting that it may be capable of long distance migration in the open ocean. The depth range of this deepwater shark extends down to at least 2,500 m on the upper continental slope. There are occasional and scattered reports from depths of 217–706 m off southern Sicily and waters between Tunisia and Malta.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be resident in Greece (mainland). This shark is taken as bycatch in handlines, longlines, gillnets, traps, trammel nets, and both mid-water and bottom trawls. The ban on fishing below 1,000 m depth in the Mediterranean region coupled with the species' wide depth range mean that it occurs largely outside the reach of fisheries. Therefore, despite the lack of region-specific data it can be inferred from the Atlantic and suspected from its range than the Bluntnose Sixgill Shark population is stable in the Mediterranean Sea as well. It is classified as Least Concern by the IUCN.
Common Guitarfish *Rhinobatos rhinobatos*	Yes. The IUCN describes it as a marine neritic species. This bottom-dwelling batoid can be found over sandy, muddy, shell, and occasionally macroalgal-covered substrates. It inhabits shallow areas of in the intertidal zone and waters <180 m deep.	No, the risk of overlap with this gear type and operational depth would appear small. Its coastal habitat makes it an easy target for artisanal fisheries and it is likely to be caught incidentally in many commercial fisheries operating along the majority of the Mediterranean coastline, including the Egyptian commercial trawl fishery off the coast of Alexandria.
Shortfin Mako *Isurus oxyrinchus*	No. The IUCN describes it as a marine oceanic species. The Shortfin Mako is an active, offshore, littoral and epipelagic species, found in tropical and warm-temperate seas from the surface down to at least 500 m.	No, the risk of overlap with this gear type and operational depth would appear small. The main threat to the Shortfin Mako in the Mediterranean Sea is incidental capture in pelagic fisheries, particularly tuna fisheries using gears such as longlines. Driftnetting is also a major threat to the population, especially since this practise has continued illegally in Mediterranean waters despite being banned in the region.
Porbeagle *Lamna nasus*	No. The IUCN describes it as a marine neritic and oceanic species. The Porbeagle is a wide-ranging coastal and oceanic species, more commonly found on continental shelves, in temperate and cold-temperate waters worldwide between one to 18°C, and zero to 1,360 m depth.	No, the risk of overlap with this gear type and operational depth would appear small. The Porbeagle has practically disappeared from the Mediterranean Sea as a result of intensive fishing effort over the past ~60 years. In particular, this shark is sensitive to both incidental and targeted exploitation by large pelagic fisheries such as driftnets and longlines.
Smooth Hammerhead *Sphyrna zygaena*	No. The IUCN describes it as a marine neritic and oceanic species. The Smooth Hammerhead is a coastal-pelagic and semi-oceanic species and occurs over the continental shelf to 200 m depth.	No, the risk of overlap with this gear type and operational depth would appear small. In the Northeast Atlantic and Mediterranean Sea this species is mainly caught by longlines and gillnets, particularly as bycatch in tuna and swordfish fisheries. Despite a ban on driftnetting in Mediterranean waters, this practice continues illegally.
Angular Rough Shark *Oxynotus centrina*	Yes. The IUCN describes it as a marine oceanic species. This benthic shark occurs at depths of 60–660 m, mostly >100 m (Serena 2005). In the northern Mediterranean Sea, it is found over coralline algal and muddy substrates, mostly at depths of 100–200 m. Kabasakal (2009) observed and video-recorded a specimen at 30 m depth in the Marmara Sea and Sion et al. (2004) reported one specimen caught at 800 m.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be resident in Greece (Kriti, Greece (mainland), East Aegean Is.). Regional survey indexes indicate that the Angular Rough Shark is more common in the western central Mediterranean Sea (Tyrrhenian Sea off Corsica, Sardinia, and Sicily) with lower abundance in the western (off Morocco, Spain, and France) and eastern (Aegean Sea) parts of the region. The Angular Rough Shark has undergone localised population declines throughout much of its Mediterranean range, including suspected disappearance from the Gulf of Lions. Incidental capture in large, offshore bottom trawl fisheries is the main threat to this benthic shark. According to Dulvy et al. (2003), the large spiny dorsal fins and relatively large body size likely make this species particularly susceptible to capture. Its exploitation as bycatch has been well documented in the Mediterranean Sea (Fischer et al. 1987).

Sawback Angelshark *Squatina aculeata*	Yes. The IUCN describes it as a marine neritic and deep benthic species. The Sawback Angelshark occurs on the outer continental shelf and uppermost slope of the Mediterranean Sea. It lives on or near the seabed at depths of 30–500 m, and prefers muddy substrates.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be possibly extinct in Greece (Kriti, Greece (mainland), East Aegean Is.). The Sawback Angelshark is taken as bycatch in benthic fisheries such as bottom trawls, trammel nets, and bottom longlines throughout its range. They are highly susceptible to trawl gear because they are sit-and-wait predators. Declines have also been reported off the Balearic Islands, where fishermen had a type of fishing net specifically for catching angel sharks called "escatera, suggesting that they used to be common in this area that they may now be absent from. Demersal fishing pressure from the shrimp bottom trawl fishery is very high in this area at depths down to ~800 m.
Smoothback Angelshark *Squatina oculata*	No. The IUCN describes it as a marine neritic and deep benthic species. A warm-temperate and tropical angel shark of the eastern Atlantic continental shelves and upper slopes from >20–500 m, mostly between 50 and 100 m, deeper in the tropics than in temperate seas.	No, the risk of overlap with this gear type and operational depth would appear small. The IUCN reports that the Smoothback Angelshark is highly susceptible to incidental capture in trawls, as well as trammel nets and bottom longlines throughout its range. It is also caught as bycatch in fixed bottom nets, line gear, and occasionally even in pelagic trawls.
Sandy Skate *Leucoraja circularis*	Yes. The IUCN describes it as a marine neritic and deep benthic species. This benthic skate occurs in offshore shelf waters and on upper slopes from 50–800 m depth. Historically it was found around 100 m depth on sandy and muddy substrates, although it now seems more abundant in deeper waters between 500 and 800 m where habitat preferences are currently unknown.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be resident in Greece (mainland). A total of 6,336 MEDITS survey tows were completed between 1994 and 1999 at depths ranging from 10–800 m across the Mediterranean including the Aegean Sea. The Sandy Skate was recorded in only 12 hauls, all in the western area of the Mediterranean basin. This skate is a bycatch in multi-species benthic trawl fisheries and offshore bottom longlines.
Maltese Skate *Leucoraja melitensis*	Yes. The IUCN describes it as a marine neritic and deep benthic species. This benthic skate occurs over sandy and sandy-muddy bottoms at depths of 60–800 m, but most commonly 400–800 m.	The majority of this species' geographic (i.e., in the Sicilian Strait around Malta) and depth (400–800 m) range occurs where trawling activity is intensive. As per Fishbase[36] the native range of this species does not extend to the Aegean Sea.
Common Skate complex *Dipturus batis* spp	Yes. The IUCN describes it as a marine oceanic species. This demersal species is found from shallow coastal waters down to depths of 600 m, although it is primarily within the 200 m depth range.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be resident in Greece (mainland). Bottom trawl surveys spanning the Alboran to Aegean Sea (i.e., northern Mediterranean coastal waters) between 1994 and 1999 at 10–800 m depth (MEDITS) only caught the Common Skate once throughout the survey. This indicates local extinction from the entire heavily fished northern coastal waters of the Mediterranean Sea. These survey data suggest that this species may only be found in the western area of the Mediterranean basin now (Morocco, Spain, and France) representing a substantial reduction in area of occurrence of this species. Common Skate is probably captured as part of the bycatch of multi-species trawl fisheries, despite its low frequency of occurrence in the Mediterranean Sea.
Spiny Butterfly Ray *Gymnura altavela*	No. The IUCN describes it as a marine neritic species. This is a large batoid that was once locally abundant with a patchy range. It is found in shallow coastal waters over sandy, muddy, and shelly detrital substrates and sometimes on Posidonia beds (seagrass) from 10–100 m depth.	No, the risk of overlap with this gear type and operational depth would appear small. This ray is a bycatch of coastal demersal fisheries but is not targeted.
Smalltooth Sawfish *Pristis pectinata*	For adult sawfish, unpublished data from pop-off archival satellite transmitting (PAT) tags indicate Smalltooth Sawfish spend the majority of their time in shallow waters (<10 m deep) and prefer temperatures between 22°C and 28°C (J.K. Carlson unpublished data). The maximum recorded depth for Smalltooth Sawfish is 88 m.	No, the risk of overlap with this gear type and operational depth would appear small. The principal threats to the Smalltooth Sawfish are from fishing. The long toothed rostrum of sawfishes makes them extremely sensitive to entanglement in any sort of net gear, gillnetting and trawling in particular.
Common Sawfish *Pristis pristis*	Largetooth Sawfish are generally restricted to shallow (<10 m) coastal, estuarine, and fresh waters, although they have been found at depths of up to 26 m in Lake Nicaragua.	No, the risk of overlap with this gear type and operational depth would appear small. In general though, the long toothed rostrum of sawfish makes them extremely vulnerable to entanglement in any sort of net gear, gillnetting and trawling in particular.
Sand Tiger *Carcharias taurus*	It may also occasionally be found in shallow bays, around coral reefs, and very rarely to depths of around 200 m on the continental shelf. It usually lives near the bottom, but may also move throughout the water column	No, the risk of overlap with this gear type and operational depth would appear small. Although this species is not targeted by commercial fishing activities in most of the Mediterranean Sea, it is taken as bycatch in relatively shallow coastal waters.

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[36] fishbase.se/summary/Leucoraja-melitensis.html#

Smalltooth Sand Tiger *Odontaspis ferox*	Yes. The IUCN describes it as a marine neritic and deep benthic species. It is usually associated with mud, sand, or rocky reef habitats. It occurs at depths ranging from 10–850 m, but is most commonly found at depths <300 m.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be resident in Greece (East Aegean Is., Greece (mainland), Kriti). Until the mid 1990s, occurrences off Croatia included relatively small (<200 cm TL) specimens caught by trawls and deepwater bottom longlines. Specimens are most often taken at night by bottom gillnets, bottom longlines, and vertical set lines operating over or closely adjacent to rocky or boulder-strewn substrates. Trawler captures are likely in various areas (e.g., Sicilian Channel and Adriatic Sea), and the species is sometimes caught by longline and sold for human consumption off Lebanon. The Smalltooth Sand Tiger Shark is inferred to have disappeared from the majority of the Mediterranean Sea based on an absence of sightings or catches over the past decade.
White Skate *Rostroraja alba*	Yes. The IUCN describes it as a marine neritic and deep benthic species. The White Skate is a demersal species of sandy and detrital substrates from coastal waters to the upper slope region between approximately 40 and 400 m depth, occasionally down to 500 m.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be resident in Greece (Greece (mainland), East Aegean Is., Kriti). Few data are available on the population size of this skate. The data do indicate that it has undergone a reduction in abundance and is now considered extremely rare in the Mediterranean Sea. This skate is a bycatch of the multi-species trawl fisheries operating within its Mediterranean range.
Blackchin Guitarfish *Rhinobatos cemiculus*	The Blackchin Guitarfish occurs from close inshore to depths of at least 80 m on the continental shelf.	No, the risk of overlap with this gear type and operational depth would appear small. In the Mediterranean, the Blackchin Guitarfish is regularly landed in fisheries both as a target species and as bycatch, particularly in the southern and eastern Mediterranean.
Scalloped Hammerhead *Sphyrna lewini*	Yes. The IUCN describes it as a marine neritic, oceanic and deep benthic species. This is a coastal and semi-oceanic pelagic shark, found over continental and insular shelves and in deepwater near to the shelf, ranging from the intertidal and surface to at least 275 m depth.	No, the risk of overlap with this gear type and operational depth would appear small. Scalloped Hammerhead is taken as both a target and bycatch by trawls, purse seines, gillnets, fixed bottom longlines, pelagic longlines and inshore artisanal fisheries.
Great Hammerhead *Sphyrna mokarran*	No. The IUCN describes it as a marine neritic and oceanic species. The Great Hammerhead is a generally solitary, coastal and semi-oceanic pelagic shark, that occurs close inshore and well offshore at depths ranging from near-surface to 300 m deep.	No, the risk of overlap with this gear type and operational depth would appear small. The Great Hammerhead is caught globally as target and bycatch in commercial and small-scale pelagic longline, purse seine, and gillnet fisheries. It is also captured in coastal longlines, gillnets, trammel nets and sometimes trawls, particularly in areas with narrow continental shelves.
Tope Shark *Galeorhinus galeus*	Yes. The IUCN describes it as a marine neritic, oceanic and deep benthic species. Tope is most abundant in cold to warm temperate continental seas, from very shallow water to well offshore, being primarily found near the bottom but ranges through the water column even into the pelagic zone to depths of 826 m, though it most frequently occurs to depths of 200 m.	Yes, it could be captured/encountered by this fishery. The species is considered by the IUCN to be resident in Greece (Kriti, Greece (mainland), East Aegean Is.). This species is now rare in the Mediterranean Sea, and although formerly common in the Adriatic Sea, it has not been captured there in the past half century. Although no direct fisheries for Tope exist in the Mediterranean Sea, it was traditionally caught as bycatch in gillnets and trammel nets in the northern Adriatic Sea, also as bycatch of semi-industrial (Adriatic Sea and Sicily) and artisanal fisheries in pelagic and demersal nets, deep longlines, drift lines, and troll lines. In recent times, only bottom trawl and longline fisheries have reported continuous bycatch of Tope, and such reports are very rare nowadays.

The species highlighted in orange could be potentially caught by the fishery in question but the assessment team does not have catch or observer data, or other information, to inform if this is indeed the case and/or to better establish the actual risk from this fishery. Absence of data is the core issue. Industry representatives have not assisted the assessment team with the catch data requested.

Another issue with sharks is the potential retention of some of these non-target species for potential sale as other valuable species, such as swordfish[37].

Conservation of sharks, rays and chimeras

Cartilaginous or chondrichthyes (sharks, rays and chimeras) are particularly sensitive to anthropogenic impact. The chondrichthyans have in fact low fertility, slow growth, late sexual maturity; and for the most part they are predators at the top of the food chains and therefore their populations are not abundant in nature. The greatest impact of human activities on cartilaginous fish populations derives from fishing. In particular bottom trawls and longlines, during fishing

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[37]   https://www.repubblica.it/ambiente/2020/05/30/news/allarme_wwf_con_la_pesca_illegale_lo_squalo_a_rischio_specie_mediterraneo-257980829/

operations for more valuable fish, accidentally but frequently catch specimens of cartilaginous fish that are discarded at sea or marketed at low prices. Another important cause of threats to be taken into consideration is the degradation by anthropogenic causes of environments and habitats potentially important for the life of these animals.

The conservation actions on this particular group of fish appear to be extremely limited. In fact, specific national legislation is missing which implements the protection actions already provided for by international agreements and by community provisions for some species. This legislation is considered urgent and will have to include rules that reduce threats from fishing on cartilaginous fish complex, providing impact assessments and identification of areas "Sensitive" for the species to be protected[38] [39].

7.5.1.2   Habitats

The MSC Fisheries Standard v2.01 requires that the UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates. If the UoA is considered to harm habitats, a strategy should then be in place to ensure the UoA does not pose a risk of serios/irreversible harm to habitats. MSC intends that the scores will be determined for three different types of habitat status: commonly encountered, vulnerable marine ecosystems and minor encountered.

The Assessment Team are required to define habitats impacted by the UoAs into the following categories:

Commonly encountered. These are those habitats that regularly come into contact with gear used by the UoA, based on the spatial overlap of the UoAs fishing effort with the habitat's range. They likely include those that the target species favours, that the UoA's gear is designed to exploit, and/or that make up a reasonable portion of the UoA's fishing area.

Vulnerable Marine Ecosystems (VMEs). These are habitats as defined in paragraph 42 subparagraphs (i)-(v) of the FAO Guidelines, which is based on the habitats having one or more of the following characteristics:
- Uniqueness or rarity,
- Functional significance (e.g. inter alia as spawning, nursery or recovery of fish stocks),
- Fragility,
- Life-history traits of component species that make recovery difficult (e.g. inter alia slow growing, slow maturing species or those with low or unpredictable recruitment),
- Structural complexity.

Minor (all other habitats).

These habitats have been defined at the end of this Habitat section.

"No serious or irreversible harm" means that a habitat can recover to at least 80% of its unimpacted structure, biological diversity and function within 5-20 years after the UoA would stop fishing. Serious or irreversible harm includes "the loss or extinction of habitat, depletion of key habitat-forming species or associated species to the extent that they meet criteria for high risk of extinction, and significant habitat alteration that causes major change in the structure, function, and/or diversity of the associated species assemblages".

Protected Areas

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[38] http://awsassets.panda.org/downloads/wwf_sharks_in_the_mediterranean_2019_v10singles.pdf
[39] http://www.iucn.it/pdf/Comitato_IUCN_Lista_Rossa_dei_vertebrati_italiani.pdf

In response to the European Habitats (92/43 / EEC) and Birds (79/409 / EEC) directives, Italy has identified a system of Community Interest Sites (SIC) and Special Protection Areas (SPAs) collectively called Natura 2000 Network, which covers about 21%[40] of the national territory.

Other management measures
The GFCM has recently adopted management measures for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Levant Sea (geographical subareas 24-27), the Ionian Sea (geographical subareas 19-21) and the Strait of Sicily (geographical subareas 12-16). The GFCM has also adopted in 2018 two multiannual management plans for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Ionian Sea (GFCM/42/2018/4) and the Levant Sea (GFCM/42/2018/3)[41].

However, no measures or plans have been adopted for shrimp caught in the Aegean Sea (GSA 22).

A management plan for Aegean bottom trawlers was published in 2013[42], although it covers mainly shallow waters and does not include management measures specific to giant red shrimp, it states that deeper international waters of the Aegean and Ionian seas are exploited by foreign fleets[43] (e.g. Italian) targeting mainly red shrimps.

Reflecting Recommendation GFCM/29/2005/1[44] contracting parties and cooperating noncontracting parties CPCs are required adopt measures aimed at increasing the selectivity of demersal trawl nets, by implementation of, at least, a 40 mm mesh size opening for the whole demersal trawl codend, as well as a ban prohibiting the use of towed dredges and trawl nets at depths beyond 1000 m. In 2016, this large protected area below 1000 metres was officially declared a FRA by the Commission. The area closed in the Aegean Sea is shown below.

[40] http://www.iucn.it/pdf/Comitato_IUCN_Lista_Rossa_dei_vertebrati_italiani.pdf
[41] http://www.fao.org/gfcm/decisions/ar/
[42] https://stecf.jrc.ec.europa.eu/documents/43805/595615/2013-04+Greece+-+Management+plan+new+version.pdf
[43] https://oceana.org/sites/default/files/reports/european_trawlers_destroying_oceans.pdf
[44] https://gfcm.sharepoint.com/CoC/Decisions%20Texts/REC.CM_GFCM_29_2005_1-e.pdf?originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlcG9pbnQuY29tLzpiOi9nL0NvQy9FVjBBcG1qUzh6NUNqU2J5dnNtU0c0SUJ1cDdGTU5PcmNfLVk5S0t3ZVpBP0J0aW1lPWeW52ZkdIMkVn
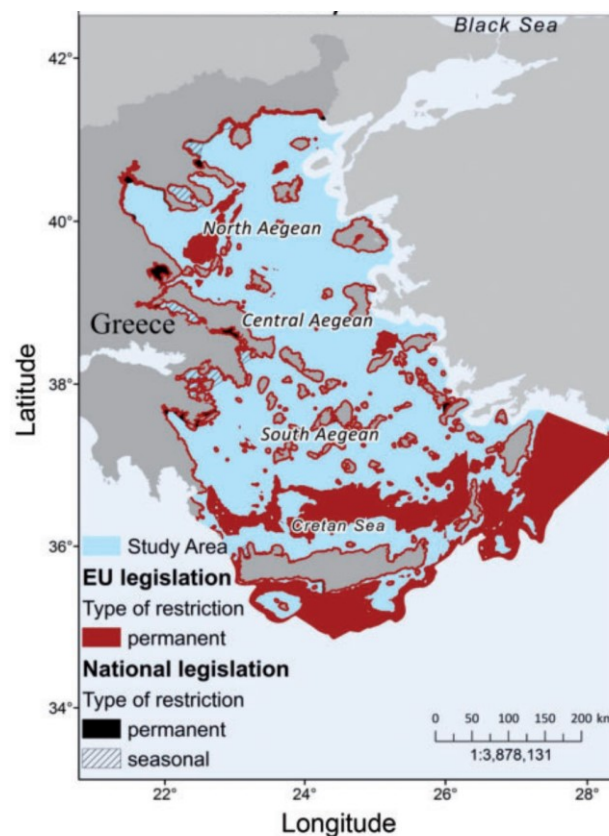
Figure 5. Spatiotemporal restrictions for bottom trawlers in the Aegean Sea based on European (EU) and national legislation (Petza et al., 2017). Trawling is prohibited at depths >1000 m (EC Regulation 1967/2006) marked in red. (Source: Maina et. al. 2018[45]).

The giant red shrimp *Aristaeomorpha foliacea* is a deep-water benthopelagic shrimp with a reported depth distribution of 120-1300 m, generally on muddy bottoms (Fischer et al., 1987)[46]. The species aggregates in submarine trenches and canyons along the continental slope (Ragonese et al., 1997; Bianchini, 1999) and peaks in abundance at 300-800 m depths (Ragonese et al., 1997 and references therein; Politou et al., 2004). In the Sicilian Channel the species has been reported to have a marked preference for habitats between 500-700 m. More specifically, off the coast of Tunisia the depth distribution of *A. foliacea* increases gradually from the Sisters' Rock located off Tabarka to the Skerki Channel (Ben Meriem, 1994) and the Pantelleria Channel, where it is only found consistently below 600 m depth (Bianchini, 1999). During the remote site visits interviews with stakeholders, scientists at the CNR confirmed that most of the catch of red shrimp in the Aegean Sea occurs at and just above the 600 m depth.

Unfortunately, there is a lack of information about the geographical distribution of catches of *A. foliacea* in the Aegean Sea. According to Garofalo et al. (2007), a spatial extension of the trawling activity of the Mazara del Vallo (Southern Sicily) fleet targeting red shrimp, allowed a comparison of catch rates from fishing grounds with different exploitation history, including those in the area under assessment. Highest catch rates were observed around the Maltese and in the easternmost region (also Aegean Sea) fishing grounds of the Mediterranean which are being exploited since 2004 (**Error! Reference source not found.**).

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[45] https://academic.oup.com/icesjms/article/75/6/2265/5047862

[46] http://www.faomedsudmed.org/html/species/Aristaeomorpha%20foliacea.html
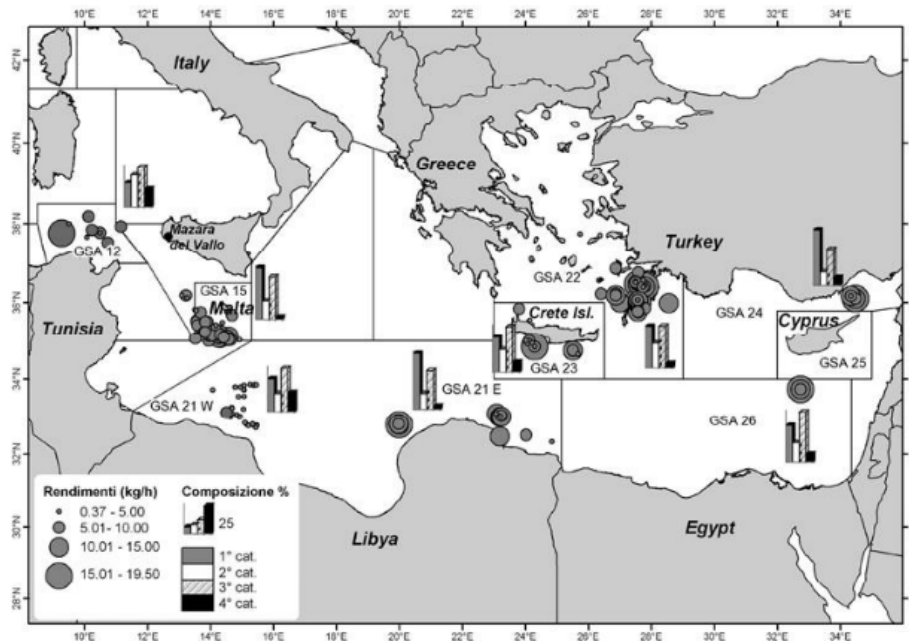
Figure 6. CPUE and percentage of commercial categories of red shrimps in the different GSAs exploited by Mazara del Vallo trawlers (2004-2006).

Further to the above, we have included a bathymetric figure to better understand which areas in GSA 22 and 23 would be within the depth range of the fishery. These are shown in the next figure in orange (440 to 800 m depth).
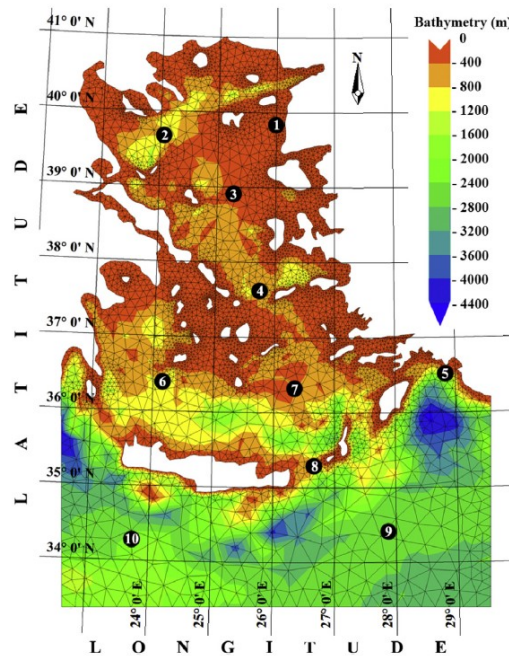
Figure 7. Bathymetry of the Aegean Sea. Note specifically the orange areas spanning from 400-800 m depth, where the UoA could be fishing in. Source: Jadidoleslam et. al. 2016[47].

In regard to habitat types in the depths fished by the UoA in the Aegean Sea and North of the Island of Crete please refer to the next figure below. Sandy and muddy habitat types appears to be commonly encountered.

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[47] https://www.sciencedirect.com/science/article/abs/pii/S0960148115303013
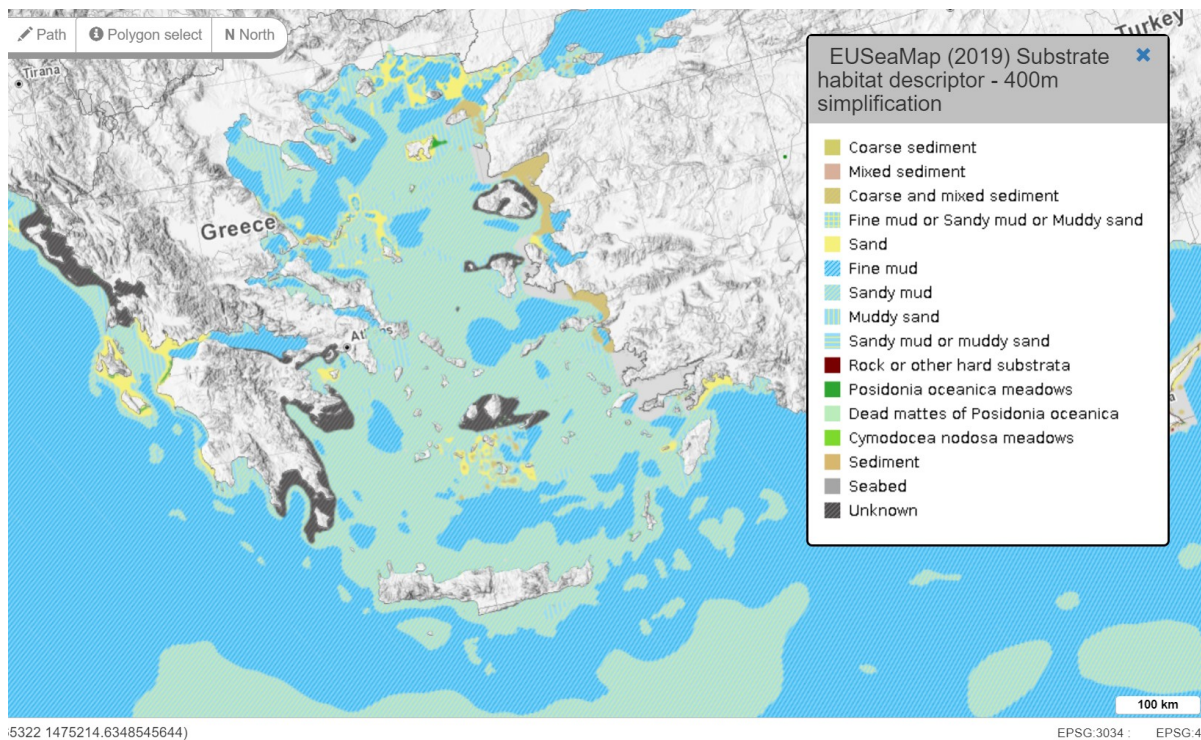
Figure 8. Substrate habitat descriptor for GSA 22 and 23. Source: EMODnet Seabed Habitats[48].

We note that no fishing effort maps have been provided by industry or were reported available by scientists from the CNR (noting however that there is a working progress to compile fishing effort and CPUE data for this fishery in the Aegean and may be published in 2021). Due to the lack of data the fishery is assumed to be able to operate primarily in the same regions reported in Garofalo et al. (2007) in the Southeastern Aegean Sea and South of Crete at all the depths (500-800 m) (but potentially other regions as well) indicated in the in the bathymetry figure reported earlier.

Trawl gear management measures and VMEs

The GFCM has not defined VMEs within its management regulations, and there are no formally declared and adopted VMEs within the Mediterranean Sea. Instead, and through its ecosystem approach, the GFCM has adopted FRAs as a multi-purpose spatial-management tool used to restrict fishing activities in order to protect deep-sea sensitive habitats, such as VMEs, and essential fish habitats[49].

The report of the second meeting of the Working Group on Vulnerable Marine Ecosystems (WGVME) held in 2018[50] advised on new proposals for closures and on the enforcement of existing FRA measures. Currently, the only management measure in place to protect VME from bottom trawl fisheries are the existing FRAs addressing VME protection, but none of these have been proposed or implemented in the Aegean Sea for the Unit of Assessment.

Considering Resolution GFCM/43/2019/6[51], CPCs are required to encourage, within the zones identified by the Scientific Advisory Committee on Fisheries (SAC), the progressive implementation of a set of transitional measures to prevent significant adverse impacts (SAIs) of deep-sea fisheries activities on vulnerable marine ecosystems

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[48] https://www.emodnet.eu/en/seabed-habitats
[49] http://www.fao.org/gfcm/data/maps/fras/en/
[50] http://www.fao.org/gfcm/technical-meetings/detail/en/c/1142043/
[51]
https://gfcm.sharepoint.com/CoC/Decisions%20Texts/Forms/AllItems.aspx?id=%2FCoC%2FDecisions%20Texts%2FRES%2DGFCM%5F43%5F20 19%5F6%2De%2Epdf&parent=%2FCoC%2FDecisions%20Texts&p=true&originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlcG9pbnQuY29tLzpiOi9nL0 NvQy9FVVJkb083NmhlMVBqYTQwZk02bGFyY0JJUHJwWWswRlFFWMWQ0Q3VieHllMbXZnP3J0aW1lPVJTTFYtX0NIMkV

(VMEs) formed by cnidarian (coral) communities, which are known to occur in the Mediterranean Sea (geographical subareas [GSAs] 1–28), and listed in Annex II of GFCM/43/2019/6. The Recommendation includes fishing vessels above 15 metres (length overall [LOA]) operating with bottom contact fishing gear and fishing for *Aristaeomorpha foliacea*, *Aristeus antennatus*, or *Plesionika martia*; and b) all fishing vessels above 15 metres (LOA) operating with bottom contact gear (bottom trawls, longlines, gillnets and pots and traps) deeper than 300 metres and on all offshore seamounts. The GFCM Resolution made also suggestions to improve data collection systems such as an adequate level of scientific observer programme coverage.

Exclusions in the Aegean Sea
Italian vessels working in GSA 22-23 are not allowed inside the 6 nm from the Greeks coast and 12 nm from the Turkish coast. This has been shown in the figure below.
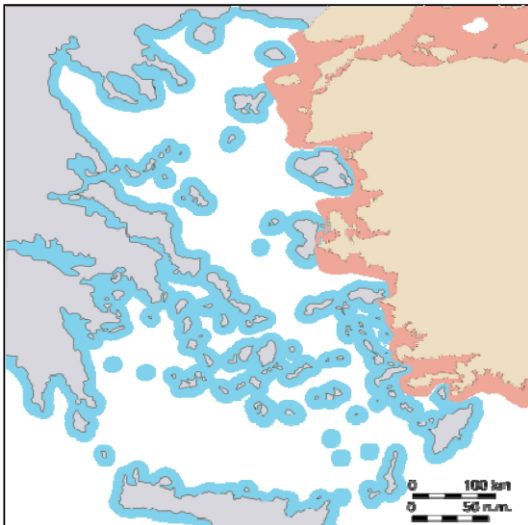
Figure 9. Greek (6 nm) and Turkish (12 nm) territorial sea width in the Aegean Sea excluded to Italian vessels. Modified from Siousiouras and Chrysochou 2014[52].

Posidonia oceanic, coralligenous outcrops and maërl beds

Posidonia oceanica habitats common in the Mediterranean Sea would generally not be found below 35 m depth. Bioconstructions such as coralligenous outcrops and maërl beds are typical Mediterranean underwater seascapes, comprising coralline algal frameworks that grow in dim light conditions. These habitats too occur in relatively shallow water and are likely not found below 140 m (Martin et. al. 2014[53]). Because the red shrimp fishery operates routinely at greater depths, the unit of assessment is highly unlikely to come in contact and affect these habitats which are not considered any further in the assessment.

Deep water corals and sponge communities

Lophelia pertusa, *Madrepora oculata* and *Desmophyllum dianthus* are cold water coral reefs known to occur in the Aegean Sea. The black coral *Leiopathes glaberrima[54]*, the hexacorals *Dendrophyllia cornigera and D. dianthus* are also known to occur in the Aegean Sea[55]. These species are endangered in the IUCN Red List[56]. Their depths of occurrence overlap with the that of the fishery operational depth[57]. We also note that some sea pens such as *Pennatulidae spp.*

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[52] https://www.mdpi.com/2075-471X/3/1/12/htm
[53] https://www.nature.com/articles/srep05073
[54] https://www.intechopen.com/books/mediterranean-identities-environment-society-culture/deep-sea-biodiversity-in-the-aegean-sea
[55] https://www.tandfonline.com/doi/full/10.1080/24750263.2018.1452990
[56] https://mx.oceana.org/sites/default/files/fs_gfcm_workshop_vmes_2017.pdf
[57] http://www.fao.org/3/a-i7256e.pdf

and *Funiculina quadrangularis* overlap with the depths of the fishery, are endangered in the IUCN Red List, although may not occur in the Aegean Sea since no such records have been found. There are no deep-sea sponge aggregations classified as endangered in the Mediterranean[58]. Furthermore, most deep sea water sponges in the Mediterranean appear to occur mainly in mixed substrates and rocky bottoms, where this fishery is unlikely to operate.

In terms of collection of available records, Sini et al. 2017[59] reported in their ecological mapping exercise of the Aegean Sea, among other items, on the geographical distribution of corals of the bathyal zone (i.e. 200 to 2000 m[60]) and anthozoa, which could occur at the depth fished by this fishery. The same study also reported on the known distribution of sponge species, mostly referring to the distribution of *Aplysina spp.* (33%) (found at 0–300 m depth; rocky bottom[61]), *Sarcotragus foetidus* (30%) (generally found above 100 m depth), and *Axinella cannabina* (18%) (probably found in shallow waters above 100 m depth). Scientists at the CNR as well as GFCM staff reported that it would be unlikely for these trawlers to fish in areas where these deep water corals and sea sponge communities would be distributed due to damage to the fishing nets, and because there trawlers tend to trawl exactly the same areas, passing over the same transect over and over again. We also note that deep water sponge communities and corals tend to occur mostly in mixed and rocky substrates[62].

They confirmed that if damage was done to important VMEs that would be done once only, after the vessel trawled over a certain section of the seabed, but after that, the vessel would not trawl new areas but continue to trawl existing (i.e. cleaned) grounds. That however does not mean that damage to these species and habitats may have not been made in the first place by "cleaning the fishing grounds" since trawlers directly produce a reduction in the coral coverage on the swept bottoms through damage and abrasion. In the figure below reporting deep water corals, only the green and black spots indicate areas where there are records of deep-water corals potentially within the depth range of the fishery under assessment. Based on the bathymetric map shown earlier, it is possible that some of these coral gardens may be found at depths overlapping with those where the fishery operates in. However, due the lack of fishing effort and distribution data we cannot determine whether an actual overlap between the fishery and these VMEs may occur.

[58] https://mx.oceana.org/sites/default/files/fs_gfcm_workshop_vmes_2017.pdf
[59] https://www.frontiersin.org/articles/10.3389/fmars.2017.00347/full
[60] https://www.sciencedirect.com/topics/earth-and-planetary-sciences/bathyal-zone
[61] http://www.fao.org/3/a-i6945e.pdf
[62] http://www.fao.org/3/a-i6945e.pdf

Figure 10. (Left) Corals of the bathyal zone (CBZ), Corals of the bathyal zone thanatocoenoses (CBZthan), Corals of the sublittoral zone (CSZ) around 200 m depth, and Anthozoa in the Aegean Sea. **(Right)** Porifera in the Aegean Sea. Source Sini et al. 2017[63].

Commonly Encountered Habitats, minor habitat and VMEs

Based on available data and as reflecting MSC standard requirements we define here:

- **Commonly encountered habitats** as sandy and muddy bottoms usually located in submarine trenches and canyons along the continental slope.
- No **minor habitats** have been identified.
- **VMEs** were identified as deep-water corals

7.5.1.3 Ecosystem

The Aegean Sea is an arm of the Mediterranean Sea located between the mainland of Greece and Turkey. It is connected to the Sea of Marmara via the Çanakkale Strait (max depth 105 m) in the northeast, while several deeper gateways provide communications to the rest of the Eastern Mediterranean Sea in the south. The Aegean Sea has a very irregular coastline with a number of small and large bays, peninsulas and islands or islets. This irregular coastline forms small basins and passages. It covers about 191,000 km2 in area and measures about 610 km longitudinally and 300 km latitudinally. The total water area is 193,950.33 km2. While there are only 96 islands and rocks belonging to Turkish waters, there are 460 of them belonging to Greek waters.

Approximately 33.6% of the Aegean Sea is shallower than 200 m, while the mean depth is 362 m. In the northern Aegean Sea, nutrients are supplied by freshwater runoff of rivers and by inflow of nutrient-rich Black Sea surface waters. Most of the deep sea is heterotrophic except the hydrothermal vents, thus the life of the deep-sea benthos depends on the food supply derived from surface production. As a consequence, even though the Mediterranean Sea is oligotrophic, the northern Aegean Sea is more productive. Higher faunal densities are expected in this area. The biodiversity of deep benthic communities is also related to depth and sediment characteristics[64].

In 2010, Tsagarakis et al.[65] published the first mass-balance trophic model describing the food-web traits of the North Aegean Sea (Strymonikos Gulf and Thracian Sea, Greece, Eastern Mediterranean) between 20 m and 300 m isobaths and to explore the impacts of fishing in the region. The results were presented and discussed in comparison to other previous ecosystems modelled from the western and the central areas of the basin (South Catalan and North-Central Adriatic Seas). The North Aegean shared some common features with other Mediterranean Sea ecosystems such as dominance of the pelagic fraction in terms of flows and strong benthic-pelagic coupling of zooplankton and benthic invertebrates through detritus. The importance of detritus highlighted the role of the microbial food-web, which was indirectly considered through detritus dynamics. Ciliates, mesozooplankton and several benthic invertebrate groups were shown as important elements of the ecosystem linking primary producers and detritus with higher trophic levels in the N. Aegean Sea. Adult anchovy was shown as the most important fish group in terms of production, consumption and overall effect on the rest of the ecological groups in the model, in line with results from the Western Mediterranean Sea. The five fishing fleets considered in their study (both artisanal and industrial) had high impacts on vulnerable species and numerous targeted groups given the multispecies nature of the fisheries in the N. Aegean Sea. Several exploitation indices highlighted that the N. Aegean Sea ecosystem was highly exploited and unlikely to be sustainably fished, similarly to other Mediterranean marine ecosystems.

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[63] https://www.frontiersin.org/articles/10.3389/fmars.2017.00347/full
[64] https://www.intechopen.com/books/mediterranean-identities-environment-society-culture/deep-sea-biodiversity-in-the-aegean-sea
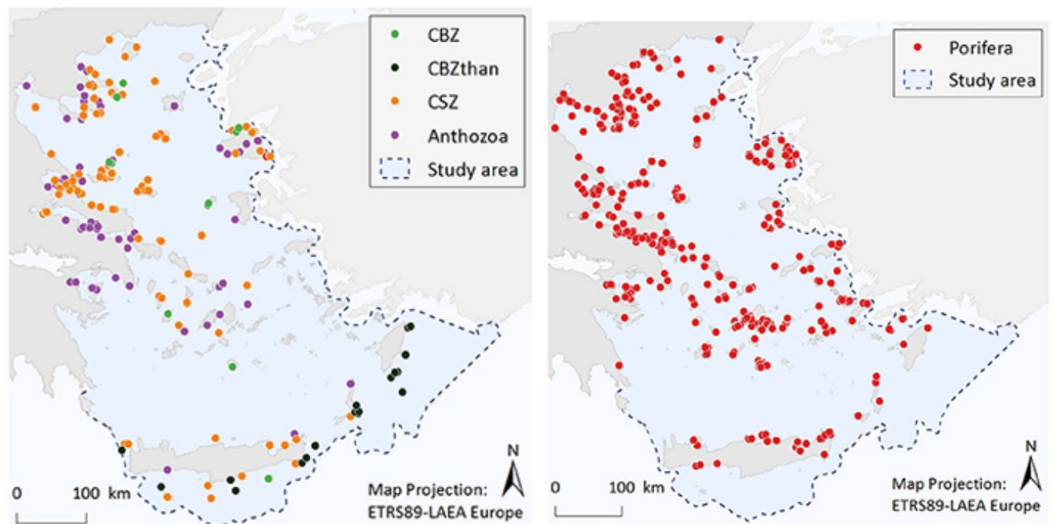[65] https://ui.adsabs.harvard.edu/abs/2010ECSS...88..233T/abstract

Giant red shrimp ecology

Giant red shrimp are opportunistic carnivores and scavengers that may consume up to 60 different prey categories[66]. The first study on the feeding behaviour of *A. foliacea* found a high diversity in consumed prey types, including pelagic, benthic and benthopelagic organisms in the Ligurian Sea. This pattern was later confirmed for the Central Mediterranean: stomach content analysis of giant red shrimp found both strictly benthic and pelagic prey. The most widely accepted explanation is that *A. foliacea* undergoes diel migrations related to its feeding behaviour, feeding on benthic organisms during the day and preying in the water column at night[67]. Kapiris et al. 2010[68] reported that deep-sea red shrimp in the Eastern Mediterranean, *Aristaeomorpha foliacea* displayed a highly diversified diet that exhibited slight seasonal fluctuations. The diets of both sexes consisted of 60 different prey categories belonging chiefly to three groups: crustaceans (e.g. decapods, such as *Plesionika* spp. and Pasiphaeidae, amphipods), cephalopods (mainly Enoploteuthidae) and fishes (Myctophidae, Macrouridae). These three prey categories accounted for 72–82% of the relative abundance and total occurrence for males and 70–88% for females, respectively. Variation in food availability, as well as increased energy demands related to gonad development and breeding activity, appear to be critical factors driving temporal changes in feeding strategy. Feeding activity increased during spring and summer, which coincides with reproductive activities (mating, gonad maturation, egg-laying). Females seem to be more active predators than males, consuming prey with greater swimming ability. However, ontogenetic shifts in diet were also apparent, despite high dietary overlap among small, medium and large females. Large individuals, which are more efficient predators, selected highly mobile prey (e.g. fishes), whereas small individuals consumed low-mobility prey (e.g. copepods, ostracods, tanaids and sipunculans). Diet composition is size related in *A. foliacea*.

If at all similar to North Western Ionian Sea food webs A foliacea should be part of a complex system of energy and biomass exchanges characterized the investigated food webs indicating an important benthic-pelagic coupling. In the food webs of the north-eastern (Salento) and south-western (Calabria) sectors of the North-Western Ionian Sea (NWIS) (Central Mediterranean Sea), for example, the regulation of flows between the benthic-pelagic coupling seems to occur through the benthopelagic shrimps (including red giant shrimp and blue and red shrimp (*Aristaeomorpha foliacea* and *Aristeus antennatus*, respectively), the deep-water rose shrimp (*Parapaeneus longirostris*), and the golden shrimp (*Plesionika martia*) and the small pelagics due to their wasp-waist control role.

7.5.1.4   P3 References

Reference	Link
ACAP. 2020. Annex 1 of the Agreement on Conservation of Albatross and Petrels (ACAP).	https://www.acap.aq/
ACCOBAMS. 2017. Accobams list of marine mammals. Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS)	https://www.accobams.org/wp-content/uploads/2017/01/ACCOBAMS_Text_Agreement_English.pdf
ACCOBAMS. 2020. Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS)	https://accobams.org/about/introduction/#:~:text=ACCOBAMS%20was%20signed%20on%20November,on%20June%201st%2C%202001.&text=ACCOBAMS%20is%20the%20first%20Agreement,work%20together%20for%20cetacean%20conservation.

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[66] https://cdn.intechopen.com/pdfs/35874/InTech-Feeding_habits_of_both_deep_water_red_shrimps_aristaeomorpha_foliacea_and_aristeus_antennatus_decapoda_aristeidae_in_the_ionian_sea_e_mediterranean_.pdf

[67] http://www.faomedsudmed.org/html/species/Aristaeomorpha%20foliacea.html

[68] https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1439-0485.2009.00344.x

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7.5.2 Principle 2 Performance Indicator scores and rationales

PI 2.1.1 – Primary species outcome

PI 2.1.1	The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI		
Scoring Issue	SG 60	SG 80	SG 100
a — **Main primary species stock status**			
a Guide post	Main primary species are **likely** to be above the PRI. OR If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **highly likely** to be above the PRI. OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a level consistent with MSY.
Met?	NA	NA	NA

Rationale

No main or minor primary species have been identified for this UoA. As per MSC interpretation (https://mscportal.force.com/interpret/s/article/P2-species-outcome-PIs-scoring-when-no-main-or-no-minor-or-both-PI-2-1-1-1527262009344) if the fishery has no main primary species, scoring issue (a) is not applicable.

	Minor primary species stock status		
b Guide post			Minor primary species are highly likely to be above the PRI. OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species.
Met?			NA

Rationale

No main or minor primary species have been identified for this UoA. As per MSC interpretation (https://mscportal.force.com/interpret/s/article/P2-species-outcome-PIs-scoring-when-no-main-or-no-minor-or-both-PI-2-1-1-1527262009344) if the fishery has no minor primary species, scoring issue (b) is not applicable.

References

Please refer to references and footnotes in the P2 background section.

Overall Performance Indicator (PI) Rationale

PI 2.1.1	The UoA aims to maintain primary species above the point where recruitment would be impaired (PRI) and does not hinder recovery of primary species if they are below the PRI
Rationale is provided for each Scoring Issue.	
Draft scoring range	≥80
Information gap indicator	The preliminary scores provided above are dependent on the determination we have made, which has been primarily derived from the lack of information on this fishery and the evaluation of secondary species instead of primary species.
Data-deficient? (Risk-Based Framework needed)	No

PI 2.1.2 – Primary species management strategy

PI 2.1.2	There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch		
Scoring Issue	SG 60	SG 80	SG 100
a	Management strategy in place		
	Guide post	There are **measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to be above the PRI.	There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the PRI.	There is a **strategy** in place for the UoA for managing main and minor primary species.
	Met?	Yes, default	Yes, default	No
Rationale			
No main or minor primary species have been identified in this UoA. **SG 60 and 80 are met** by default[69]. We note however, that there is no fishery management plan for this fishery in the Aegean where it is prosecuted by Italian vessels, and (likely) by Egyptian and Turkish trawlers. In addition to this, aside from a minimum mesh size regulation which applies to this gear type and the prohibition to trawl below seabed habitats found below 1000 m depth, the assessment team is not aware of any significant regulation that may affect the management of non-target species. Due to the large level of uncertainty in regards to non-target catches potentially affected by this fishery, we cannot determine that there is a strategy in place for the UoA for managing main and minor primary species. **SG 100 is not met.**			
b	Management strategy evaluation		
	Guide post	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Yes, default	Yes, default	No
Rationale			
No main or minor primary species have been identified in this UoA. **SG 60 and 80 are met** by default. Referring to the rationale provided under scoring issue (a), the team cannot determine that there is any relevant partial /strategy or strategy or testing supporting high confidence. SG 100 is not met.			
c	Management strategy implementation		
	Guide post		There is **some evidence** that the measures/partial strategy	There is clear evidence that the partial strategy/strategy is being implemented

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[69] https://mscportal.force.com/interpret/s/article/Use-of-if-necessary-in-P2-management-PIs-2-1-2-2-2-2-4-2-2-5-2-PI-2-1-2-1527262011402

PI 2.1.2	There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch		
		is being **implemented successfully**.	successfully and is achieving its overall objective as set out in scoring issue (a).
	Met?	Yes, default	No

Rationale

No main or minor primary species have been identified in this UoA. **SG 60 and 80 are met** by default. Referring to the rationale provided under scoring issue (a), the team cannot determine that there is clear evidence of partial strategy/strategy implementation. SG 100 is not met.

	Shark finning			
d	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	**NA**	**NA**	**NA**

Rationale

No main or minor primary species have been identified in this UoA. Accordingly, no primary species are sharks. Consequently, in accordance with SA3.5.2 (MSC Standard v2.01) this scoring issue is not applicable.

	Review of alternative measures			
e	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.
	Met?	Yes, default	Yes, default	No

Rationale

There are no main or minor primary species recorded in this UoA. The score meets SG80. **SG 60 and 80 are met** by default. However, we cannot determine with confidence that there a biennial review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate, considering the lack of available data and also that other incidental impacts could still occur. SG 100 is not met.

References

Please refer to the references and footnotes provided throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	≥80

PI 2.1.2	There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch
Information gap indicator	The preliminary scores provided above are dependent on the determination we have made, which has been primarily derived from the lack of information on this fishery and the evaluation of secondary species instead of primary species.

PI 2.1.3 – Primary species information

PI 2.1.3	Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue	SG 60	SG 80	SG 100
a — Information adequacy for assessment of impact on main primary species			
Guide post	Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.	Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status.
Met?	yes	yes	no

Rationale

No main or minor primary species have been identified for this PI which scores automatically SG 60 and 80. However, due to the lack of catch data, effort information or observer data relevant to this fishery we cannot determine that quantitative information is available and is adequate to assess with a high degree of certainty the impact of the UoA on main primary species with respect to status. SG 100 is not met.

b — Information adequacy for assessment of impact on minor primary species			
Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
Met?			no

Rationale

No main or minor primary species have been identified for this PI which scores automatically SG 60 and 80. However, due to the lack of catch data, effort information or observer data relevant to this fishery we cannot determine that some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status. SG 100 is not met

c — Information adequacy for management strategy			
Guide post	Information is adequate to support **measures** to manage **main** primary species.	Information is adequate to support a **partial strategy** to manage **main** primary species.	Information is adequate to support a **strategy** to manage **all** primary species, and evaluate with a **high degree of**

PI 2.1.3	Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
			certainty whether the strategy is achieving its objective.
Met?	yes	yes	no

Rationale

No main or minor primary species have been identified for this PI which scores automatically SG 60 and 80. However, due to the lack of catch data, effort information or observer data relevant to this fishery we cannot determine that there is adequate information to support a strategy to manage all primary species, and evaluate with a high degree of certainty whether the strategy is achieving its objective. SG 100 is not met.

References

Please refer to the references and footnotes provided throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	≥80
Information gap indicator	The preliminary scores provided above are dependent on the determination we have made, which has been primarily derived from the lack of information on this fishery and the evaluation of secondary species instead of primary species.

PI 2.2.1 – Secondary species outcome

PI 2.2.1	The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit		
Scoring Issue	SG 60	SG 80	SG 100
	Main secondary species stock status		
a Guide post	Main secondary species are **likely** to be above biologically based limits. OR If below biologically based limits, there are **measures** in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **highly likely** to be above biologically based limits. OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main secondary species are above biologically based limits.
Met?	Blackbelly rosefish - yes Gulper shark - yes Mediterranean slimehead – yes Shortnose greeneye - yes Red shrimp - yes	Blackbelly rosefish - yes Gulper shark - **NO** Mediterranean slimehead – yes Shortnose greeneye - **NO** Red shrimp - yes	Not scored

Rationale

No catch profile exists for this fishery or has been provided by the fishermen representative organisations. Because of this, the assessment team was unable to derive a list of non target species or bycatch regularly associated with this fishery, and classified in the MSC standard as primary and secondary species, depending on whether they are managed with reference points (i.e. primary species) or without (i.e. secondary species). Due to the lack of information, the assessment team used CPUE information from a study from Mytilineou et al., 2006[70] to derive a list of species potentially affected by the fishery. For details please refer back to the P2 background section and explanation therein.

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[70] https://link.springer.com/article/10.1007/s10750-005-1318-7

PI 2.2.1	The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit

The secondary main species identified were the following: Blackbelly rosefish *Helicolenus dactylopterus,* Gulper shark *Centrophorus granulosus,* Shortnose greeneye *Chlorophthalmus agassizii,* red shrimp *Aristeus antennatus* and Silver roughy or Mediterranean slimehead *Hoplostethus mediterraneus.* Due to the lack of information for those species in the Aegean sea or the presence of stock assessment, status information, or suitable biologically based limits, and considering *Table PF1: RBF methodologies PIs and implications for non-RBF PIs* in the MSC's FCP v2.1, we have used the RBF's PSA to score main secondary species. Furthermore, PF5.3.2.1 state that If the team has only considered "main" species in the PSA analysis, the final PI score shall not be greater than 80. The team has only considered secondary main species for the PSA.

The scores resulting from the PSA tables completed to risk assess the 5 Main Secondary species are shown below. The MSC score for the 5 scoring elements would be 75 (pass with condition). Specifically, the gulper shark and the shortnose greeneye achieved a score of less than 80.

Family name	Scientific name	Common name	Species type	Fishery descriptor	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level	Density Dependance	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	Weighted PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost
Sebastidae	*Helicolenus dactylopterus*	Blackbelly rosefish	Vertebrate	Bottom trawl	2	3	1	1	1	2	3		1.86	1	3	3	3	1.65	2.48		86	Low	≥80
Centrophoridae	*Centrophorus granulosus*	Gulper shark	Vertebrate	Bottom trawl	2	3	3	2	2	3	3		2.57	1	3	3	2	1.43	2.94		75	Med	60-79
Trachichthyidae	*Hoplostethus mediterraneus*	Mediterranean slimehead	Vertebrate	Bottom trawl	2	2	1	1	1	1	3		1.57	1	3	3	3	1.65	2.28		91	Low	≥80
Chlorophthalmidae	*Chlorophthalmus agassizii*	Shortnose greeneye	Vertebrate	Bottom trawl	1	2	2	1	1	1	3		1.57	3	3	3	3	3.00	3.39		62	Med	60-79
Aristeidae	*Aristeus antennatus*	Red shrimp	Invertebrate	Bottom trawl	1	1	1			1	3	1	1.33	3	3	2	3	2.33	2.68		82	Low	≥80

	Minor secondary species stock status			
b	Guide post			Minor secondary species are highly likely to be above biologically based limits. OR If below biologically based limits', there is evidence that

PI 2.2.1		The UoA aims to maintain secondary species above a biologically based limit and does not hinder recovery of secondary species if they are below a biological based limit	
			the UoA does not hinder the recovery and rebuilding of secondary species
	Met?		No

Rationale

Due to the lack of data, minor secondary species have not been identified or considered for this unit of assessment. Therefore, we cannot conclude that there is evidence to support that minor secondary species are highly likely to be above biologically based limits.

References

Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	*Available information is not sufficient to score the PI adequately or with confidence, we have a used a risk assessment process to both deciding which species to score and for the scoring process itself.*
Data-deficient? (Risk-Based Framework needed)	Yes

PI 2.2.2 – Secondary species management strategy

PI 2.2.2	There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch		
Scoring Issue	SG 60	SG 80	SG 100
a	**Management strategy in place**		
	Guide post	There are **measures** in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **partial strategy** in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **strategy** in place for the UoA for managing main and minor secondary species.
	Met?	Blackbelly rosefish - no Gulper shark - no Mediterranean slimehead – no Shortnose greeneye - no Red shrimp -no	Not scored	

Rationale

The secondary main species identified in this UoA were the following: Blackbelly rosefish *Helicolenus dactylopterus,* Gulper shark *Centrophorus granulosus,* Shortnose greeneye *Chlorophthalmus agassizii,* red shrimp *Aristeus antennatus* and Silver roughy or Mediterranean slimehead *Hoplostethus mediterraneus.* The available management measure in the area (mainly EC regulation 1967/2006) appear to be limited to:

- A limitation of the number of fishing vessel licenses (primarily geared for Italian vessels operating in Italian waters but affecting the activities of vessels operating outside of Sicily, GSA 16),
- A reduction in fishing days required by Executive Decree No 26510 of 28 December 2018[71] (which appears to have decreased the fishing effort to some degree, refer to P1 background section, same comment as above),
- A minimum 40 mm (stretched) square meshes or a cod end with 50 mm (stretched) diamond meshes, as well as a ban prohibiting the use of towed dredges and trawl nets at depths beyond 1000 m[72]. The mesh size used in this fishery appears to be of 50 mm (Fabio Fiorentino pers. comm.) and there is no minimum landing size for *A. foliacea.*
- The recording of catches/landings as part of DCRF requirements (although we note that the recording of catches/landings from Italian vessels fishing in GSA 22-23 is formally aggregated into those of GSA 16 and of limited use).
- VMS/AIS active on board.

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[71] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/13693
[72] https://gfcm.sharepoint.com/CoC/Decisions%20Texts/REC.CM_GFCM_29_2005_1-e.pdf?originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlcG9pbnQuY29tLzpiOi9nL0NvQy9FVjBBcG1Uzh6NUNqqU2J5dnNtU0c0SUJ1cDdGGbjJMTU5PcmNfLVk5S0t3ZVpBP3J0aW1lPXBWeW52ZZZkIMkVn

PI 2.2.2	There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch

- The Italian vessels operating in GSA 22-23 are not allowed inside 6 nm from the Greeks coast and 12 nm from the Turkish coast.

Based on the information collected for these 5 species in the PSA tables, both *encounterability* and *selectivity of the gear type* attributes appear to be high risk meaning that the fishery is a) likely to encounter these species and b) that individuals < size at maturity are likely to be frequently caught in the gear under assessment given the small mesh size. These bottom trawlers do not use excluder devices that may exclude large animals such as sharks (or large fish) from the catch (Fabio Fiorentino pers. comm.). Furthermore, shark species are intrinsically vulnerable and tend to be highly impacted by any type of fishing mortality[73]. Also, since Greek vessels do not really prosecute species in deep waters of their archipelago, management measures that may affect the secondary species identified (either explicitly or implicitly) do not appear to be in place.

It is unclear at this stage, due to lack of data, if the overall trawl effort in GSA 22 and 23 may be relatively low, medium or high in respect to the impacts it may produce on the secondary species described here. Trawl effort could potentially provide one additional indicator to estimate impacts on the species in question.

Overall, due to the lack of information on those species in the Aegean sea or the presence of stock assessments, status information, suitable biologically based limits, or specific management measures or strategies that may directly affect these species in the areas and depths fished by the deep water red shrimp fishery, we cannot determine that *there are measures in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be above biologically based limits or to ensure that the UoA does not hinder their recovery*. SG 60 is not met.

		Management strategy evaluation		
b	Guide post	The measures are considered **likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.
	Met?	Blackbelly rosefish - no Gulper shark - no Mediterranean slimehead – no Shortnose greeneye - no Red shrimp -no	Not scored	

Rationale

Referring to the evidence provided above in Scoring Issue a and the lack of management measures that may positively affect the secondary main species identified, we cannot determine that *measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species)*. SG 60 is not met.

		Management strategy implementation		
c	Guide post		There is **some evidence** that the measures/partial strategy	There is clear evidence that the partial strategy/strategy is being implemented

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[73] https://wwfit.awsassets.panda.org/downloads/wwf_report_squali_in_crisi_nel_med.pdf

PI 2.2.2		There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch	
		is being **implemented successfully**.	successfully and is achieving its objective as set out in scoring issue (a).
	Met?	Blackbelly rosefish - no Gulper shark - no Mediterranean slimehead – no Shortnose greeneye - no Red shrimp -no	Not scored

Rationale

Referring to the evidence provided above in Scoring Issue a and the lack of management measures that may positively affect the secondary main species identified, we cannot determine that *there is some evidence that the measures/partial strategy is being implemented successfully*. SG 80 is not met.

	Shark finning			
d	Guide post	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	Blackbelly rosefish - NA Gulper shark - yes Mediterranean slimehead – NA Shortnose greeneye - NA Red shrimp -NA	Blackbelly rosefish - NA Gulper shark - yes Mediterranean slimehead – NA Shortnose greeneye - NA Red shrimp -NA	Blackbelly rosefish - NA Gulper shark - no Mediterranean slimehead – NA Shortnose greeneye - NA Red shrimp -NA

Rationale

As per MSC requirements, if the secondary species is a shark, the team shall score scoring issue (d) (following SA2.4.3–SA2.4.7) to ensure that shark finning is not being undertaken in the UoA.

Recommendation GFCM/42/2018/2[74] part III prohibited to remove shark fins onboard vessels and to retain, tranship or land shark fins, and to purchase, offer for sale or sell shark fins which have been removed, retained onboard, transhipped or landed in contravention of this recommendation. The assessment team is not aware of any significant shark finning activity occurring in the Mediterranean or the Aegean Sea. It is highly likely that shark finning is not taking place. **SG 60 and 80 would be met.** However, given the lack of an observer program or other reliable information we cannot determine that there is a high degree of certainty that shark finning is not taking place. SG 100 is not met.

	Review of alternative measures to minimise mortality of unwanted catch			
e	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species,

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[74] http://www.fao.org/gfcm/decisions/en/

PI 2.2.2	There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch		
		unwanted catch of main secondary species.	secondary species and they are implemented as appropriate.	and they are implemented, as appropriate.
Met?	Blackbelly rosefish - no Gulper shark - no Mediterranean slimehead – no Shortnose greeneye - no Red shrimp -no	Not scored	

Rationale

The catch data for this fishery is aggregated to that of GSA 16 for reporting purposes. Catches of non target species in this fishery are largely unknown and have only been identified here as part of a risk assessment process where a similar (test) fishery in nearby waters was used to understand what species might be encountered in GSA 22 and 23, and through additional stakeholder information submitted. Although there have been reviews in the Mediterranean regarding the possible reduction of non target catches, such as for example the work of Brčić et al 2016[75] testing a shark-excluding grid device with 90 mm bar spacing during experimental fishing in the Tyrrhenian Sea (Western Mediterranean), no such or similar type work or review has been conducted specific to the deep water shrimp fishery that would apply to GSA 16 or GSA 22 and 23. It is quite possible that some discards occur in this fishery but that may not be fully reported. Hence, the assessment team is not aware of any review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main secondary species. SG 60 is not met.

References

Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	<60
Information gap indicator	More information sought: • Catch information to accurately describe non target species caught in the fishery • Management measure, if available, for such species

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[75] https://www.sciencedirect.com/science/article/pii/S0165783615300448

PI 2.2.3 – Secondary species information

PI 2.2.3	Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species		
Scoring Issue	SG 60	SG 80	SG 100
a	**Information adequacy for assessment of impacts on main secondary species**		
	Guide post	~~Qualitative information is **adequate to estimate** the impact of the UoA on the main secondary species with respect to status.~~ OR If RBF is used to score PI 2.2.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	~~Some quantitative information is available and **adequate to assess** the impact of the UoA on main secondary species with respect to status.~~ OR If RBF is used to score PI 2.2.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and **adequate to assess with a high degree of certainty** the impact of the UoA on main secondary species with respect to status.
	Met?	Blackbelly rosefish - yes Gulper shark - yes Mediterranean slimehead – yes Shortnose greeneye - yes Red shrimp - yes	Blackbelly rosefish - yes Gulper shark - no Mediterranean slimehead – yes Shortnose greeneye - no Red shrimp -yes	Not scored

Rationale

Since the RBF has been used to score PI 2.2.1 for the UoA, qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species. All 5 scoring elements meet SG 60. The results of the PSA were shown in PI 2.2.1. Blackbelly rosefish, red shrimp and Mediterranean slimehead score ≥80 (meeting SG 80), while the gulper shark and shortnose greeneye score 75 and 62, respectively (not meeting SG80).

b	**Information adequacy for assessment of impacts on minor secondary species**			
	Guide post			Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.
	Met?			No

Rationale

Due to the lack of data, minor secondary species have not been identified or considered for this unit of assessment. Therefore, we cannot conclude that some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status. SG 100 would not be met.

c	**Information adequacy for management strategy**		

PI 2.2.3		Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species		
	Guide post	Information is adequate to support **measures** to manage **main** secondary species.	Information is adequate to support a **partial strategy** to manage **main** secondary species.	Information is adequate to support a **strategy** to manage **all** secondary species, and **evaluate** with a **high degree of certainty** whether the strategy is **achieving its objective**.
	Met?	Blackbelly rosefish - no Gulper shark - no Mediterranean slimehead – no Shortnose greeneye - no Red shrimp -no	Not scored	

Rationale

As described earlier, the unavailability of catch data or other surrogates, or management measures for the species identified (or indeed for additional or other species that may be routinely caught in this fishery) does not allow the assessment team to determine that information is adequate to support measures to manage main secondary species. SG 60 is not met.

References

Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	<60
Information gap indicator	More information sought: • Catch information to accurately describe non target species caught in the fishery • Management measure, if available, for such species

PI 2.3.1 – ETP species outcome

PI 2.3.1	The UoA meets national and international requirements for the protection of ETP species The UoA does not hinder recovery of ETP species		
Scoring Issue	SG 60	SG 80	SG 100
a	**Effects of the UoA on population/stock within national or international limits, where applicable**		
	Guide post	Where national and/or international requirements set limits for ETP species, the **effects of the UoA** on the population/ stock are known and **likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, the **combined effects of the MSC UoAs** on the population /stock are known and **highly likely** to be within these limits.	Where national and/or international requirements set limits for ETP species, there is a **high degree of certainty** that the **combined effects of the MSC UoAs** are within these limits.
	Met?	NA	NA	NA

Rationale
A number of ETP shark and ray species have been identified as potentially at risk from the Unit of Assessment. However, this scoring issues is not scored because there are no national or international requirements that set limits for such ETP species.

b	**Direct effects**		
	Guide post	Known direct effects of the UoA are likely to not **hinder recovery** of ETP species.	Direct effects of the UoA are **highly likely** to not **hinder recovery** of ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the UoA on ETP species.
	Met?	Sharks and rays - no	Not scored	

Rationale
A number of ETP shark and ray species, here treated as group for scoring purposes (i.e. 1 scoring element), have been identified as potentially at risk from the Unit of Assessment. These species have been singled out because they occur at depths where the fishery under assessment is known to operate, between 500 and 800 metres. The shark and rays group assessed here includes Electric ray *Tetronarce nobiliana,* Sharpnose sevengill shark *Heptranchias perlo,* Bluntnose sixgill shark *Hexanchus griseus,* Angular Rough Shark *Oxynotus centrina,* Sawback Angelshark *Squatina aculeata*, Sandy Skate *Leucoraja circularis,* Common Skate complex *Dipturus batis* spp, Smalltooth Sand Tiger *Odontaspis ferox*, White Skate *Rostroraja alba and* Tope Shark *Galeorhinus galeus.* The main direct effects of the fishery on these sharks are through bycatch and mortality, and habitat disturbance. The above shark and ray species have been caught in very small numbers, due to their rarity, in MEDITS surveys of the Mediterranean conducted over the past few decades. Some additional information about the rarity of these species can be found in Table 8 and in IUCN Red list pages[76] where available data was summarised by experts. All of the species are considered to be very rare, with some considered to be extinct in the Aegean Sea (e.g. Sawback Angelshark). Based on their rarity, the relative chance of the deep-water red shrimp fishery capturing these elasmobranchs is probably small. However, for the same reasons, it is possible that even small accidental catches of

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[76] https://www.iucnredlist.org/

these animals may hinder their recovery, mostly because cartilaginous or chondrichthyes (sharks, rays and chimeras) are particularly sensitive to anthropogenic impact. The chondrichthyans have in fact low fertility, slow growth, late sexual maturity; and for the most part they are predators at the top of the food chains and therefore their populations are not abundant in nature. The greatest impact of human activities on cartilaginous fish populations derives from fishing.

As reviewed by Ellis et al. 2016[77], elasmobranch discard survival varies with a range of biological attributes (species, size, sex and mode of gill ventilation) as well as the range of factors associated with capture (e.g. gear type, soak time, catch mass and composition, handling practices and the degree of exposure to air and any associated change in ambient temperature). In general, demersal species with buccal-pump ventilation have a higher survival than obligate ram ventilators (e.g. great white, makos, salmon sharks, hammerheads and whale sharks). We note that the majority of sharks can breathe while stationary (buccal-pump ventilation) and bottom dwelling sharks tend to be buccal pumping. Several studies have indicated that females may have a higher survival than males. Certain taxa (including hammerhead sharks *Sphyrna* spp. and thresher sharks *Alopias* spp.) may be particularly prone to higher rates of mortality when caught.

Another important cause of threats to be taken into consideration is the degradation by anthropogenic causes of environments and habitats potentially important for the life of these animals. The fishery in question has not been reported to use any excluder device or other practice to exclude these animals from being caught in the first place, despite there being some evidence in support of such devices (e.g. as used in Brewer at al 2006[78], Scott et al. 2012[79], Brčić et al 2016[80], Garstin et al 2018[81] and Campbell et al 2020[82]). Also, the fishery does not use rolling bobbins (elevating the net from the seafloor), semi pelagic trawl doors (flying above the seabed) or other mechanisms to decrease /minimise the abrasion of the gear type upon the seabed and various habitats (for review of measures and practices see McConnaughey et al. 2019[83]). The effects of such disturbance on potential shark habitat are not known.

The MSC Standard V2.01 describes **Does not hinder** as follows**:** "the impact of the UoA is low enough that if the species is capable of improving its status, the UoA will not hinder that improvement. It does not require evidence that the status of the species is actually improving." Logbook data (including information on fishing activities, catch data, incidental catches, release and/or discarding of sharks species listed either in Annex II or Annex III of the SPA/BD Protocol, as detailed in Recommendation GFCM/42/2018/2[84]) and observer coverage information documenting catches and discards of elasmobranchs would enable a more equitable determination of the likelihood of impact of the fishery on this group of species. However, this data does not appear to be available. Accordingly, the assessment team does not have enough evidence to determine that known direct effects of the UoA are likely (> 70th %ile) to not hinder recovery of ETP species. **SG 60 may not be met.**

| c | **Indirect effects** |

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[77] https://onlinelibrary.wiley.com/doi/abs/10.1111/jfb.13197

[78] Brewer, D., Heales, D., Milton, D., Dell, Q., Fry, G., Venables, B., Jones, P., 2006, The impact of turtle excluder devices and bycatch reduction devices on diverse tropical marine communities in Australia's northern prawn trawl fishery

[79] https://www.tandfonline.com/doi/abs/10.1080/02755947.2012.678962

[80] https://www.sciencedirect.com/science/article/pii/S0165783615300448

[81] Garstin, A., Oxenford, H.A., 2018, The effectiveness of a modified turtle excluder device (TED) in reducing the bycatch of elasmobranchs in the Atlantic seabob (Xiphopenaeus kroyeri) industrial trawl fishery of Guyana.

[82] Campbell, M. J., Tonks, M. L., Miller, M., Brewer, D. T., Courtney, A. J., and C.A Simpfendorfer , 2020, Factors affecting elasmobranch escape from turtle excluder devices (TEDs) in a tropical penaeid-trawl fishery.

[83] https://onlinelibrary.wiley.com/doi/full/10.1111/faf.12431

[84] http://www.fao.org/gfcm/decisions/ar/

PI 2.3.1		**The UoA meets national and international requirements for the protection of ETP species** **The UoA does not hinder recovery of ETP species**		
	Guide post		Indirect effects have been considered for the UoA and are thought to be **highly likely** to not create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the UoA on ETP species.
	Met?		Sharks and rays - yes	Sharks and rays - no

Rationale

Food depletion would be the main indirect risk posed by fishing. It is possible that depletion of red shrimp may affect food availability of sharks. However, given the large diet of sharks, it is more likely that in the case of decrease in red shrimp they would switch to another prey which may include cephalopods, mollusks, fish and other crustacean species[85]. Accordingly, indirect effects have been considered for the UoA and are thought to be highly likely to not create unacceptable impacts. **SG 80 would be met.** However, the circumstantial evidence provided above is not sufficient to justify a higher degree of confidence in such indirect impacts. SG 100 is not met.

References

Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	<60
Information gap indicator	More information sought: • Logbook data including information on fishing activities, catch data, incidental catches, release and/or discarding of sharks species listed either in Annex II or Annex III of the SPA/BD Protocol, as detailed in Recommendation GFCM/42/2018/2
Data-deficient? (Risk-Based Framework needed)	No

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[85] https://academic.oup.com/icesjms/article/56/5/707/691331

PI 2.3.2 – ETP species management strategy

PI 2.3.2	The UoA has in place precautionary management strategies designed to: - meet national and international requirements; - ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species

Scoring Issue	SG 60	SG 80	SG 100
a	**Management strategy in place (national and international requirements)**		
	Guide post	There are **measures** in place that minimise the UoA-related mortality of ETP species, and are expected to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to be **highly likely to achieve** national and international requirements for the protection of ETP species.	There is a **comprehensive strategy** in place for managing the UoA's impact on ETP species, including measures to minimise mortality, which is designed to **achieve above** national and international requirements for the protection of ETP species.
	Met?	NA	NA	NA

Rationale
A number of ETP shark and ray species have been identified as potentially at risk from the Unit of Assessment. However, this scoring issues is not scored because there are no national or international requirements that set limits for such ETP species.

		SG 60	SG 80	SG 100
b	**Management strategy in place (alternative)**		
	Guide post	There are **measures** in place that are expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **strategy** in place that is expected to ensure the UoA does not hinder the recovery of ETP species.	There is a **comprehensive strategy** in place for managing ETP species, to ensure the UoA does not hinder the recovery of ETP species.
	Met?	Sharks and rays - no	Not scored	

Rationale
The shark and rays group assessed here includes Electric ray *Tetronarce nobiliana,* Sharpnose sevengill shark *Heptranchias perlo,* Bluntnose sixgill shark *Hexanchus griseus,* Angular Rough Shark *Oxynotus centrina,* Sawback Angelshark *Squatina aculeata*, Sandy Skate *Leucoraja circularis,* Common Skate complex *Dipturus batis* spp, Smalltooth Sand Tiger *Odontaspis ferox*, White Skate *Rostroraja alba and* Tope Shark *Galeorhinus galeus.* The available management measure in the area (mainly EC regulation 1967/2006[86]) appear to be limited to: - A limitation of the number of fishing vessel licenses, - A reduction in fishing days required by Executive Decree No 26510 of 28 December 2018[87] (which appears to have decreased the fishing effort to some degree, refer to P1 background section),

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[86] https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32006R1967
[87] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/13693

PI 2.3.2	The UoA has in place precautionary management strategies designed to: - meet national and international requirements; - ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species

- A minimum 40 mm (stretched) square meshes or a cod end with 50 mm (stretched) diamond meshes, as well as a ban prohibiting the use of towed dredges and trawl nets at depths beyond 1000 m[88]. The mesh size used in this fishery appears to be of 50 mm (Fabio Fiorentino pers. comm.) and there is no minimum landing size for *A. foliacea*.
- The recording of catches/landings as part of DCRF requirements (although we note that the recording of catches/landings from Italian vessels fishing in GSA 22-23 is aggregated into those of GSA 16).
- VMS/AIS active on board.
- The vessels working in GSA 22-23 are not allowed inside 6 nm from the Greeks coast and 12 nm from the Turkish coast.
- Fisheries Restricted Areas (none active or proposed in the Aegean).

The GFCM has recently adopted management measures for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Levant Sea (geographical subareas 24-27), the Ionian Sea (geographical subareas 19-21) and the Strait of Sicily (geographical subareas 12-16), as well as two multiannual management plans adopted in 2018 for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Ionian Sea (GFCM/42/2018/4) and the Levant Sea (GFCM/42/2018/3)[89]. However, no measures or plans have been adopted for shrimp caught in the Aegean Sea (GSA 22).

These bottom trawlers do not use excluder devices that may exclude large animals such as sharks (or large fish) from the catch (Fabio Fiorentino pers. comm.). Furthermore, shark species are intrinsically vulnerable and tend to be highly impacted by any type of fishing mortality[90]. Also, since Greek vessels do not really prosecute species in deep waters of the Aegean (i.e. deeper than ~300 m[91]), management measures that may affect these species do not appear to have been put in place.

Specific to management measures for the protection of sharks in the Aegean we note that there are no concrete measures aside from the ones highlighted above that may have limited to inconsequential effects to the catches of shark species identified here. Although we note that there are GFCM Data Collection Reference Framework (DCRF) requirements for the collection and submission of fisheries-related data in the GFCM area of application[92], which have been reiterated in logbook data requirements for catch data, incidental catches, release and/or discarding of sharks species listed either in Annex II or Annex III of the SPA/BD Protocol, as detailed in Recommendation GFCM/42/2018/2[93]; such data does not appear to be available, and no examples of such data or their collection were supplied to the assessment team in support of this assessment.

It is unclear at this stage, due to lack of data, if the overall trawl effort in GSA 22 and 23 may be low, medium or high in respect to the impacts it may produce on the shark species described here. Overall, due to the lack of information on those species in the Aegean sea or the presence of detailing status information, specific management measures

[88] https://gfcm.sharepoint.com/CoC/Decisions%20Texts/REC.CM_GFCM_29_2005_1-e.pdf?originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlcG9pbnQuY29tLzpiOi9nL0NvQy9FVjjBBcG1qUzh6NUNqU2J5dNtU0c0SUJ1cDdGbjJMTU5PcmNfLVk5S0t3ZVpBP3J0aW1lXBWeW52ZkdIMkVn
[89] http://www.fao.org/gfcm/decisions/ar/
[90] https://wwfit.awsassets.panda.org/downloads/wwf_report_squali_in_crisi_nel_med.pdf
[91] https://stecf.jrc.ec.europa.eu/documents/43805/595615/2013-04+Greece+-+Management+plan+new+version.pdf
[92] http://www.fao.org/3/ca2702en/CA2702EN.pdf
[93] http://www.fao.org/gfcm/decisions/ar/

PI 2.3.2	**The UoA has in place precautionary management strategies designed to:** - **meet national and international requirements;** - **ensure the UoA does not hinder recovery of ETP species.** **Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species**

or strategies that may directly affect these vulnerable low fertility, slow growth, late sexual maturity species in the areas and depths fished by the deep water red shrimp fishery[94], we cannot determine that *there are measures in place that are expected to ensure the UoA does not hinder the recovery of ETP species.* SG 60 is not met.

	Management strategy evaluation		
c	Guide post	The measures are **considered likely** to work, based on **plausible argument** (e.g., general experience, theory or comparison with similar fisheries/species).	There is an **objective basis for confidence** that the measures/strategy will work, based on **information** directly about the fishery and/or the species involved.	The strategy/comprehensive strategy is mainly based on information directly about the fishery and/or species involved, and a **quantitative analysis** supports **high confidence** that the strategy will work.
	Met?	Sharks and rays - no	Not scored	

Rationale
Referring to the evidence provided above in Scoring Issue b and the lack of management measures that may positively affect the shark species identified, we cannot determine that *measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species)*. SG 60 is not met.

	Management strategy implementation		
d	Guide post		There is some **evidence** that the measures/strategy is being implemented successfully.	There is **clear evidence** that the strategy/comprehensive strategy is being implemented successfully and **is achieving its objective as set out in scoring issue (a) or (b).**
	Met?		Sharks and rays - no	Not scored

Rationale
Referring to the evidence provided above in Scoring Issue b and the lack of management measures that may positively affect the shark species identified, we cannot determine that t*here is some evidence that the measures/strategy is being implemented successfully.* SG 60 is not met.

	Review of alternative measures to minimize mortality of ETP species		
e	Guide post	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality ETP species,

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[94] http://awsassets.panda.org/downloads/wwf_sharks_in_the_mediterranean_2019_v10singles.pdf

PI 2.3.2	The UoA has in place precautionary management strategies designed to: - meet national and international requirements; - ensure the UoA does not hinder recovery of ETP species. Also, the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of ETP species		
			species and they are implemented as appropriate.	and they are implemented, as appropriate.
	Met?	Sharks and rays - no	Not scored	

Rationale

The catch data for this fishery is aggregated to that of GSA 16 for reporting purposes. Catches of non-target species in this fishery, whether ETP or non ETP, are unknown and have only been identified here as part of a very rough risk approximation. Although there have been reviews in the Mediterranean regarding the possible reduction of non-target catches, such as for example the work of Brčić et al 2016[95] testing a shark-excluding grid device with 90 mm bar spacing during experimental fishing in the Tyrrhenian Sea (Western Mediterranean), no such or similar type work or review has been conducted specific to the deep water shrimp fishery that would apply to GSA 16 or GSA 22 and 23. Hence, the assessment team is not aware of any review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of ETP species. SG 60 is not met.

References

Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	<60
Information gap indicator	More information sought: Management measures that may affect shark and ray bycatch

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[95] https://www.sciencedirect.com/science/article/pii/S0165783615300448

PI 2.3.3 – ETP species information

PI 2.3.3	Relevant information is collected to support the management of UoA impacts on ETP species, including: - Information for the development of the management strategy; - Information to assess the effectiveness of the management strategy; and - Information to determine the outcome status of ETP species

Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts			
	Guide post	Qualitative information is **adequate to estimate** the UoA related mortality on ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Qualitative information is **adequate to estimate productivity and susceptibility** attributes for ETP species.	Some quantitative information is **adequate to assess** the UoA related mortality and impact and to determine whether the UoA may be a threat to protection and recovery of the ETP species. OR If RBF is used to score PI 2.3.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for ETP species.	Quantitative information is available to assess with a high degree of certainty the **magnitude of UoA-related impacts, mortalities and injuries and the consequences for the status** of ETP species.
	Met?	Sharks and rays - no	Not scored	

Rationale

As described earlier, the unavailability of reliable catch data, incidental catches, release and/or discarding of sharks species, coupled to the lack of an observer program to capture information, or other surrogates to estimate the UoA related mortality on ETP species (or indeed to clearly understand which species may be routinely caught in this fishery), does not allow the assessment team to determine that *qualitative information is adequate to estimate the UoA related mortality on ETP species*. **SG 60 is not met.**

Scoring Issue		SG 60	SG 80	SG 100
b	Information adequacy for management strategy			
	Guide post	Information is adequate to support **measures** to manage the impacts on ETP species.	Information is adequate to measure trends and support a **strategy** to manage impacts on ETP species.	Information is adequate to support a **comprehensive strategy** to manage impacts, minimize mortality and injury of ETP species, and evaluate with a **high degree of certainty** whether a strategy is achieving its objectives.
	Met?	Sharks and rays - no	Not scored	

Rationale

As described earlier, the unavailability of reliable catch data, incidental catches, release and/or discarding of sharks species, coupled to the lack of an observer program to capture information, or other surrogates to estimate the UoA

PI 2.3.3	Relevant information is collected to support the management of UoA impacts on ETP species, including: - **Information for the development of the management strategy;** - **Information to assess the effectiveness of the management strategy; and** - **Information to determine the outcome status of ETP species**

related mortality on ETP species (or indeed to clearly understand which species may be routinely caught in this fishery), coupled to the lack of meaningful management measures[96] for the conservation of shark and rays does not allow the assessment to determine that *information is adequate to support measures to manage the impacts on ETP species*. **SG 60 is not met.**

References
Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale
Rationale is provided for each Scoring Issue.

Draft scoring range	<60
Information gap indicator	More information sought • Logbook data including information on fishing activities, catch data, incidental catches, release and/or discarding of sharks species listed either in Annex II or Annex III of the SPA/BD Protocol, as detailed in Recommendation GFCM/42/2018/2

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[96] http://awsassets.panda.org/downloads/wwf_sharks_in_the_mediterranean_2019_v10singles.pdf

PI 2.4.1 – Habitats outcome

PI 2.4.1	The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates		
Scoring Issue	SG 60	SG 80	SG 100
a	**Commonly encountered habitat status**		
	Guide post	The UoA is **unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	The UoA is **highly unlikely** to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm.
	Met?	sandy and muddy habitat - Yes	sandy and muddy habitat - No	

Rationale

The commonly encountered habitats in the UoA are sandy and muddy habitats.

There is a lack of recent information about the geographical distribution of catches of *A. foliacea* in the Aegean Sea. However, according to Garofalo et al. (2007), a spatial extension of the trawling activity of the Mazara del Vallo (Southern Sicily) fleet targeting red shrimp, allowed a comparison of catch rates from fishing grounds with different exploitation history. Highest catch rates were observed around the Maltese and in the easternmost region (also Aegean Sea) fishing grounds of the Mediterranean which are being exploited since 2004. Please refer to Figure 2 for details of these fishing grounds.

In regard to habitat types in the depths fished by the UoA in the GSA 22 and 23 please refer to the next figure below. Most of the substrate habitat at the depths of interest are sandy and muddy habitat types.

PI 2.4.1	The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates

Figure 11. Substrate habitat descriptor for GSA 22 and 23. Source: EMODnet Seabed Habitats[97].

We note that no fishing effort maps have been provided by industry or were reported available by scientists from the CNR (noting however that there is a working progress to compile fishing effort and CPUE data for this fishery in the Aegean and may be published in 2021). Due to the lack of data the fishery is assumed to operate primarily in the same regions reported in Garofalo et al. (2007) in the South-eastern Aegean Sea and South of Crete at the depths (500-800 m) (but potentially other regions as well) indicated in the bathymetry of Figure 7.
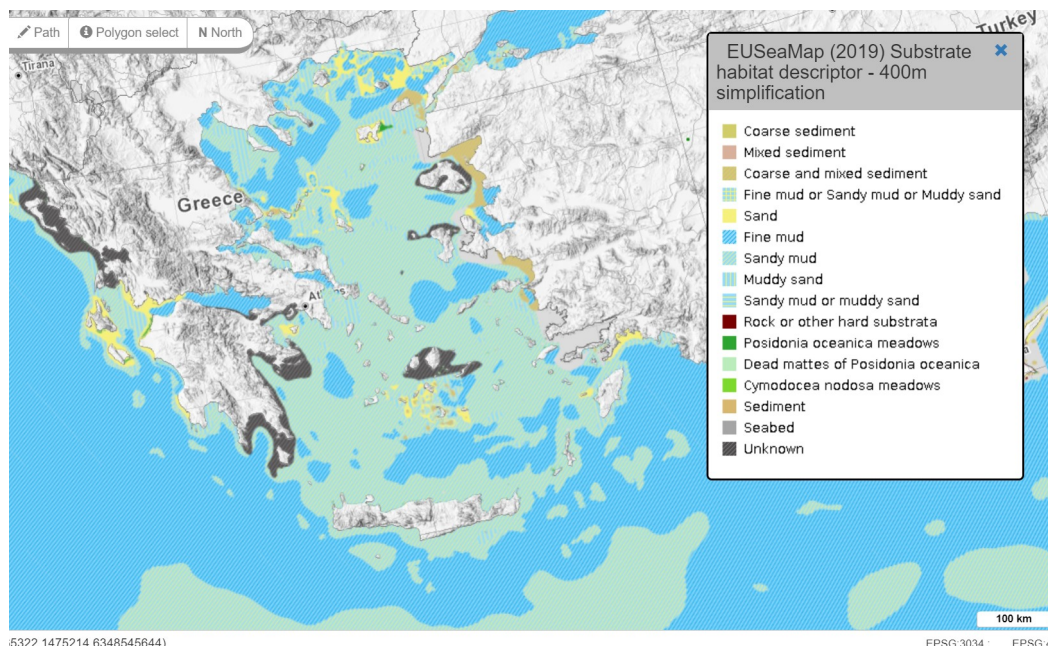
Given the nature of the common encountered habitats identified here, the UoA is unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. **SG 60 would be met.**

However, we note that another problem related to trawling is the effects of sediment resuspension and related increased sedimentation, even at depths well beyond the ones trawled. In the Mediterranean, some fishing grounds of deep-water shrimp are located around the perimeter of coral habitats, as well as on the margin of submarine canyons. It is suggested that although direct trawling (or other fishing methods) on coral reefs is the main obvious threat to the remaining Mediterranean deep-water coral reefs, trawling in the neighbouring bathyal mud bottoms could be equally deleterious on these suspension feeders. Through a recent study, it was shown that sediment resuspension from trawlers working at 600–800 m depth reached a depth of 1200 m[98].

In a recent review of the impacts of deep-sea fisheries on benthic communities, Clark at al 2016[99] reported that in soft-sediment slope environments without significant habitat structure, epifauna community structure has been demonstrated to be markedly different between lightly and heavily trawled areas off southwest Africa, where, infaunal community structure was reported as very different between two of four pairs of lightly and heavily trawled sites. An extensive study of the effects of trawling on deep-sea infaunal communities also was conducted using data from research trawls from a 2400 km 2 area of slope off New Zealand where it was demonstrated that 11–40% of variation in infaunal community structure was attributable to fishing (over many years for both finfish and scampi), and inferred that trawling probably changes benthic community structure over broad spatial scales on the continental slope as well as in coastal systems. Watling (2014)[100] also highlighted that that the small benthic animals living in muddy sediments can be impacted by bottom trawling as much or more than the larger, more charismatic, deep-sea corals and sponges and that very likely no habitat may be immune to the impacts of deep-sea bottom trawling. The author highlighted the suggestion that the repeated passage of bottom trawls creates a nutrient-poor environment with conditions analogous to sites in much deeper water.

According to the above and considering the lack of fishing effort information we cannot determine that there is evidence that the UoA is highly unlikely to reduce structure and function of the commonly encountered habitats to a point where there would be serious or irreversible harm. SG80 would not be met.

b	VME habitat status		
	Guide post	The UoA is **unlikely** to reduce structure and function of the	The UoA is **highly unlikely** to reduce structure and function	There is **evidence** that the UoA is highly unlikely to reduce

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[97] https://www.emodnet.eu/en/seabed-habitats
[98] http://www.fao.org/3/a-i1116e.pdf
[99] https://academic.oup.com/icesjms/article/73/suppl_1/i51/2573992
[100] https://www.pnas.org/content/111/24/8704

PI 2.4.1		The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates		
		VME habitats to a point where there would be serious or irreversible harm.	of the VME habitats to a point where there would be serious or irreversible harm.	structure and function of the VME habitats to a point where there would be serious or irreversible harm.
	Met?	Yes – deep water corals	No – deep water corals	

Rationale

Deep water corals have been identified as VMEs in this region.

Lophelia pertusa, *Madrepora oculata* and *Desmophyllum dianthus* are cold water coral reefs known to occur in the Aegean Sea. The black coral *Leiopathes glaberrima*[101], the hexacorals *Dendrophyllia cornigera and D. dianthus* are also known to occur in the Aegean Sea[102]. These species are endangered in the IUCN Red List[103]. Their depths of occurrence overlap with the that of the fishery operational depth[104]. We also note that some sea pens such as *Pennatulidae spp.* and *Funiculina quadrangularis* overlap with the depths of the fishery, are endangered in the IUCN Red List, although may not occur in the Aegean Sea since no such records have been found. There are no deep-sea sponge aggregations classified as endangered in the Mediterranean[105]. Furthermore, most deep sea water sponges in the Mediterranean appear to occur mainly in mixed substrates and rocky bottoms, where this fishery is unlikely to operate.

Scientists at the CNR as well as GFCM staff also reported that it would be unlikely for these trawlers to fish in areas where these deep water corals and sea sponge communities would be distributed due to damage to the fishing nets, and because there trawlers tend to trawl exactly the same areas, passing over the same transect over and over again. We also note that deep water sponge communities and corals tend to occur mostly in mixed and rocky substrates[106], while the fishery reportedly operates on soft bottoms. The UoA is unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm. **SG 60 may be met.**

The scientist we interviewed also highlighted that if damage was done to important VMEs, damage would be done once only - after the vessel trawled over a certain section of the seabed, following which the vessel would not trawl new areas but continue to trawl existing (i.e. cleaned) grounds. That however does not mean that damage to these species and habitats may have not been made in the first place by "cleaning the fishing grounds" since bottom trawlers are known to directly produce a reduction in the coral coverage on the swept bottoms through damage and abrasion[107]. In Figure 10 reporting deep water corals, only the green and black spots indicate areas where there are records of deep-water corals within the depth range of the fishery under assessment. Based on the bathymetric map in Figure 7 shown earlier, it is possible that some of these coral gardens may be found at depths overlapping with those where the fishery operates in. However, due the lack of fishing effort and distribution data we cannot determine whether an actual overlap between the fishery and these VMEs fishery may occur. We cannot determine with confidence that the UoA is highly unlikely to reduce structure and function of the VME habitats to a point where there would be serious or irreversible harm. **SG 80 may not be met.**

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[101] https://www.intechopen.com/books/mediterranean-identities-environment-society-culture/deep-sea-biodiversity-in-the-aegean-sea
[102] https://www.tandfonline.com/doi/full/10.1080/24750263.2018.1452990
[103] https://mx.oceana.org/sites/default/files/fs_gfcm_workshop_vmes_2017.pdf
[104] http://www.fao.org/3/a-i7256e.pdf
[105] https://mx.oceana.org/sites/default/files/fs_gfcm_workshop_vmes_2017.pdf
[106] http://www.fao.org/3/a-i6945e.pdf
[107] http://www.int-res.com/abstracts/meps/v397/p279-294/

PI 2.4.1	The UoA does not cause serious or irreversible harm to habitat structure and function, considered on the basis of the area covered by the governance body(s) responsible for fisheries management in the area(s) where the UoA operates

	Minor habitat status			
c	Guide post			There is **evidence** that the UoA is highly unlikely to reduce structure and function of the minor habitats to a point where there would be serious or irreversible harm.
	Met?			Yes

Rationale

No minor habitats have been identified. SG 100 may be met.

References

Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	More information sought: Geographical effort data for the fishery under assessment, VMEs information for the Aegean Sea.
Data-deficient? (Risk-Based Framework needed)	No

PI 2.4.2 – Habitats management strategy

PI 2.4.2	There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats		
Scoring Issue	SG 60	SG 80	SG 100
a	**Management strategy in place**		
	Guide post	There are **measures** in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a **partial strategy** in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a **strategy** in place for managing the impact of all MSC UoAs/non-MSC fisheries on habitats.
	Met?	Yes	No	

Rationale

There are a few management measures available geared towards habitat protection. These measures (mainly EC regulation 1967/2006[108]) include:

- A prohibiting the use of towed dredges and trawl nets at depths beyond 1000 m[109].
- VMS/AIS active on board.
- The vessels working in GSA 22-23 are not allowed inside 6 nm from the Greeks coast and 12 nm from the Turkish coast.
- There are shallow water closures in coastal bays around the Aegean Sea to protect from trawl fishing effects. However, these closures are in relatively shallow waters since Greek vessels do not really prosecute species in deep waters of the Aegean (i.e. deeper than ~300 m) (see 2013 management plan for the Greek trawlers[110]).
- Fisheries Restricted Areas (none active or proposed in the Aegean).

Exclusions in the Aegean Sea
Italian vessels working in GSA 22-23 are not allowed inside the 6 nm from the Greeks coast and 12 nm from the Turkish coast (shown below). These limits effectively offer some buffer from the impacts of the fishery under assessment where these areas overlap with operational depths of the fishery between 500 and 800 m depth.

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[108] https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32006R1967
[109] https://gfcm.sharepoint.com/CoC/Decisions%20Texts/REC.CM_GFCM_29_2005_1-e.pdf?originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlG9pbnQuY29tLzpiOi9nL0NvQy9FVjBBBcG1qUzh6NUNqU2J5dnNtU0c0SUJ1cDDGbjJMTU5PcmNfLVk5S0t3ZVpBP3J0aW1lPXBWeW52ZkdIMkVn
[110] https://stecf.jrc.ec.europa.eu/documents/43805/595615/2013-04+Greece+-+Management+plan+new+version.pdf

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PI 2.4.2	There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats

Figure 12. Greek (6 nm) and Turkish (12 nm) territorial sea width in the Aegean Sea excluded to Italian vessels. Modified from Siousiouras and Chrysochou 2014[111].

Also, the following areas, marked in red, are closed because occur at depths of 1000 m and deeper, although we note that the fishery does not operate that deep.

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[111] https://www.mdpi.com/2075-471X/3/1/12/htm

PI 2.4.2	There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats

Figure 13. Spatiotemporal restrictions for bottom trawlers in the Aegean Sea based on European (EU) and national legislation (Petza et al., 2017). Trawling is prohibited at depths >1000 m (EC Regulation 1967/2006). Depths 1000 m and deeper are marked in red. (Source: Maina et. al. 2018[112]).

Considering available management measures and that the impacts of the fishery on sandy and muddy habitat types is not considered significant, we can determine that there are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance. **SG 60 would be met.**

However, we also consider the potential for additional risks of bottom trawl fisheries on deep sea habitats as highlighted by Clark at al 2016[113] and Watling (2014)[114] and the fact that the assessment team is not aware of any additional management measure geared towards minimising the effects of trawling on seabed habitats. For example, the fishery does not use rolling bobbins (elevating the net from the seafloor), semi pelagic trawl doors (flying above the seabed) or other mechanisms to decrease / minimise the abrasion of the gear type upon the seabed and various habitats (for review of measures and practices see McConnaughey et al. 2019[115]). Accordingly, we cannot determine that there is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above. SG 80 would not be met.

		Management strategy evaluation		
b	Guide post	The measures are **considered likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/habitats).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on **information directly about the UoA and/or habitats** involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on **information directly about the UoA and/or habitats** involved.
	Met?	Yes	No	

Rationale

Referencing the information provided in Scoring Issue a, we note that the commonly encountered habitats in the depths this operates are sandy and muddy habitat types and that impacts on such habitats is not considered significant, the measures are considered likely to work, based on plausible argument (e.g. effect of bottom trawl gear on sandy and muddy bottoms is relatively limited). **SG 60 may be met.**

However, considering the potential for additional risks of bottom trawl fisheries on deep sea habitats as highlighted by Clark at al 2016 and Watling (2014) and the fact that the assessment team is not aware of any additional management measure geared towards minimising the effects of trawling on seabed habitats, and considering the lack of fishing distribution maps for the fishery in GSA 22 and 23, we cannot determine that there is some objective basis for confidence that the measures/partial strategy will work, based on information directly about the UoA and/or habitats involved. SG 80 may not be met.

c	**Management strategy implementation**

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[112] https://academic.oup.com/icesjms/article/75/6/2265/5047862
[113] https://academic.oup.com/icesjms/article/73/suppl_1/i51/2573992
[114] https://www.pnas.org/content/111/24/8704
[115] https://onlinelibrary.wiley.com/doi/full/10.1111/faf.12431

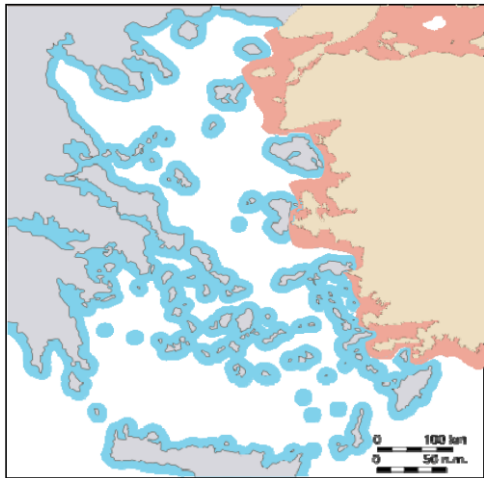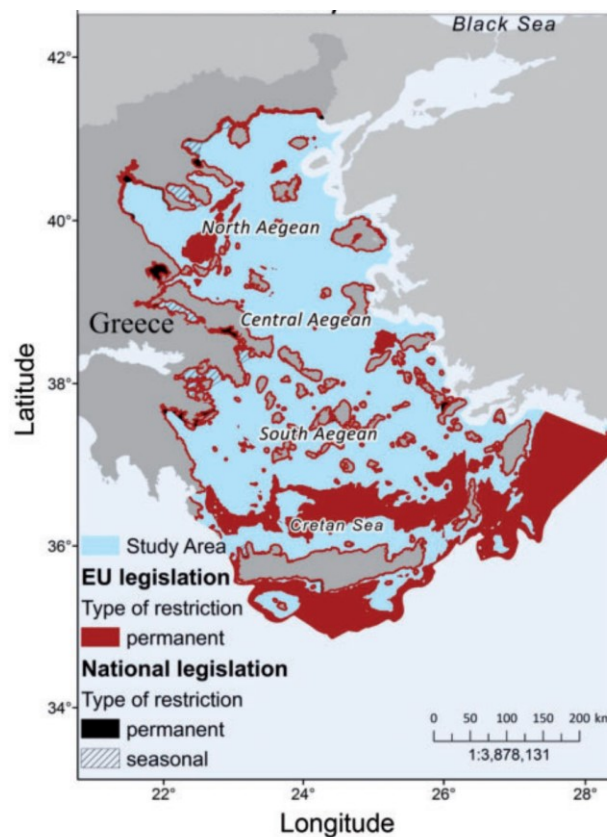| PI 2.4.2		There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats		
	Guide post		There is **some quantitative evidence** that the measures/partial strategy is being implemented successfully.	There is **clear quantitative evidence** that the partial strategy/strategy is being implemented successfully and is achieving its objective, as outlined in scoring issue (a).
	Met?		No	

Rationale

Based on the relatively limited management measures currently in place for this fishery in relation to habitat management and conservation and considering the lack of fishing distribution maps for the fishery in GSA 22 and 23, we cannot determine that There is some quantitative evidence that the measures/partial strategy is being implemented successfully. **SG 80 may not be met.**

		Compliance with management requirements and other MSC UoAs'/non-MSC fisheries' measures to protect VMEs		
d	Guide post	There is **qualitative evidence** that the UoA complies with its management requirements to protect VMEs.	There is **some quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.	There is **clear quantitative evidence** that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant.
	Met?	Yes	No	

Rationale

VMEs management

The report of the second meeting of the Working Group on Vulnerable Marine Ecosystems (WGVME) held in 2018[116] advised on new proposals for closures and on the enforcement of existing FRA measures. Currently, the only management measure in place to protect VME from bottom trawl fisheries are the existing FRAs addressing VME protection, but none of these have been proposed or implemented in the Aegean Sea for the Unit of Assessment. Additional restrictions include the ban on fishing grounds deeper than 1000 m and the prohibitions to enter 6 nm from the Greek coast and 12 nm from the Turkish coast.

Considering Resolution GFCM/43/2019/6[117], CPCs are required to encourage, within the zones identified by the Scientific Advisory Committee on Fisheries (SAC), the progressive implementation of a set of transitional measures to prevent significant adverse impacts (SAIs) of deep-sea fisheries activities on vulnerable marine ecosystems (VMEs) formed by cnidarian (coral) communities, which are known to occur in the Mediterranean Sea (geographical subareas [GSAs] 1–28), and listed in Annex II of GFCM/43/2019/6. The Recommendation includes fishing vessels above 15 metres (length overall [LOA]) operating with bottom contact fishing gear and fishing for *Aristaeomorpha foliacea*, *Aristeus antennatus*, or *Plesionika martia*; and b) all fishing vessels above 15 metres (LOA)

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[116] http://www.fao.org/gfcm/technical-meetings/detail/en/c/1142043/
[117]
https://gfcm.sharepoint.com/CoC/Decisions%20Texts/Forms/AllItems.aspx?id=%2FCoC%2FDecisions%20Texts%2FRES%2DGFCM%5F43%5F20 19%5F6%2De%2Epdf&parent=%2FCoC%2FDecisions%20Texts&p=true&originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlcG9pbnQuY29tLzpiOi9nL0 NvQy9FVVJkb083NmhlMVBqYTQwZk02bGFyY0JJUHJwWWswRlFFWMWQ0Q3VieHlMbXZnP3J0aW1lVFJTFYtX0NIMkVn

PI 2.4.2	There is a strategy in place that is designed to ensure the UoA does not pose a risk of serious or irreversible harm to the habitats

operating with bottom contact gear (bottom trawls, longlines, gillnets and pots and traps) deeper than 300 metres and on all offshore seamounts. The GFCM Resolution made also suggestions to improve data collection systems such as an adequate level of scientific observer programme coverage.

The only qualitative information that the fishery may not affect VMEs in a significant way relates to anecdotal information collected through the stakeholder meeting process for this pre-assessment. Accordingly, scientists at the CNR as well as GFCM staff reported that it would be unlikely for these trawlers to fish in areas where these deep water corals and sea sponge communities would be distributed due to damage to the fishing nets, and because there trawlers tend to trawl exactly the same areas, passing over the same transect over and over again, without necessarily exposing new fishing sites. We also note that deep water sponge communities and corals tend to occur mostly in mixed and rocky substrates, while the fishery reportedly operates on soft bottoms. There is qualitative evidence that the UoA complies with its management requirements to protect VMEs. **SG 60 may be met.**

However, due to the lack of additional evidence we cannot determine that there is some quantitative evidence that the UoA complies with both its management requirements and with protection measures afforded to VMEs by other MSC UoAs/non-MSC fisheries, where relevant. SG 80 may not be met.

References
Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale
Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	More information sought: - Habitat specific management measures and incidence of fishing effort by the red shrimp fishery within GSA 22 and 23 to establish trawl footprint in relation to existing habitats and VMEs

PI 2.4.3 – Habitats information

PI 2.4.3	Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat		
Scoring Issue	SG 60	SG 80	SG 100
	Information quality		
a	Guide post	The types and distribution of the main habitats are **broadly understood**. OR If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the types and distribution of the main habitats.	The nature, distribution and **vulnerability** of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. OR If CSA is used to score PI 2.4.1 for the UoA: Some quantitative information is available and is adequate to estimate the types and distribution of the main habitats.	The distribution of all habitats is known over their range, with particular attention to the occurrence of vulnerable habitats.
	Met?	Yes	No	

Rationale

Regarding habitat types[118] in the depths[119] fished by the UoA in the GSA 22 and 23 please refer to Figure 11 and Figure 7 respectively, for a graphical representation. Most of the substrate habitat at the depths of interest are sandy and muddy habitat types. The types and distribution of the main habitats are broadly understood. **SG 60 would be met.**

However, due to the lack of fishing effort maps of the red shrimp fishery within GSA 22 and 23 that would enable the understanding of the actual fishery footprint in relation to existing habitats and VMEs we cannot determine that the nature, distribution and vulnerability of the main habitats in the UoA area are known at a level of detail relevant to the scale and intensity of the UoA. SG 80 would not be met.

	Information adequacy for assessment of impacts		
b	Guide post	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. OR If CSA is used to score PI 2.4.1 for the UoA: Qualitative information is adequate to estimate the consequence and spatial	Information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. OR If CSA is used to score PI 2.4.1 for the UoA:	The physical impacts of the gear on all habitats have been quantified fully.

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[118] https://www.emodnet.eu/en/seabed-habitats
[119] https://www.sciencedirect.com/science/article/abs/pii/S0960148115303013

PI 2.4.3		Information is adequate to determine the risk posed to the habitat by the UoA and the effectiveness of the strategy to manage impacts on the habitat		
		attributes of the main habitats.	Some quantitative information is available and is adequate to estimate the consequence and spatial attributes of the main habitats.	
	Met?	Yes	No	

Rationale

Considering the same information provided under Scoring issue a we can determine that available information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear. **SG 60 would be met.**

However, due to the lack of lack of fishing effort maps of the red shrimp fishery within GSA 22 and 23 that would enable the understanding of the actual fishery footprint in relation to existing habitats and VMEs we cannot determine that information is adequate to allow for identification of the main impacts of the UoA on the main habitats, and there is reliable information on the spatial extent of interaction and on the timing and location of use of the fishing gear. SG 80 would not be met.

	Monitoring			
c	Guide post		Adequate information continues to be collected to detect any increase in risk to the main habitats.	Changes in all habitat distributions over time are measured.
	Met?		No	

Rationale

As per evidence provided in Scoring issue a, we cannot determine that adequate information continues to be collected to detect any increase in risk to the main habitats. **SG 80 is not met.**

References

Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	More information sought: Fishing effort maps of the red shrimp fishery within GSA 22 and 23

PI 2.5.1 – Ecosystem outcome

PI 2.5.1	The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function		
Scoring Issue	SG 60	SG 80	SG 100
a **Ecosystem status**			
a Guide post	The UoA is **unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The UoA is **highly unlikely** to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is **evidence** that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
Met?	Yes	No	

Rationale

Giant red shrimp ecology

Giant red shrimp are opportunistic carnivores and scavengers that may consume up to 60 different prey categories[120]. The first study on the feeding behaviour of *A. foliacea* found a high diversity in consumed prey types, including pelagic, benthic and benthopelagic organisms in the Ligurian Sea. This pattern was later confirmed for the Central Mediterranean: stomach content analysis of giant red shrimp found both strictly benthic and pelagic prey. The most widely accepted explanation is that *A. foliacea* undergoes diel migrations related to its feeding behaviour, feeding on benthic organisms during the day and preying in the water column at night[121]. Kapiris et al. 2010[122] reported that deep-sea red shrimp in the Eastern Mediterranean, *Aristaeomorpha foliacea* displayed a highly diversified diet that exhibited slight seasonal fluctuations. The diets of both sexes consisted of 60 different prey categories belonging chiefly to three groups: crustaceans (e.g. decapods, such as *Plesionika* spp. and Pasiphaeidae, amphipods), cephalopods (mainly Enoploteuthidae) and fishes (Myctophidae, Macrouridae). These three prey categories accounted for 72–82% of the relative abundance and total occurrence for males and 70–88% for females, respectively. Females seem to be more active predators than males, consuming prey with greater swimming ability. However, ontogenetic shifts in diet were also apparent, despite high dietary overlap among small, medium and large females. Large individuals, which are more efficient predators, selected highly mobile prey (e.g. fishes), whereas small individuals consumed low-mobility prey (e.g. copepods, ostracods, tanaids and sipunculans). Diet composition is size related in *A. foliacea*.

If at all similar to North Western Ionian Sea food webs *A foliacea* should be part of a complex system of energy and biomass exchanges indicating an important benthic-pelagic coupling. In the food webs of the north-eastern (Salento) and south-western (Calabria) sectors of the North-Western Ionian Sea (NWIS) (Central Mediterranean Sea), for example, the regulation of flows between the benthic-pelagic coupling seems to occur through the benthopelagic shrimps (including red giant shrimp and blue and red shrimp (*Aristaeomorpha foliacea* and *Aristeus antennatus*, respectively), the deep-water rose shrimp (*Parapaeneus longirostris*), and the golden shrimp (*Plesionika martia*) and the small pelagics due to their wasp-waist control role.

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[120] https://cdn.intechopen.com/pdfs/35874/InTech-Feeding_habits_of_both_deep_water_red_shrimps_aristaeomorpha_foliacea_and_aristeus_antennatus_decapoda_aristeidae_in_the_ionian_sea_e_mediterranean_.pdf
[121] http://www.faomedsudmed.org/html/species/Aristaeomorpha%20foliacea.html
[122] https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1439-0485.2009.00344.x

PI 2.5.1	The UoA does not cause serious or irreversible harm to the key elements of ecosystem structure and function

A. foliacea does not appear to be a keystone species[123] in the Mediterranean ecosystem in terms of being a key prey or predator species. Also, because animals like elasmobranchs, which have been recognised in this assessment as being potentially affected by and potentially important to this the UoA (i.e. secondary and ETP species), feed on many different species and could switch prey relatively easily (e.g. cephalopods, mollusks, fish and other crustacean species[124]), we consider that the UoA is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. **SG 60 may be met.**

However, due to the absence of specific fishing effort, distribution, stock abundance and/or food web information, relating to this fishery and geographical area, we cannot determine that the UoA is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm. SG 80 may not be met.

References
Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale
Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	More information sought: More specific fishing effort, distribution, stock abundance and/or food web information, relating to this fishery and geographical area
Data-deficient? (Risk-Based Framework needed)	No

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[123] https://hal.archives-ouvertes.fr/hal-01790558/document
[124] https://academic.oup.com/icesjms/article/56/5/707/691331

PI 2.5.2 – Ecosystem management strategy

PI 2.5.2	There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue	SG 60	SG 80	SG 100
a **Management strategy in place**			
a Guide post	There are **measures** in place, if necessary which take into account the **potential impacts** of the UoA on key elements of the ecosystem.	There is a **partial strategy** in place, if necessary, which takes into account **available information and is expected to restrain impacts** of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	There is a **strategy** that consists of a **plan**, in place which contains measures to **address all main impacts of the UoA** on the ecosystem, and at least some of these measures are in place.
Met?	Yes	No	

Rationale

The GFCM has recently adopted management measures for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Levant Sea (geographical subareas 24-27), the Ionian Sea (geographical subareas 19-21) and the Strait of Sicily (geographical subareas 12-16), as well as two multiannual management plans adopted in 2018 for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Ionian Sea (GFCM/42/2018/4) and the Levant Sea (GFCM/42/2018/3)[125]. However, no measures or plans have been adopted for shrimp caught in the Aegean Sea (GSA 22).

The only available management measure in the area (mainly EC regulation 1967/2006[126]) that may affect the wider ecosystem appear to be limited to:

- A limitation of the number of fishing vessel licenses,
- A reduction in fishing days required by Executive Decree No 26510 of 28 December 2018[127] (which appears to have decreased the fishing effort to some degree, refer to P1 background section),
- A minimum 40 mm (stretched) square meshes or a cod end with 50 mm (stretched) diamond meshes, as well as a ban prohibiting the use of towed dredges and trawl nets at depths beyond 1000 m[128]. The mesh size used in this fishery appears to be of 50 mm (Fabio Fiorentino pers. comm.) and there is no minimum landing size for *A. foliacea*.
- The recording of catches/landings as part of DCRF requirements (although we note that the recording of catches/landings from Italian vessels fishing in GSA 22-23 is aggregated into those of GSA 16).
- VMS/AIS active on board.
- The vessels working in GSA 22-23 are not allowed inside 6 nm from the Greeks coast and 12 nm from the Turkish coast.
- Fisheries Restricted Areas (none active or proposed in the Aegean).

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[125] http://www.fao.org/gfcm/decisions/ar/
[126] https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32006R1967
[127] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/13693
[128] https://gfcm.sharepoint.com/CoC/Decisions%20Texts/REC.CM_GFCM_29_2005_1-e.pdf?originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlcG9pbnQuY29tLzpiOi9nL0NvQy9FVjBBcG1Uzh6NUNqU2J5dnNtU0c0SUJ1cDDGbjJMTU5PcmNfLVk5S0t3ZVpP3J0aW1lPBWeW52ZkdIMkVn

PI 2.5.2	There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function

These bottom trawlers do not use excluder devices that may exclude large animals such as sharks (or large fish) from the catch (Fabio Fiorentino pers. comm.) (e.g. as used in Brewer at al 2006[129], Scott et al. 2012[130], Brčić et al 2016[131], Garstin et al 2018[132] and Campbell et al 2020[133]) nor do they use rolling bobbins (elevating the net from the seafloor), semi pelagic trawl doors (flying above the seabed) or other mechanisms to decrease / minimise the abrasion of the gear type upon the seabed and various habitats (for review of measures and practices see McConnaughey et al. 2019[134]).

In terms of GFCM decisions, considering Resolution GFCM/43/2019/6[135], CPCs are required to encourage, within the zones identified by the Scientific Advisory Committee on Fisheries (SAC), the progressive implementation of a set of transitional measures to prevent significant adverse impacts (SAIs) of deep-sea fisheries activities on vulnerable marine ecosystems (VMEs) formed by cnidarian (coral) communities, which are known to occur in the Mediterranean Sea (geographical subareas [GSAs] 1–28), and listed in Annex II of GFCM/43/2019/6. The Recommendation includes fishing vessels above 15 metres (length overall [LOA]) operating with bottom contact fishing gear and fishing for *Aristaeomorpha foliacea*, *Aristeus antennatus*, or *Plesionika martia*; and b) all fishing vessels above 15 metres (LOA) operating with bottom contact gear (bottom trawls, longlines, gillnets and pots and traps) deeper than 300 metres and on all offshore seamounts. The GFCM Resolution made also suggestions to improve data collection systems such as an adequate level of scientific observer programme coverage.

There are measures in place, if necessary, which take into account the potential impacts of the UoA on key elements of the ecosystem. **SG 60 may be met.**

However, it is unclear at this stage if the overall trawl effort in GSA 22 and 23 may be low, medium or high in respect to the impacts it may produce on ecosystem elements, structure and function so far identified. Overall, considering the general lack of information on this fishery, and due to lack of more specific management evidence, we cannot determine that there is a partial strategy in place, if necessary, which takes into account available information and is expected to restrain impacts of the UoA on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance. SG 80 is not met.

	Management strategy evaluation		
b	Guide post	The **measures** are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar UoAs/ ecosystems).	There is **some objective basis for confidence** that the measures/ partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved.	**Testing** supports **high confidence** that the partial strategy/ strategy will work, based on information directly about the UoA and/or ecosystem involved.

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[129] Brewer, D., Heales, D., Milton, D., Dell, Q., Fry, G., Venables, B., Jones, P., 2006, The impact of turtle excluder devices and bycatch reduction devices on diverse tropical marine communities in Australia's northern prawn trawl fishery

[130] https://www.tandfonline.com/doi/abs/10.1080/02755947.2012.678962

[131] https://www.sciencedirect.com/science/article/pii/S0165783615300448

[132] Garstin, A., Oxenford, H.A., 2018, The effectiveness of a modified turtle excluder device (TED) in reducing the bycatch of elasmobranchs in the Atlantic seabob (Xiphopenaeus kroyeri) industrial trawl fishery of Guyana.

[133] Campbell, M. J., Tonks, M. L., Miller, M., Brewer, D. T., Courtney, A. J., and C.A Simpfendorfer , 2020, Factors affecting elasmobranch escape from turtle excluder devices (TEDs) in a tropical penaeid-trawl fishery.

[134] https://onlinelibrary.wiley.com/doi/full/10.1111/faf.12431

[135] https://gfcm.sharepoint.com/CoC/Decisions%20Texts/Forms/AllItems.aspx?id=%2FCoC%2FDecisions%20Texts%2FRES%2DGFCM%5F43%5F2019%5F6%2De%2Epdf&parent=%2FCoC%2FDecisions%20Texts&p=true&originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlcG9pbnQuY29tLzpiOi9nL0NvQy9FVVJkb083NmhlMVBBqYTQwZk02bGFyY0JJUHJwWWswRlFWMWQ0Q3VieHlYZ3J3Q1lrXZnP3J0aWW1PVFJTFYtX0NIMkkkVn

PI 2.5.2		There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function		
	Met?	Yes	No	

Rationale

Considering that *A. foliacea* does not appear to be a keystone species[136] in the ecosystem in terms of being a key prey or predator species, and considering that some of his predators at least (e.g. sharks and rays) would be able to consume other preys items due to their varied diet[137], overly specific management measures may not be strictly needed. Of the management measures in place, including mesh size and restrictions from operating at a predetermined distance from the coast (i.e. 6 nm in Greece and 12 nm in Turkey), and the need to carry active VMS/AIS on board we can say that the measures are considered likely to work, based on plausible argument. **SG 60 may be met.**

However, it is unclear at this stage if the overall trawl effort in GSA 22 and 23 may be low, medium or high in respect to the impacts it may produce on ecosystem elements, structure and function so far identified. Overall, considering the general lack of information on this fishery (e.g. effort levels and distribution) and due to lack of more specific management evidence, we cannot determine that there is some objective basis for confidence that the measures/ partial strategy will work, based on some information directly about the UoA and/or the ecosystem involved. **SG 80 may not be met.**

	Management strategy implementation			
c	Guide post		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).
	Met?		No	

Rationale

It is unclear at this stage if the overall trawl effort in GSA 22 and 23 may be low, medium or high in respect to the impacts it may produce on ecosystem elements, structure and function so far identified. Overall, considering the general lack of information on this fishery (e.g. effort levels and distribution) and due to lack of more specific management evidence, we cannot determine that *there is some evidence that the measures/partial strategy is being implemented successfully*. **SG 80 may not be met.**

References

Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	More information sought:

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[136] https://hal.archives-ouvertes.fr/hal-01790558/document
[137] https://academic.oup.com/icesjms/article/56/5/707/691331

PI 2.5.2	There are measures in place to ensure the UoA does not pose a risk of serious or irreversible harm to ecosystem structure and function
	More specific fishing effort, distribution, stock abundance and/or food web information, relating to this fishery and geographical area. Management information specific to the Aegean.

PI 2.5.3 – Ecosystem information

PI 2.5.3	There is adequate knowledge of the impacts of the UoA on the ecosystem		
Scoring Issue	SG 60	SG 80	SG 100
a	**Information quality**		
	Guide post	Information is adequate to **identify** the key elements of the ecosystem.	Information is adequate to **broadly understand** the key elements of the ecosystem.	
	Met?	Yes	No	

Rationale

Some information on the ecology of *A. foliacea* exists. For example, it is known that giant red shrimp are opportunistic carnivores and scavengers that may consume up to 60 different prey categories[138] [139] [140]. If at all similar to North Western Ionian Sea food webs *A foliacea* in the Aegean Sea should be part of a complex system of energy and biomass exchanges characterized in the investigated food webs indicating an important benthic-pelagic coupling. In the food webs of the north-eastern (Salento) and south-western (Calabria) sectors of the North-Western Ionian Sea (NWIS) (Central Mediterranean Sea), for example, the regulation of flows between the benthic-pelagic coupling seems to occur through the benthopelagic shrimps (including red giant shrimp and blue and red shrimp (*Aristaeomorpha foliacea* and *Aristeus antennatus*, respectively), the deep-water rose shrimp (*Parapaeneus longirostris*), and the golden shrimp (*Plesionika martia*) and the small pelagics due to their wasp-waist control role.

In 2010, Tsagarakis et al.[141] published the first mass-balance trophic model describing the food-web traits of the North Aegean Sea (Strymonikos Gulf and Thracian Sea, Greece, Eastern Mediterranean) between 20 m and 300 m isobaths and to explore the impacts of fishing in the region. The results were presented and discussed in comparison to other previous ecosystems modelled from the western and the central areas of the basin (South Catalan and North-Central Adriatic Seas). The North Aegean shared some common features with other Mediterranean Sea ecosystems such as dominance of the pelagic fraction in terms of flows and strong benthic-pelagic coupling of zooplankton and benthic invertebrates through detritus. The importance of detritus highlighted the role of the microbial food-web, which was indirectly considered through detritus dynamics. Ciliates, mesozooplankton and several benthic invertebrate groups were shown as important elements of the ecosystem linking primary producers and detritus with higher trophic levels in the N. Aegean Sea. Adult anchovy was shown as the most important fish group in terms of production, consumption and overall effect on the rest of the ecological groups in the model, in line with results from the Western Mediterranean Sea.

Information is adequate to identify the key elements of the ecosystem. **SG60 is met.**

However, due to a lack of more specific ecosystem information on deep sea ecosystem communities and dynamics, and more generally the general lack of information associated with this fishery, we cannot determine that information is adequate to broadly understand the key elements of the ecosystem. SG80 is not met.

b	**Investigation of UoA impacts**

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[138] https://cdn.intechopen.com/pdfs/35874/InTech-Feeding_habits_of_both_deep_water_red_shrimps_aristaeomorpha_foliacea_and_aristeus_antennatus_decapoda_aristeidae_in_the_ionian_sea_e_mediterranean_.pdf

[139] http://www.faomedsudmed.org/html/species/Aristaeomorpha%20foliacea.html

[140] https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1439-0485.2009.00344.x

[141] https://ui.adsabs.harvard.edu/abs/2010ECSS...88..233T/abstract

PI 2.5.3		There is adequate knowledge of the impacts of the UoA on the ecosystem		
	Guide post	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but **have not been investigated** in detail.	Main impacts of the UoA on these key ecosystem elements can be inferred from existing information, and **some have been investigated in detail**.	Main interactions between the UoA and these ecosystem elements can be inferred from existing information, and **have been investigated in detail**.
	Met?	Yes	No	

Rationale

Considering that *A. foliacea* does not appear to be a keystone species[142] in the ecosystem in terms of being a key prey or predator species, and considering that some of his predators at least (e.g. sharks and rays) would be able to consume other preys items due to their varied diet[143], and considering the effect on sandy and muddy habitats appear to be somewhat limited main impacts of the UoA on these key ecosystem elements can be inferred from existing information, but cannot be said to have been investigated in detail. **SG 60 would be met.** However, the evidence available is somewhat scares and not sufficient to achieve a SG80 score.

	Understanding of component functions			
c	Guide post		The main functions of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are **known**.	The impacts of the UoA on P1 target species, primary, secondary and ETP species and Habitats are identified and the main functions of these components in the ecosystem are **understood**.
	Met?		No	

Rationale

The fishery specific information is inadequate. Currently there are no reliable stock assessments, effort or fishing distribution maps, or a reliable list of primary, secondary species or ETP species affected by this fishery. Furthermore, information on habitats and ecosystem dynamics is also somewhat lacking. Accordingly, we cannot determine that the main functions (or indeed identity) of the components (i.e., P1 target species, primary, secondary and ETP species and Habitats) in the ecosystem are known. **SG 80 may not be met.**

	Information relevance			
d	Guide post		Adequate information is available on the impacts of the UoA on these components to allow some of the main consequences for the ecosystem to be inferred.	Adequate information is available on the impacts of the UoA on the components **and elements** to allow the main consequences for the ecosystem to be inferred.
	Met?		No	

Rationale

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[142] https://hal.archives-ouvertes.fr/hal-01790558/document
[143] https://academic.oup.com/icesjms/article/56/5/707/691331

PI 2.5.3	There is adequate knowledge of the impacts of the UoA on the ecosystem

As specified in scoring issue c and earlier in this report, we consider fishery specific information on the impacts of the UoA on these components to be inadequate. **SG 80 is not met.**

	Monitoring			
e	Guide post		Adequate data continue to be collected to detect any increase in risk level.	Information is adequate to support the development of strategies to manage ecosystem impacts.
	Met?		No	

Rationale

There is no evidence to support the statement that adequate data continue to be collected to detect any increase in risk level. For example, we are not aware that reliable information is collected on primary, secondary or ETP species in fishing logbooks. Furthermore, any catch data collected through the DCRF in this region, is associated with data from GSA 16, diluting the specificity of information and hindering efforts for a proper assessment of the effects of this fishery on ecosystem components. Although the MEDITS survey has been operational in the region for decades, the information produced does not appear to be sufficient for the scope of this assessment. Furthermore, the lack of an observer program to properly understand which species are most affected by this fishery further impacts on the overall level of available information for this fishery. Due to the general lack of information in this fishery **SG 80 is not met**.

References

Please refer to the references and footnotes provided here and throughout the P2 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	<60-79
Information gap indicator	More information sought: Catch information for the fishery including non-target species Other ecosystem information that may relate to this UoA.

7.6 Principle 3
7.6.1 Principle 3 background

The UoA consists of the giant red shrimp stock occurring in the Aegean Sea, GSA 22 and 23, in Greek waters. The stock does not appear to be formally shared with any other EU countries (e.g. Greece) in terms of management. The fishery area of operation is the Eastern Mediterranean FAO Division 37.3.1, Aegean Sea in GSA 22 and 23. The UoA vessels are Italian-registered and fish under Italian licences, and report (via electronic logbooks) to the Italian management authorities.

The main management body for the UoA is therefore the Italian central government, which operates in accordance with its commitments as a Member State of the European Union and as a contracting party of the regional fishery management organisation, the UN FAO's General Fisheries Commission of the Mediterranean and Black Sea (GFCM). How each organisation works to manage the fishery is described in the sections below.

EU Level Management

As Italy is an EU Member State, the key legal framework for the management of the UoA is set out at European level by the Common Fisheries Policy (CFP; European Regulation 1380/2013[144]). The CFP provides a framework under which shared stocks in European waters (stocks where the geographic distribution covers more than one European EEZ, or stocks fished outside 12 miles in a given EEZ) are managed on a common European basis.

EU vessels are all bound by the same rules and regulations as defined under the EU Common Fisheries Policy (CFP) (EC reg. 1380/2013). These rules continue to apply to vessels fishing outside EU waters, including outside the EEZs of the Member States.

The CFP also defines common objectives and requirements that the Italian operators in the fishery must adhere to. These are implemented in each Member State; in the case of Italy via presidential decrees.

The objective of the CFP is to ensure that fisheries and aquaculture are ecologically, economically and socially sustainable. It is also concerned with maintaining employment and the sector's economic viability.

Following the 2002 CFP reform, a new system for limiting the fishing capacity of the EU fleet entered into force on 1 January 2003. This system gave more responsibility to the Member States in achieving a better balance between the fishing capacity of their fleets and the available resources. An Italian Ministerial Circular of 07 October 2004 laid down a plan that aims at reducing fishing effort, particularly by encouraging a reduction in fishing vessels operating within 6 nautical miles of the baseline and using trawl nets.

The CFP is reviewed every 10 years and its most recent revision (EU Reg. 1308/2013) sought to make fisheries more sustainable. The new policy came into force in 2014[145], including commitments to:

- Fish stocks exploited at Maximum sustainable yield (MSY),
- Greater regionalization (through increased roles for Regional Advisory Councils, including the Mediterranean Sea Advisory Council (MEDAC[146]),
- An ecosystem approach to fisheries by ensuring fishing capacity is in line with fishing opportunities and moving more stocks under Long Term Management Plans,
- An obligation to land the fish that is caught (discard ban).

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[144] https://www.guardiacostiera.gov.it/en/Pages/common-fisheries-policy.aspx
[145] https://ec.europa.eu/fisheries/reform_en
[146] http://en.med-ac.eu/index.php

The EC's DG Maritime Affairs and Fisheries has recently published its strategic plan 2016-2020[147], which sets out fisheries management objectives and targets as well as those for marine environmental management.

For Monitoring, Control and Surveillance activities, the EU Member States are required to comply with the agreed control regulations within the CFP framework. Since 2007 these have been coordinated at an EU level by the European Fisheries Control Agency (EFCA)[148]. Its goal is to coordinate the fisheries inspection and control operational activities of Member States, and to provide assistance to the Member States in their application of the CFP.

The CFP includes requirements for fishing vessels longer than 12 meters to report their logbook data, including catch data, electronically and to have an approved satellite-based vessel monitoring system (VMS) on board[149]. Fishing vessels longer than 18 meters are also required to have an automatic identification system (AIS) on board. From May 2014, AIS must be on board all vessels over 15 meters in length.

As a European Union Member State, Italy has a responsibility to monitor fishing activities and catches, and to share such information via the Data Collection Framework (DCF), which is consistent with commitments under the GFCM.

The vessels are required to report the location and quantity of species retained on a daily basis via an electronic logbook that is transmitted to control authorities. Skippers must also notify authorities ahead of landing their fish and only into designated ports.

European fisheries management also involves taking decisions based on the best available scientific data. The European Commission receives advice from the Scientific, Technical and Economic Committee for Fisheries (STECF) and various other scientific organisations. In the event of data gaps, the EU has the means to fund studies and projects in the short, medium, and long term with the aim of rectifying the lack of data.

STECF can be consulted for the annual stock assessment results and STECF reports and recommendations are publicly available[150]. The outcomes of the deliberations of the EU Fisheries Commission are also publicly available via their communications and regulations.

Management plan under the Mediterranean regulation 1967/2006

The basic EC regulation for the fishing activity in the Mediterranean Sea is Council Regulation (EC) No 1967/2006 of 21 December 2006[151] concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, amending Regulation (EEC) No 2847/93 and repealing Regulation (EC) No 1626/94.

The Regulation's aim is to establish an effective management framework, through an appropriate sharing of responsibilities between the Community and the Member States. It also extends to the Mediterranean High Sea the strict protection of certain marine species already afforded by Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, which was previously only applicable to marine waters under Member States' sovereignty.

This regulation introduces for the first time the concept of management plans for Mediterranean fisheries, which was present in the basic CFP regulation since 2002. A reference to those plans can be found in the preamble of the regulation, both at community level and national level:

> "*In view of the specific characteristics of many Mediterranean fisheries, which are restricted to certain geographical sub-zones, and taking into account the tradition of applying effort management system at sub-regional level, it is appropriate to provide for the establishment of Community and national management plans, combining in particular effort management with specific technical measures.*"

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[147] https://ec.europa.eu/info/sites/info/files/strategic-plan-2016-2020-dg-mare_march2016_en.pdf
[148] https://www.efca.europa.eu/en
[149] https://ec.europa.eu/fisheries/cfp/control/technologies_en
[150] https://stecf.jrc.ec.europa.eu/reports/medbs
[151] https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32006R1967

It also introduces a procedure to deal with new fishing protected areas:

> "*By Decision 98/392/EC2 the Council has concluded the United Nations Convention on the Law of the Sea, which contains principles and rules relating to the conservation and management of the living resources of the high seas. In accordance with the rules of that Convention, the Community endeavours to coordinate the management and conservation of living aquatic resources with other coastal States.*"

Chapter VII of Regulation 1967/2006 includes provisions for Management Plans.

Article 18 refers to Community-level management plans that should be deployed to manage specific Mediterranean fisheries, in particular, in areas totally or partially beyond the territorial waters of Member States. Until now, there have not been any such plans at Community level.

Management plans may include measures which go beyond the provisions of this Regulation for the purpose of: increasing the selectivity of fishing gear; reducing discards and limiting the fishing effort. The measures to be included in the management plans had to be proportionate to the objectives, the targets and the expected time frame.

Landing obligation

The CFP regulation (EU) No 1380/2013[152] aims to progressively eliminate discards in all Union fisheries through the introduction of a landing obligation. Article 15(6) empowers the Commission to adopt discard plans by means of a delegated act for a period of no more than three years on the basis of joint recommendations developed by Member States in consultation with the relevant Advisory Councils. In accordance with the joint recommendation provided by the Mediterranean Advisory Council (MEDAC), the discard plan should cover all catches of species which are subject to minimum sizes as defined in Annex III to Regulation (EC) No 1967/2006.

This amount is above the average levels of discarding and with the de minimis derogation in place, there has been very limited impact from the landings obligation to date.

GFCM

The fishery advisory body in the Mediterranean is the General Fisheries Commission for the Mediterranean and Black Sea (hereafter GFCM). GFCM is a regional fisheries management organization (RFMO) established under the provisions of Article XIV of the FAO Constitution. The GFCM was established as a Council in 1952 and became a Commission with greater powers in 1997[153].

The main objective of the GFCM is to promote the development, conservation, rational management and best utilization of living marine resources as well as the sustainable development of aquaculture in the Mediterranean, the Black Sea and connecting waters (GFCM area of application).

The GFCM is currently composed of 23 member countries, including Italy, (22 member countries and the European Union) and 5 cooperating non contracting parties (Bosnia and Herzegovina · Georgia · Jordan · Republic of Moldova · Ukraine) who contribute to its autonomous budget to finance its functioning. Membership is open to Mediterranean coastal States and regional economic organizations as well as to United Nations member States whose vessels engage in fishing in its area of application.

The GFCM implements its policy and activities through its Secretariat, based at its headquarters in Rome, Italy. The Commission holds its regular sessions annually and operates during the intersession by means of its committees:

- Scientific Advisory Committee (SAC),
- Committee on Aquaculture (CAQ),
- Compliance Committee (CoC),
- Committee of Administration and Finance (CAF) and their subsidiary bodies, including the ad hoc Working

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[152] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02013R1380-20190814

[153] http://www.fao.org/gfcm/about/legal-framework/en/

Group for the Black Sea (WGBS),

- GFCM Bureau steers strategic orientations to the Commission and the Secretariat.

The Commission has the authority to adopt binding recommendations for fisheries conservation and management in its area of application and plays a critical role in fisheries governance in the region. In particular, its measures can relate to the regulation of fishing methods, fishing gear and minimum landing size, the establishment of open and closed fishing seasons and areas, and fishing effort control. GFCM Resolution GFCM/37/2013/2 established guidelines on the management of fishing capacity in the GFCM area to be followed by contracting parties. The GFCM is one of the few RFMOs worldwide entitled to adopt spatial management measures that regulate or restrict human activities in the high seas, e.g. by introducing closures or prohibiting the use of certain gears.

In cooperation with other RFMOs, the GFCM coordinates efforts by governments to effectively manage fisheries at the regional level following the 1995 FAO Code of Conduct for Responsible Fisheries (CCRF). Moreover, it closely cooperates with other international organizations in matters of mutual interest and it benefits from the support of cooperation projects and programmes at the regional and subregional level in order to enhance scientific cooperation and capacity-building among its members. The GFCM also manages a database of national fisheries legislation of member countries[154].

The GFCM has recently amended its legal framework and the Agreement for its establishment with a view to enhancing its efficiency and thus better responding to current and future challenges in the whole region[155].

The decision-making process can be considered to be well developed through the use of the GFCM – Scientific Advisory Committee (SAC) and its integrated advisory structure comprised of the STECF/MEDAC/European Commission, as well as the different interested parties having the option to participate in the decision-making. Advice to the GFCM can only be given by the SAC with other groups able to advise the SAC, but not the GFCM directly (GFCM Fishery Officer, pers comm.). The outcomes of the technical meetings and scientific councils are considered when taking decisions on fisheries management and made available on the GFCM website.

As with the CFP, National management plans must be consistent with GFCM plans, and can only be more restrictive, not less. The GFCM Compliance Committee meets years to assess how the contracting parties have enforced the agreed plans.

Proposed developments include an on-board observer programme (as set out in the GFCM mid-term strategy 2016-2020), which will be GFCM-wide complementing the EU's existing observer and reporting activities under the EU's Data Collection Framework.

Italian Management

The "*Ministero delle politiche agricole alimentari, forestali e del turismo*"(MIPAAFT) is the Central Government Ministry that is responsible for managing fishing activity in Italy. The "*Direzione generale della pesca marittima e dell'acquacoltura*" (hereater PEMAC) is part of this ministry and is responsible for carrying out this task. In 2019, the name "*Ministero delle politiche agricole alimentari e forestali*" has replaced that of: "*Ministero delle politiche agricole alimentari, forestali e del turismo*"[156] (hereafter MIPAAF or MIPAFFT in case of references to older documents and actions taken by such Ministry).

In Italy no legal or natural persons are allowed to engage in commercial fishing without the preliminary registration in the Fishing Company Register. Crew members are also registered in the Seamen Register and ships are recorded in apposite Vessels Register. This obligatory recording regime came from the Navigation Code, Presidential Decree No. 328/1952 of 1952, Law No. 963/1965 of 1965, and Presidential Decree No. 1639/1968 of 1968.

MIPAAF is the competent authority for Monitoring, Control and Surveillance (hereafter MCS).

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[154] http://nationallegislation.gfcmsecretariat.org/index
[155] http://www.fao.org/gfcm/background/about/en/
[156] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/8

In order to register, professional seamen must satisfy the following statutory requirements:

> a) they must show that fishing is their sole or principal source of income; and

> b) they must demonstrate that they have acquired adequate professional knowledge and skills to conduct commercial fishing operations (training course).

Currently this regime is confirmed by the context of the new Legislative Decree 153/2004[157]. The registers are kept by the local offices of the Ministry of Transport (Comando Generale delle Capitanerie di Porto or Coast Guard Authorities) located along the Italian coastline.

The Italian Coast Guard is delegated responsibility by MIPAAF for fisheries control at sea and on land. It works with the local and national agencies to apply these controls (e.g. with the financial ministry and police to progress prosecutions). On MCS, the Coastguard works with EFCA, and other control authorities to implement joint deployment plans such as those for specific fisheries (e.g. Bluefin tuna) or more generally (Mediterranean). It operates the National Fishery Control Centre (Centro Controllo Nazionale Pesca - CCNP); in Rome and 15 regional offices, each with their own assets for aerial, sea and land-based inspections. For fisheries in GSA 16, the Italian Coastguard carries out aerial surveillance, sea-based inspections and port inspections with resources targeted using a risk analysis approach. Statistics on inspections and infringement are not available for the present UoA but only for the whole Italian fleet (see Ecomafie Report 2018 - https://www.legambiente.it/rapporto-ecomafia/). In the process of organizing interviews with stakeholders during the pre-assessment process, representatives of MIPAAF or the Coast Guard did not make themselves available for a meeting.

The Italian Government regularly convenes the sector to inform them of the resolutions and changes that affect or may affect the fishery, and they work hand in hand to find the best solution. This also means that the Government has first-hand knowledge of the sector's issues and concerns.

The fisheries sector participates in the Mediterranean Advisory Council (MEDAC[158]). The MEDAC is made up of European and national organizations representing the fisheries sector (including the industrial fleet, small-scale fisheries, the processing sector and trade unions) and other interest groups (such as environmental organizations, consumer groups and sports/recreational fishery associations) which operate in the Mediterranean area in the framework of the CFP. During the site visits, stakeholders of MEDAC confirmed that they had no formal Opinions relating to this fishery or UoA.

The role of MEDAC includes the preparation of opinions on fisheries management and socio-economic aspects in support of the fisheries sector in the Mediterranean, to be submitted to the Member States and the European institutions in order to facilitate the achievement of the objectives of the CFP; MEDAC also proposes technical solutions and suggestions, such as joint recommendations (ex. Art. 18 Reg.1380 / 2013) at the request of the Member States. MEDAC consists of an executive committee and a number of thematic working groups (including Management Plans and GFCM issues) and regional focus groups[159], (including the Strait of Sicily Focus Group, GSA 16, where the Mazara del Vallo vessels fishing in the Aegean Sea operate from).

The Italian fishery sector itself is organized within co-operatives, many of which are also Producer Organisations or POs (an EU-recognized marketing body that often also acts as a representative of its members). Federpesca[160] and Federcoopesca[161] are umbrella bodies that represent these numerous sector organisations at a national level and are members of MEDAC.

The Italian ministerial decree n. 26510 (2018) adopts new management plans for several stocks and areas[162], including one for the stocks in GSA 16 (Sicily Strait) that include *A. foliacea* vessels/fishing operations. The plan does not specify

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[157] http://extwprlegs1.fao.org/docs/pdf/ita44708.pdf

[158] http://en.med-ac.eu/index.php

[159] http://en.med-ac.eu/gruppi.php

[160] http://www.federpesca.it

[161] http://www.federcoopesca.it

[162] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/13693

a minimum landing size for red shrimp, but included the objective to reduce fishing effort though reduction of fishing days in 2019 (reduce 6% from the 2015-17 average) and 2020 (reduce 5% from the 2015-17 average). Harvest control rules were also potentially predicted for the 2021-2023.

Cooperation in Fisheries Management

The governance of the management plan mentioned above will be assisted through the definition of a functional structure in which the roles and responsibilities relating to management, supervision and monitoring activities relating to the execution of the Plan will be defined. Governance will be inspired by the most recent approaches in terms of co-management involvement and responsive management (Sampedro et al. 2017; ECOFISHMAN project) with the broad involvement of stakeholders, in the management, control and monitoring phases. At the same time as the adoption of the decree approving the Plan or subsequently, the implementing body of the Plan will be appointed (which may take the form of a Consortium and may be made up of representatives of the main users of the Plan, e.g. trade associations and / or OPs), which is responsible for coordination, management and administration functions. The implementing body will mediate the relations between the central administration (MiPAAF) and the recipients of the Plan, namely the fishermen, who will have to implement the measures and, to a certain extent, also be vigilant on the effective application of the same. In fact, fishermen will be required to collaborate through the carrying out supervisory actions (eg "sentinels of the sea"), with the Coast Guard, which is task of carrying out checks on the area so that the measures provided for in the Plan are respected. The effectiveness of the governance of the Plan will be corroborated by the periodic performance of consultations with the representatives of all interested parties (stakeholders), having, as the only one objective, the achievement of the general and specific objectives (targets) defined by the Plan itself. Currently the consultation plan includes an initial consultation, an intermediate consultation (18 months after Plan adoption), a consultation geared towards monitoring in 2021 and a final one in 2024.

Fishery Specific Management

The GFCM has recently adopted management measures for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Levant Sea (geographical subareas 24-27), the Ionian Sea (geographical subareas 19-21) and the Strait of Sicily (geographical subareas 12-16). The GFCM has also adopted in 2018 two multiannual management plans for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Ionian Sea (GFCM/42/2018/4) and the Levant Sea (GFCM/42/2018/3)[163]. However, no measures or plans have been adopted for shrimp caught in the Aegean Sea (GSA 22).

No management plan is available for the vessels operating in and the stock in the Aegean Sea. However, there are a number of management measure in the area (mainly EC regulation 1967/2006) that include:

- A limitation of the number of fishing vessel licenses,
- A reduction in fishing days required by Executive Decree No 26510 of 28 December 2018[164] (which appears to have decreased the fishing effort to some degree, refer to P1 background section),
- A minimum 40 mm (stretched) square meshes or a cod end with 50 mm (stretched) diamond meshes, as well as a ban prohibiting the use of towed dredges and trawl nets at depths beyond 1000 m[165]. The mesh size used in appears to be of 50 mm (Fabio Fiorentino pers. comm.) and there is no minimum landing size for *A. foliacea*.
- The recording of catches/landings as part of DCRF requirements (although we note that the recording of catches/landings from Italian vessels fishing in GSA 22-23 is aggregated into those of GSA 16).
- VMS/AIS active on board.
- Vessels working in GSA 22-23 are not allowed inside 6 nm from the Greeks coast and 12 nm from the Turkish coast.

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[163] http://www.fao.org/gfcm/decisions/ar/

[164] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/13693

[165] https://gfcm.sharepoint.com/CoC/Decisions%20Texts/REC.CM_GFCM_29_2005_1-e.pdf?originalPath=aHR0cHM6Ly9nZmNtLnNoYXJlcG9pbnQuY29tL2NpOi9nL0NvQy9FVjBBBcG1qUzh6NUNqU2J5dnNtU0c0SUJ1cDdGGbjJMTU5PcmNfLVk5S0t3ZVpBP3J0aW1lPXBWBWeW52ZkdIMkVn

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7.6.1.1 P3 References

Consolidated text: Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC	https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02013R1380-20190814
Council Regulation (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea, amending Regulation (EEC) No 2847/93 and repealing Regulation (EC) No 1626/94	https://eur-lex.europa.eu/legal-content/en/ALL/?uri=CELEX%3A32006R1967
DLGS. 2004. Decreto Legislativo 26 maggio 2004, n. 153 "Attuazione della legge 7 marzo 2003, n. 38, in materia di pesca marittima"	http://extwprlegs1.fao.org/docs/pdf/ita44708.pdf
EC. 2014. Reform of the common fisheries policy. European Commission	https://ec.europa.eu/fisheries/reform_en
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Federpesca. 2020. Chi siamo. Federpesca	http://www.federpesca.it/
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GFCM. 2019. Compendium of GFCM decisions. General Fisheries Commission for the Mediterranean.	https://gfcm.sharepoint.com/CoC/_layouts/15/guestaccess.aspx?docid=093ea3a39fe1645a5b5146124ca291a89&authkey=ASzLducZ3qcB9XhOZhcumvs
GFCM. 2020. Basic Text. General Fisheries Commission for the Mediterranean	http://www.fao.org/gfcm/about/legal-framework/en/
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GFCM. 2020. Scientific Advisory Committee on Fisheries. General Fisheries Commission for the Mediterranean	http://www.fao.org/gfcm/about/structure/sac/en/
Guardia Costiera. 2020. Common Fisheries Policy. Capitanerie di Porto - Guardia Costiera	https://www.guardiacostiera.gov.it/en/Pages/common-fisheries-policy.aspx
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MiPAAF. 2019. D.M. n. 13128 del 30 dicembre 2019 recante "Disposizioni in materia di interruzione temporanea delle attività di pesca esercitate mediante l'utilizzo di attrezzi trainanti reti a strascico a divergenti (OTB), reti gemelle a divergenti (OTT) e/o sfogliare-rapidi (TBB)2 - Annualità 2020 e misure di gestione nelle GSA 9, 10 e 11". Ministero delle politiche agricole alimentari e forestali.	https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/14858
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Proposal for a COUNCIL DECISION concerning the conclusion, on behalf of the European Union, of the amended Agreement for the establishment of the General Fisheries Commission for the Mediterranean /* COM/2014/0580 final - 2014/0274 (NLE) */	https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52014PC0580

7.6.2 Principle 3 Performance Indicator scores and rationales
PI 3.1.1 – Legal and/or customary framework

PI 3.1.1	The management system exists within an appropriate legal and/or customary framework which ensures that it: - Is capable of delivering sustainability in the UoA(s); - Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and - Incorporates an appropriate dispute resolution framework		
Scoring Issue	SG 60	SG 80	SG 100
	Compatibility of laws or standards with effective management		
a Guide post	There is an effective national legal system **and a framework for cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and **organised and effective cooperation** with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and **binding procedures governing cooperation with other parties** which delivers management outcomes consistent with MSC Principles 1 and 2.
Met?	Yes	Yes	Yes

Rationale

Italy has an effective national legal system and binding procedures listed within comprehensive suite of fisheries legislation that is updated to implement commitments under the EU's CFP and the under the GFCM.
A summary of this legislation is available at:
http://nationallegislation.gfcmsecretariat.org/index.php?title=Italy

This stock would appear to be a single jurisdiction in that it occurs in and is fished in the Aegean Sea. However, the fact that Italian vessels from GSA 16 fish outside of Italy in Greek waters of GSA 22 and 23 under effective Italian legislation, makes the determination of jurisdictional category complex.

For a UoA not subject to international cooperation for management of the stock this means:
a. The existence of national laws, agreements and policies governing the actions of all the authorities and actors involved in managing the UoA, and
b. That these laws, agreements and/or policies provide a framework for cooperation between national entities (e.g., between regional and national management, state and federal management, indigenous and other groups) on national management issues, as appropriate for the context, size, scale or intensity of the UoA.

In relation to a: Membership of the EU requires co-operation with other parties to deliver such management outcomes under the Common Fisheries Policy[166]. The fishery is managed within the context of the CFP and the Italian national system for fisheries management. At regional level, management of the fishery is based on multi stakeholder input from the Regional Advisory Bodies (here MEDAC). Scientific advice and input on various aspects of fisheries management and conservation is provided by the European Commission's Scientific, Technical and Economic Committee for Fisheries (STECF). The GFCM has the authority to adopt binding recommendations for

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[166] https://www.guardiacostiera.gov.it/en/Pages/common-fisheries-policy.aspx

PI 3.1.1	The management system exists within an appropriate legal and/or customary framework which ensures that it: - Is capable of delivering sustainability in the UoA(s); - Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and - Incorporates an appropriate dispute resolution framework

fisheries conservation and management in its area of application and plays a critical role in fisheries governance in the region. In particular, its measures can relate to the regulation of fishing methods, fishing gear and minimum landing size, the establishment of open and closed fishing seasons and areas, and fishing effort control.

In relation to b: Membership of the GFCM among Mediterranean countries also has binding procedures governing co-operation with other parties[167]. General Agreement on Establishment of the GFCM: "Further recognizing that, under international law, States are required to cooperate in the conservation and management of living marine resources and the protection of their ecosystems". Furthermore, recalling the Agreement for the Implementation of the Provisions of the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks of 4 December 1995, the Agreement to promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas of 24 November 1993, as well as other relevant international instruments concerning the conservation and management of living marine resources. There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2. **SG 60, 80 and 100 may be met.**

	Resolution of disputes			
b	Guide post	The management system incorporates or is subject by law to a **mechanism** for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes which is **considered to be effective** in dealing with most issues and that is appropriate to the context of the UoA.	The management system incorporates or is subject by law to a **transparent mechanism** for the resolution of legal disputes that is appropriate to the context of the fishery and has been **tested and proven to be effective**.
	Met?	Yes	Yes	No

Rationale

Disputes in the fishery may be settled at two levels, the EU level and the national level in Italy. The Court of Justice of the European Union (CJEU)[168] interprets EU law to make sure it is applied in the same way in all EU countries, and settles legal disputes between national governments and EU institutions. Common cases dealt with the CJEU include appropriate national interpretation of EU Law, national infringements with EU law, annulling EU legal acts that are in violation of other acts and treaties, ensuring the EU takes action, and sanctioning EU institutions in case of harm resulting from action or inaction. It can also, in certain circumstances, be used by individuals, companies or organisations to take action against an EU institution. If a company or an individual has suffered damage as a result of action or inaction by an EU institution or its staff, action can be taken in the Court, in one of two ways: i) indirectly through national courts (which may decide to refer the case to the Court of Justice); or ii) directly before the General

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[167] http://www.fao.org/gfcm/about/en/
[168] https://europa.eu/european-union/about-eu/institutions-bodies/court-justice_en

PI 3.1.1	The management system exists within an appropriate legal and/or customary framework which ensures that it: - Is capable of delivering sustainability in the UoA(s); - Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and - Incorporates an appropriate dispute resolution framework

Court (if a decision by an EU institution has affected the individual, company or organisation directly and individually).

At the National level, the Italian legal system provides recourse for the resolution of disputes resulting from the management system. This can be applied at a local (Regional) and national level through the court system[169].

At the wider Mediterranean level, an amendment of the GFCM Agreement[170] was launched in 2013 following a performance review finalised in 2011, which concluded that the Agreement should be amended to clarify the objectives and functions of the GFCM, and strengthen its efficiency, which included the establishment of a well-defined dispute settlement mechanism in case disputes arise between Contracting Parties. These were detailed in:
Article 19: Settlement of disputes on the interpretation and application of the Agreement
1. In the event of a dispute between two or more of Contracting Parties concerning the interpretation or application of this Agreement, the Parties concerned shall consult among each other with a view to seeking solutions by negotiation, mediation, inquiry or any other peaceful means of their own choice.
2. If the parties concerned cannot reach agreement in accordance with paragraph 19.1, they may jointly refer the matter to a committee composed of one representative appointed by each of the party of the dispute, and in addition the Chairperson of the Commission. The findings by such committee, while not binding in character, shall constitute the basis for renewed consideration by the Contracting Parties concerned of the matter out of which disagreement arose.
3. Any dispute concerning the interpretation or application of this Agreement not resolved under paragraphs 19.1 and 19.2 may, with the consent in each case of all parties to the dispute, be referred for settlement to arbitration. The results of the arbitration procedure shall be binding upon the parties.
4. In cases where the dispute is referred to arbitration, the arbitral tribunal shall be constituted as provided in the Annex to this Agreement. The Annex forms an integral part of this Agreement.

The Contracting Parties to the GFCM endorsed the "Amended Agreement for the establishment of the General Fisheries Commission for the Mediterranean" at the GFCM 38 Annual Session on 19-24 May 2014[171].

Accordingly, the management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the UoA. **SG 60 and 80 would be met.** However, to date there is no evidence of this dispute resolution system being tested and proven to be effective. So SG100 may not be met.

c		**Respect for rights**		
	Guide post	The management system has a mechanism to **generally respect** the legal rights created explicitly or established by custom of people dependent on fishing	The management system has a mechanism to **observe** the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a	The management system has a mechanism to **formally commit** to the legal rights created explicitly or established by custom of people dependent on fishing

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[169] https://www.oecd.org/tax/beps/making-dispute-resolution-more-effective-map-peer-review-report-italy-stage-2-08a4369e-en.htm
[170] http://www.fao.org/3/a-i5450e.pdf
[171] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52014PC0580

PI 3.1.1	The management system exists within an appropriate legal and/or customary framework which ensures that it: - Is capable of delivering sustainability in the UoA(s); - Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and - Incorporates an appropriate dispute resolution framework		
		for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	manner consistent with the objectives of MSC Principles 1 and 2.	for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	Yes	Yes	No

Rationale

Within the EU, member states are obliged, according to the 2013 CFP[172], to include social and economic dimensions in their criteria for allocation of quota rights, among them the contribution to the local economy and historic catch levels (Art. 17). Protection of the interests of coastal communities dependent on fisheries is also one of the rationales for the principle of relative stability in fishing rights between the member states (Recital (35)). Among the objectives of the CFP (which are not legally binding, but an aid to interpretation) is to foster job creation and economic development in coastal areas (Recital (12)) and to contribute to a fair standard of living for those who depend on fishing activities, bearing in mind coastal fisheries and socio-economic aspects (Art. 2 f)). Marine biological resources in the outermost parts of the Union shall be secured special protection due their importance to the local economy, and certain types of fishing activities shall be limited to fishing vessels registered in the ports of those territories (Recital (21)).

At national level in Italy, there are a number of mechanisms to support the interests of smaller fishing vessels and coastal communities, including so-called Fishery Local Action Groups (FLAGs),[173] of which there is a number in Sicily, which design and implement a local development strategy to address economic, social and/or environmental needs. Based on their strategies, the FLAGs select and provide funding to local projects that contribute to local development in their areas, involving thousands of local stakeholders. The main objective of these FLAG is to promote fisheries, environmentally sustainable aquaculture and work to increase employment and territorial cohesion, promote the marketing and processing of fisheries and aquaculture products, promote the tourist appeal of the area and preserve cultural heritage.

Hence, the management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2. **SG 60 is met.** The system has a mechanism to observe such rights, so **SG 80 is also met.** It has not been documented that the mechanisms formally commit to these rights at national level in Italy. SG 100 is not met.

References

Please refer to the references and footnotes provided here and throughout the P3 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

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[172] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32013R1380
[173] https://webgate.ec.europa.eu/fpfis/cms/farnet2/on-the-ground/flag-factsheets-list_en

PI 3.1.1	The management system exists within an appropriate legal and/or customary framework which ensures that it: - Is capable of delivering sustainability in the UoA(s); - Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and - Incorporates an appropriate dispute resolution framework
Draft scoring range	≥80
Information gap indicator	Information sufficient to score PI

PI 3.1.2 – Consultation, roles and responsibilities

PI 3.1.2	The management system has effective consultation processes that are open to interested and affected parties The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
Scoring Issue	SG 60	SG 80	SG 100
a	**Roles and responsibilities**		
	Guide post	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **generally understood**.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for key areas** of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are **explicitly defined and well understood for all areas** of responsibility and interaction.
	Met?	Yes	Yes	No

Rationale

The P3 background section describes the various management, industry and scientific organisations involved in fisheries management. GFCM co-ordinates regional management and scientific data collection to inform fishery management[174].

The EC through the CFP sets the framework for fisheries management, which is then implemented by the Italian ministry (implements the CFP and GFCM binding recommendations).

MEDAC is a multi-stakeholder group that feeds advice into these complementary processes. Federpesca and Federcoopesca are industry bodies representing the Italian catching sector as members of MEDAC[175].

The functions and relationships between these management, industry and advisory groups are, therefore explicitly defined and understood by key areas of responsibility. **SG 60 and 80 would be met.**

However, staff from the ministry did not make themselves available for interviews and we are uncertain as to whether functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction. Therefore SG 100 is not met.

b	**Consultation processes**		
	Guide post	The management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that **regularly seek and accept** relevant information, including local knowledge. The management system demonstrates consideration of the information and **explains how it is used or not used**.
	Met?	Yes	No	No

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[174] http://www.fao.org/gfcm/about/en/
[175] http://en.med-ac.eu/membri.php

PI 3.1.2	The management system has effective consultation processes that are open to interested and affected parties The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties

Rationale

MEDAC is the main regular consultation process that enables local knowledge from the sector to be considered in development of the management system. However, it is not always explained by the EC how that information is used or not used.

Non-EU operators that may fish alongside the Italian bottom trawlers in deep waters of the Aegean Sea are not part of the formal MEDAC consultation process although some of these issues are considered in the GFCM Compliance Committee and communicated to external non-EU nations through that forum. We note that some of these activities appear to be seen as IUU (illegal) activities in coastal waters of EU member countries (see for example *DG MARE reply- MEDAC letter Egyptian fleet in the Strait of Sicily[176]*). It is not clear if this is true also for offshore waters as we have not been able to interview Coast Guard of MIPAAF representatives to confirm.

At the national level if we consider the Italian ministerial decree n. 26510 (2018) that adopted new management plans for several stocks and areas[177], including one for the stocks in GSA 16 (Sicily Strait) that include *A. foliacea* vessels/fishing operation, instances of consultations are explained.

The governance of the management plan will be assisted through the definition of a functional structure in which the roles and responsibilities relating to management, supervision and monitoring activities relating to the execution of the Plan will be defined. Governance will be inspired by the most recent approaches in terms of co-management involvement and responsive management (Sampedro et al. 2017; ECOFISHMAN project) with the broad involvement of stakeholders, in the management, control and monitoring phases. At the same time as the adoption of the decree approving the Plan or subsequently, the implementing body of the Plan will be appointed (which may take the form of a Consortium and may be made up of representatives of the main users of the Plan, e.g. trade associations and / or POs), which is responsible for coordination, management and administration functions. The implementing body will mediate the relations between the central administration (MiPAAF) and the recipients of the Plan, namely the fishermen, who will have to implement the measures and, to a certain extent, also be vigilant on the effective application of the same. In fact, fishermen will be required to collaborate through the carrying out supervisory actions (eg "sentinels of the sea"), with the Coast Guard, which is task of carrying out checks on the area so that the measures provided for in the Plan are respected. The effectiveness of the governance of the Plan will be corroborated by the periodic performance of consultations with the representatives of all interested parties (stakeholders), having, as the only one objective, the achievement of the general and specific objectives (targets) defined by the Plan itself. Currently the consultation plan includes an initial consultation, an intermediate consultation (18 months after Plan adoption), a consultation geared towards monitoring in 2021 and a final one in 2024.

Hence, the management system includes consultation processes that **obtain relevant information** from the main affected parties, including local knowledge, to inform the management system. SG60 is met. However, due to uncertainties about the consultation agreements and mechanisms surrounding non-EU operators in the Aegean Sea SG 80 is not met.

	Participation			
c	Guide post		The consultation process **provides opportunity** for all	The consultation process provides **opportunity and encouragement** for all

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[176] http://en.med-ac.eu/pareri_lettere.php?page=2
[177] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/13693

| PI 3.1.2 | The management system has effective consultation processes that are open to interested and affected parties |
| | The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties |

			interested and affected parties to be involved.	interested and affected parties to be involved, and **facilitates** their effective engagement.
	Met?		Yes	No

Rationale

The reform of the CFP[178] placed a greater emphasis on regionalization and sea basin-level management, enhancing the role of the MEDAC at regional level and developing Fisheries Local Action Group (hereafter FLAG) at local level (in Sicily)[179], along with the development of the Better Regulation Guidelines[180] ensures more effective consultation and is a recent improvement in performance. In particular MEDAC is involved at regional level for the consultation on discard plan for various species. Therefore, the MEDAC consultation process provides opportunity for all interested and affected parties (NGOs are also part of MEDAC) to be involved. Furthermore, the General Fisheries Commission for the Mediterranean is composed of 23 contracting parties including Italy, Greece, Egypt and Turkey that participate in GFCM activities, attend its sessions and contribute financially to its operations. **SG80 is met**.

However, it has not been documented that the authorities actively encourage all stakeholders, including environmental NGOs, to be involved and facilitate their effective engagement. SG 100 is not met.

References

Please refer to the references and footnotes provided here and throughout the P3 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	Information not sufficient to score PI: • *Information about the consultation process involving non-EU operators in the Aegean Sea is required*

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[178] https://ec.europa.eu/fisheries/reform_en

[179] https://webgate.ec.europa.eu/fpfis/cms/farnet2/on-the-ground/flag-factsheets-list_en

[180] https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en

PI 3.1.3 – Long term objectives

PI 3.1.3	The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Fisheries Standard, and incorporates the precautionary approach		
Scoring Issue	SG 60	SG 80	SG 100

			SG 60	SG 80	SG 100
	Objectives				
a	Guide post		Long-term objectives to guide decision-making, consistent with the MSC Fisheries Standard and the precautionary approach, are **implicit** within management policy.	**Clear** long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach are **explicit** within management policy.	**Clear** long-term objectives that guide decision-making, consistent with MSC Fisheries Standard and the precautionary approach, are **explicit** within **and required by** management policy.
	Met?		Yes	Yes	Yes

Rationale

The CFP Basic Document requires that member states, in accordance with international treaties such as the 1982 Law of the Sea Convention, the 1993 FAO Compliance Agreement and the 1995 Fish Stocks Agreement, apply the precautionary approach to fisheries management, and aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield (Recital (6), Art. 2)[181]. It is specifically mentioned that when targets relating to the maximum sustainable yield cannot be determined, multiannual (management) plans shall provide for measures based on the precautionary approach, ensuring at least a comparable level of protection for the relevant fish stocks (Art. 9). The maximum sustainable yield exploitation rate shall be achieved by 2015 where possible and, on a progressive, incremental basis at the latest by 2020 for all stocks (Art. 2).

CFP and GFCM have clear long-term objectives that explicitly require the precautionary approach to be followed.
GFCM General Agreement[182] Article 5:
In giving effect to the objective of this Agreement, the Commission shall:
a) adopt recommendations on conservation and management measures aimed at ensuring the long-term sustainability of fishing activities, in order to preserve the marine living resources, the economic and social viability of fisheries and aquaculture; in adopting such recommendations, the Commission shall give particular attention to measures to prevent overfishing and minimize discards. The Commission shall also pay particular attention to the potential impacts on small-scale fisheries and local communities;
c) apply the precautionary approach in accordance with the 1995 Agreement and the Code of Conduct for Responsible Fisheries. Therefore SG 60, 80 and 100 would be met.

References

Please refer to the references and footnotes provided here and throughout the P3 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	≥80

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[181] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02013R1380-20190814
[182] http://www.fao.org/3/a-i5450e.pdf

PI 3.1.3	The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Fisheries Standard, and incorporates the precautionary approach
Information gap indicator	Information sufficient to score PI

PI 3.2.1 – Fishery-specific objectives

PI 3.2.1	The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2		
Scoring Issue	SG 60	SG 80	SG 100
	Objectives		
a Guide post	Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **implicit** within the fishery-specific management system.	**Short and long-term objectives**, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery-specific management system.	**Well defined and measurable short and long-term objectives**, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are **explicit** within the fishery-specific management system.
Met?	No		

Rationale

The GFCM has recently adopted management measures for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Levant Sea (geographical subareas 24-27), the Ionian Sea (geographical subareas 19-21) and the Strait of Sicily (geographical subareas 12-16). The GFCM has also adopted in 2018 two multiannual management plans for sustainable trawl fisheries targeting giant red shrimp and blue and red shrimp in the Ionian Sea (GFCM/42/2018/4) and the Levant Sea (GFCM/42/2018/3)[183]. However, no GFCM plans have been adopted for shrimp caught in the Aegean Sea (GSA 22).

The Italian ministerial decree n. 26510 (2018) adopts new management plans for several stocks and areas[184], including one for the stocks in GSA 16 (Sicily Strait) that include *A. foliacea* vessels/fishing operations. The plan does not specify a minimum landing size for red shrimp but included the objective to reduce fishing effort though reduction of fishing days in 2019 (reduce 6% from the 2015-17 average) and 2020 (reduce 5% from the 2015-17 average). Harvest control rules were also potentially predicted for the 2021-2023.

Also, according to the Italian Ministerial Decree n.13128 of 30/12/2019[185], a fishing ban for trawling fisheries is implemented in each Italian GSA. Such temporal closure is applicable also to the Italian vessels operating in the Aegean Sea but that are registered in GSA 16, where a closure of 30 days is implemented in accordance with regional authority.

According to the above, it is not clear if objectives can be said to be broadly consistent with achieving the outcomes expressed by MSC's Principles 1 in an implicit manner. This is partially highlighted by the gaps identified in P1 and P2. **SG60 may not be met**.

References

Please refer to the references and footnotes provided here and throughout the P3 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	<60

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[183] http://www.fao.org/gfcm/decisions/ar/
[184] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/13693
[185] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/14858

PI 3.2.1	The fishery-specific management system has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2
Information gap indicator	Information insufficient to score PI: Fishery Specific Management objectives that affect the operations in GSA 22 and 23

PI 3.2.2 – Decision-making processes

PI 3.2.2	The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery		
Scoring Issue	SG 60	SG 80	SG 100

a	**Decision-making processes**			
	Guide post	There are **some** decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are **established** decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Yes	No	

Rationale

The GFCM develops binding recommendations that are required to be implemented by the GFCM contracting parties. Those recommendations are drafted based on advice from the Scientific Advisory Council (SAC)[186], which is the only body able to provide advice directly to the GFCM. Submissions from other parties (e.g. European Union) can also be taken into account.

The GFCM checks compliance by those parties required to implement the binding recommendations and reports on the extent to which this has been achieved. In particular GFCM decision (RES-GFCM/33/2009/1)[187] on the management of demersal fisheries in the GFCM area, foresees reduction of a minimum of 10 % of bottom trawling fishing effort that shall be applied in all GFCM areas.

Italy (but not GFCM) developed a management plan for fisheries in GSA 16 which partially affects fishing activities in GSA 22 and 23. This represents somewhat of a formulation of a decision-making processes that result in measures (e.g. fishing effort restrictions) and strategies (data collection, scientific advice, effort restriction, etc.) to achieve some fisheries objectives (effort reduction). **Therefore SG 60 is met.** However, due to the lack of specific fishery objectives for the fishery in question we cannot determine that *there are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives*. SG 80 may not be met.

b	**Responsiveness of decision-making processes**			
	Guide post	Decision-making processes respond to **serious issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to **serious and other important issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to **all issues** identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	No		

Rationale

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[186] http://www.fao.org/gfcm/about/structure/sac/en/

[187] http://www.fao.org/gfcm/decisions/en/

PI 3.2.2	The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery

It is not evident to date that either MIPAAF and GFCM have identified or responded to serious issues specific to this fishery prosecuted in the Aegean Sea by Italian (and likely Egyptian and Turkish) vessels. There are a number of P1 and P2 issues that may be only addressed though targeted measures in the geographical area they occur in, as opposed to being only loosely and indirectly addressed through measures available for *A. foliacea* caught in GSA 16. We note that there is a general and extensive lack of information on the red shrimp activities that occur in GSA 22 and 23. **SG 60 may not be met.**

	Use of precautionary approach			
c	Guide post		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		No	

Rationale

For the same reason described above we cannot determine that decision-making processes use the precautionary approach and are based on best available information. SG 80 may not be met.

	Accountability and transparency of management system and decision-making process			
d	Guide post	Some information on the fishery's performance and management action is generally available on request to stakeholders.	**Information on the fishery's performance and management action is available on request**, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders **provides comprehensive information on the fishery's performance and management actions** and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Yes	Yes	No

Rationale

There is no hindrance to available information being made available to stakeholders as scientific information, management decisions and other aspects of fisheries management are publicly available on the internet. Furthermore, MEDAC consults with its members as so do FLAGs and other platforms that collect and use stakeholder input. Information on the fishery's performance and management action is available on request, but it is not clear if explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity. **SG 60 would be met, but not SG 80.**

e	**Approach to disputes**

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery		
	Guide post	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	Yes	Yes	Yes

Rationale
The assessment team is not aware of the management authority being subject to continuing court challenges or indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery. The management system or fishery would appear to attempt to comply in a timely fashion with judicial decisions arising from any legal challenges. The management authority works proactively to avoid legal disputes through the tight cooperation with user-groups at the regulatory level, ensuring as high legitimacy as possible for regulations and other management decisions. Only the most serious cases go to prosecution by the police and possible transfer to the court system[188]. **SG 60, 80 and 100 would be met.**

References
Please refer to the references and footnotes provided here and throughout the P3 background section.

Overall Performance Indicator (PI) Rationale
Rationale is provided for each Scoring Issue).

Draft scoring range	<60
Information gap indicator	More information sought: Decision making system, processes and outputs relating to the activities of the red shrimp fishery operating in the Aegean Sea.

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[188] https://www.oecd.org/tax/beps/making-dispute-resolution-more-effective-map-peer-review-report-italy-stage-2-08a4369e-en.htm

PI 3.2.3 – Compliance and enforcement

PI 3.2.3	Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with		
Scoring Issue	SG 60	SG 80	SG 100
a MCS implementation			
Guide post	Monitoring, control and surveillance **mechanisms** exist, and are implemented in the fishery and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance **system** has been implemented in the fishery and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A **comprehensive** monitoring, control and surveillance system has been implemented in the fishery and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
Met?	Yes	No	

Rationale

Monitoring, control and surveillance in the fishery is conducted by the EU member states through their national enforcement bodies. The EU Commission conducts controls by dispatching Community inspectors to check on member states´ control activities and to ensure that EU rules are being followed. The European Fisheries Control Agency (EFCA), established in 2005, coordinates the EU member state's fisheries control and inspection activities and provides assistance in the application of the CFP. The Mediterranean is one of the area subject to the Joint Development Plan (JDP) inspection framework of ECFA[189].

The EU system for fisheries control is laid out in the Control Regulation, which entered into force on 1 January 2010[190] [191]. The Regulation applies to all activities covered by the CFP carried out on the territory of member states or in EU waters, and by EU fishing vessels or nationals of a member state (Art. 2). It requires all member states to adopt appropriate measures, allocate adequate financial, human and technical resources and set up all administrative and technical structures necessary for ensuring control, inspection and enforcement of activities under the CFP (Art. 5). The Regulation contains Titles ('sections' above chapter level) on, among other things, access to waters and resources (Title III), control of fisheries (Title IV), control of marketing (Title V), surveillance (Title VI), inspections and proceedings (Title VII), enforcement (Title VIII) and common control programmes (Title IX). Among the substantial requirements are that member states operate a vessel monitoring system (VMS) and an automatic identification system (AIS), to be generally applied by vessels above 12 and 15 meters, respectively (Art. 9, 10), and that they make the use of fishing logbooks mandatory for all vessels above 10 meters (Art. 14) and electronic logbook for all vessels above 12 meters (Art. 15). The Regulation also introduces an obligation of member states to employ real-time closure of fisheries (Art. 51-54). Further, member states are obliged to carry out monitoring of fishing activities by inspection vessels or surveillance aircraft (Art. 71) and physical inspections of fishing vessels (Art. 74-77); in addition to national inspectors, a pool of Community inspectors shall also be set up (Art. 79). Procedures are established for situations where infringements are detected (Art. 82-88), including enhanced follow-up when infringements are serious, such as mis-recording of catches of more than 500 kg or 10 % of what is reported in the logbook (Art. 84). Further, provisions are given for proceedings (Art. 85-88) and sanctions (Art. 90-93).

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[189] https://www.efca.europa.eu/sites/default/files/EFCA%20AYIR_DEF_Digital.pdf
[190] https://ec.europa.eu/fisheries/cfp/control_en
[191] https://www.europarl.europa.eu/factsheets/en/sheet/116/fisheries-control-and-enforcement

PI 3.2.3	Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with

At national level MCS in the Mediterranean is a combination of technical measures geared inspection such as the requirement for Vessel Monitoring Systems (VMS) on vessels over 12m (all UoA vessels) and e-logbooks. This is supported by at sea inspection, aerial surveillance and port inspection.

Control authorities have a reasonable expectation and confidence that MCS measures are effective. The resources available to and used by those authorities have demonstrated an ability to enforce the regulations applying to the fishery.

The Italian Coastguard manages monitoring control and surveillance of Italian vessels[192].

Relevant statistics on sanctions and inspections are not available for the UoA but only for the whole Italian fleets on "*Ecomafie*" report 2018 (https://www.legambiente.it/rapporto-ecomafia). Therefore, it's not possible to demonstrate the efficacy of the MCS mechanism but it is possible just to infer an expectation of efficacy, SG 60 would be met but not 80.

b	**Sanctions**			
	Guide post	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, **are consistently applied** and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and **demonstrably** provide effective deterrence.
	Met?	Yes	No	

Rationale

Sanctions for non-compliances exist and are applied since records exist, at least from an EFCA perspective (refer to page 12 of the 2019 EFCA Year in Review[193], showing a 5-year average of just above 10% suspected infringements/Inspections between 2014 and 2019). **SG 60 is met.** However, we note that the assessment team was unable to speak to Ministry/Coast Guard representatives as these parties did not make themselves available to invitations for interviews. Also, data from the *Ecomafie* report is aggregated for the whole Italian fleets. Accordingly. we cannot determine at this point if sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence. **SG 80 is not met.**

c	**Compliance**			
	Guide post	Fishers are **generally thought** to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	**Some evidence exists** to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a **high degree of confidence** that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Yes	No	

Rationale

PI 3.2.3	Monitoring, control and surveillance mechanisms ensure the management measures in the fishery are enforced and complied with

The statistics on inspection and infringements are not directly available for the present UoA but we have no reason to doubt that fishers would be generally thought to comply with management system rules and regulations for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery. **SG 60 is likely met.** However, due to lack of data highlighted earlier, we cannot determine that some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery. **SG 80 is not met.**

d	**Systematic non-compliance**			
	Guide post		There is no evidence of systematic non-compliance.	
	Met?		No	

Rationale

Due to the lack of specific evidence or information from stakeholders, we cannot determine, at this stage that there is no evidence of systematic non-compliance. **SG80 may not be met.**

References

Please refer to the references and footnotes provided here and throughout the P3 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	More information sought: • Enforcement information specific to the fishery in question as it relates to its operations in GSA 22 and 23

PI 3.2.4 – Monitoring and management performance evaluation

PI 3.2.4	There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system		
Scoring Issue	SG 60	SG 80	SG 100
a	**Evaluation coverage**		
	Guide post	There are mechanisms in place to evaluate **some** parts of the fishery-specific management system.	There are mechanisms in place to evaluate **key** parts of the fishery-specific management system.	There are mechanisms in place to evaluate **all** parts of the fishery-specific management system.
	Met?	Yes	No	

Rationale

The EU CFP is reviewed in connection with the major revisions[194] of its basic regulations every tenth year. In 2009, the Commission analysed the functioning of the CFP based on the Green Paper on the Reform of the Common Fisheries Policy. The Commission concluded that despite progress since the 2002 reform, the objectives to achieve sustainable fisheries in all its dimensions (environmental, economic and social) were not been met, and the Green Paper identified a series of structural shortcomings of the current CFP. The European Parliament and the Council of Ministers supported this conclusion. Numerous contributions from EU citizens, organizations and governments during the public debate between April 2009 and November 2010, as well as specific studies and evaluations, also confirmed the overall assessment in the Green Paper and helped to identify the weaknesses to be addressed through the reform[195]. The proposals resulting from the original evaluation on the reform of the CFP included the implementation of multi-annual management plans, banning discards, restoring fisheries to MSY levels, decentralizing governance, financial assistance for sustainability purposes (resulting in the European maritime and fisheries fund (EMFF)), beneficial measures for small scale fisheries, and a system of transferable fishing concessions. Furthermore, Article 49 of EU Reg. No 1380/2013 details that: 'The Commission shall report to the European Parliament and to the Council on the functioning of the CFP by 31 December 2022.' Further, Article 50 states that: 'The Commission shall report annually to the European Parliament and to the Council on the progress on achieving maximum sustainable yield and on the situation of fish stocks, as early as possible following the adoption of the yearly Council Regulation fixing the fishing opportunities available in Union waters and, in certain non-Union waters, to Union vessels.'

Enforcement is member states is reviewed by the EFCA, which in turn was audited by the Internal Auditing Service (IAS) in September 2018[196]. The scope of the audit engagement was to assess the adequacy of the design and efficiency and effectiveness of the management and control system set up by the EFCA for the planning, budgeting and monitoring of its activities. The IAS concluded that the three audited processes are effective and efficient and did not identify any critical or very important risks that may affect the achievement of the objectives for the processes audited. However, notwithstanding the overall positive conclusion, a limited number of issues were identified, and five recommendations were issues, all rated as 'important'. For each recommendation EFCA drafted a comprehensive action plan that was considered by IAS as adequate to mitigate the risks identified. The recommendations will be addressed by 2020.

In terms of scientific advice, the mechanism in place to evaluate some parts of the fishery-specific management system are the scientific working groups (both in the framework of SAC-GFCM and STECF) evaluating the status of

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[194] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32013R1380
[195] https://ec.europa.eu/fisheries/reform_en
[196] https://ec.europa.eu/info/sites/info/files/ias_aar_2018_final.pdf

PI 3.2.4	There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system

the stocks. **Therefore SG 60 would be met.** However, key parts of the management system such as those needed to set up specific measure for the Aegean Sea activities do not appear to have been evaluated, based on the lack of fishery specific measures. Hence SG80 may not be met.

b	**Internal and/or external review**			
	Guide post	The fishery-specific management system is subject to **occasional internal** review.	The fishery-specific management system is subject to **regular internal** and **occasional external** review.	The fishery-specific management system is subject to **regular internal and external** review.
	Met?	Yes	Yes	No

Rationale

The European Commission reports annually to the European Parliament and to the Council on the status in EU fisheries management. There is also regular internal review within the Commission.

At the Italian level, the Italian ministerial decree n. 26510 (2018) adopted new management plans for several stocks and areas[197], including one for the stocks in GSA 16 (Sicily Strait) that include *A. foliacea* vessels/fishing operations. The plan does not specify a minimum landing size for red shrimp, but included the objective to reduce fishing effort though reduction of fishing days in 2019 (reduce 6% from the 2015-17 average) and 2020 (reduce 5% from the 2015-17 average). Harvest control rules were also potentially predicted for the 2021-2023. Such process would be achieved through internal and likely external review. Hence, we can say that there is some evidence that the fishery-specific management system is subject to regular internal and occasional external review. **SG 60 and 80 may be met.** However, given the lack of a Aegean specific management plan, we do not have additional evidence to determine if the fishery-specific management system is subject to regular internal and external review. SG 100 may not be met.

References

Please refer to the references and footnotes provided here and throughout the P3 background section.

Overall Performance Indicator (PI) Rationale

Rationale is provided for each Scoring Issue.

Draft scoring range	60-79
Information gap indicator	More information sought: • Review mechanisms at the Italian level specific to the fishery in question and its connection to the red shrimp resource in the Aegean.

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[197] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/13693

8 Appendices

8.1 Assessment information

8.1.1 Small-scale fisheries

Table 10. Small-scale fisheries.

Unit of Assessment (UoA)	Percentage of vessels with length <15m	Percentage of fishing activity completed within 12 nautical miles of shore
Current UoA	All the vessels identified in the UoA are above 15 metres in length. These are: Motopesca Twenty One Motopesca Twenty Two Motopesca Sofocle Motopesca Socrate Motopesca Ciclamino The number or length of non-EU vessels fishing in GSA 22 and 23 is unknown.	None likely.

8.2 Evaluation processes and techniques
8.2.1 Site visits

The assessment team organised conference calls as part of the remote "site visits" envisioned for this project to collect information about this fishery and to better frame the pre-assessment. A series of calls took place between September and November 2020. We note that representatives of the Ministry/Coast Guard did not make themselves available for this pre-assessment, and we were not able to speak with fishermen or industry representatives. A meeting with the following stakeholders was held.

Table 11. Itinerary of meetings including names of organisations and individuals consulted remotely.				
Meeting	Date	Meeting	Attendants	Expertise
1	28/09/2020	Consiglio Nazionale delle Ricerche (CNR) – Science Organisation	Fabio Fiorentino	Fishery Researcher (stock assessor)
			Germana Garofalo	Fishery Researcher (stock assessor)
			Vito Romito	Lead Assessor (P2 and P3) – Global Trust Certification (GTC)
			Giuseppe Scarcella	Assessor (P1 and P3) – GTC Contracted Expert
			Ilaria Vielmini	Client – MSC Italy
2	16/11/2021	General Fisheries Commission for the Mediterranean (GFCM) - RFMO	Paolo Carpentieri	Fishery resources monitoring, scientific surveys and bycatch expert
			Elisabetta Morello	Fishery resources officer
			Vito Romito	Lead Assessor (P2 and P3) – Global Trust Certification (GTC)
			Giuseppe Scarcella	Assessor (P1 and P3) – GTC Contracted Expert
			Ilaria Vielmini	Client – MSC Italy
3	16/11/2021	Consiglio Nazionale delle Ricerche (CNR) – Science Organisation	Vita Gancitano	Fishery Researcher (shrimp expert)
			Vito Romito	Lead Assessor (P2 and P3) – Global Trust Certification (GTC)
			Giuseppe Scarcella	Assessor (P1 and P3) – GTC Contracted Expert
			Ilaria Vielmini	Client – MSC Italy
4	17/11/2020	WWF Italy / Mediterranean Advisory Council MEDAC	Alessandro Buzzi	WWF Fisheries Manager / MEDAC vice Chairmen
			Vito Romito	Lead Assessor (P2 and P3) – Global Trust Certification (GTC)

8.2.2 Recommendations for stakeholder participation in full assessment
As well as recommending the same people interviewed during the pre-assessment, the assessment team recommends that the following additional stakeholders be interviewed:

1. Fishermen operating in Greek waters (Italian as well as other non-EU nationalities)
2. Supply chain operators including shrimp buyers and processors spanning between Greece and Italy
3. MIPAAF
4. Coast Guard
5. Federpesca and/or Federcoopesca
6. Other experts/researchers to deal with issues surrounding bycatch and habitat effects of bottom trawl gear

8.3 Risk-Based Framework outputs

8.3.1 Consequence Analysis (CA)

A consequence analysis was conducted was conducted as part of the RBF process for the target stock. The results are shown below.

Table 12. Consequence Analysis (CA) scoring template.

	Scoring element	Consequence subcomponents	Consequence score
Principle 1: Stock status outcome	*Aristeomorpha foliacea*	Population size	60
		Reproductive capacity	
		Age/size/sex structure	
		Geographic range	
Rationale for most vulnerable subcomponent	Population size was considered the most vulnerable subcomponent in accordance with the information provided during the interviews with the scientists and stakeholders.		
Rationale for consequence score	MEDITS surveys which estimate abundance and distribution of target stock is carried out every year since 1994 (**Error! Reference source not found.**). Such data, provide trends showing a stable status in term of size but a decreasing patterns in abundance since 2006, just a couple of years after the start of the exploitation of the Italian fleets in the Aegean. Therefore, changes to the population as a consequence of fishing are detectable.		

8.3.2 Productivity Susceptibility Analysis (PSA)

The following table contains details about the PSA table relating to the Principle 1 stock.

Table 13. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Performance Indicator	1.1.1	
Productivity		
Scoring element (species)	*Aristeomorpha foliacea*	
Attribute	**Rationale**	**Score**
Average age at maturity	Sexual maturity is reached at the end of the second year (https://www.sealifebase.ca/Reproduction/MaturityList.php?ID=25506&GenusName=Aristaeomorpha&SpeciesName=foliacea&fc=395)	**1**
Average maximum age	The average maximum age is approximately 8 years (see: https://www.sealifebase.ca/summary/Aristaeomorpha-foliacea.html).	**1**
Fecundity	The average absolute fecundity of *A. foliacea* is 151 936 oocytes/female (see: https://www.researchgate.net/publication/236610888_Comparative_fecundity_and_oocyte_size_of_Aristaeomorpha_foliacea_and_Aristeus_antennatus_in_the_Greek_Ionian_Sea_E_Mediterranean_Decapoda_Aristeidae)	**1**
Average maximum size Not scored for invertebrates	-	-
Average size at maturity	-	-

Table 13. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Not scored for invertebrates		
Reproductive strategy	The species is a broadcast spawner (https://www.sealifebase.ca/summary/Aristaeomorpha-foliacea.html)	**1**
Trophic level	The trophic level is 3.8 (https://www.sealifebase.ca/summary/Aristaeomorpha-foliacea.html)	**3**
Density dependence Invertebrates only	Compensatory dynamics at low population size are demonstrated or likely (Fabio Fiorentino pers. comm.).	**1**
Susceptibility		
Fishery Only where the scoring element is scored cumulatively	*Bottom trawl*	
Attribute	Rationale	**Score**
Areal Overlap	Taking into account the that the depth distribution of the target stock is up to 750 m and the fishery is mainly occurring at 400-600 m an aereal overlap of more than 30% can be assumed	**3**
Encounterability	Default value	**3**
Selectivity of gear type	Taking into account data available in **Error! Reference source not found.**, individuals smaller than size at maturity (3.7 cm) are regularly caught. This was confirmed also by Vita Gancitano during the site visit.	**2**
Post capture mortality	Default value	**3**
Catch (weight) Only where the scoring element is scored cumulatively	No other fisheries	

							Productivity Scores [1-3]								Susceptibility Scores [1-3]					Cumulative only								
Scoring element	First of each scoring element	Family name	Scientific name	Common name	Species type	Fishery descriptor	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level	Density Dependance	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	Catch (tons)	Weighting	Weighted Total	Weighted PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost	Consequence Score (CA)	Final MSC score (per scoring element)
1	First	Aristidae	Aristeomorpha foliacea	Giant red shrimp	Invertebrate	Bottom trawl	1	1	1			1	3	1	1.33	3	3	2	3	2.33	2.68	1000	1.00	2.68	2.68	79	Med	60-79	60	70

The following tables contain details about the PSA tables that relate to the Principle 2 (non target) species identified in this assessment.

Table 14. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Performance Indicator	2.2.1	
Productivity		
Scoring element (species)	Blackbelly rosefish *Helicolenus dactylopterus*. Evidence collected primarily from Fishbase's life history tool [198]	
Attribute	Rationale	**Score**
Average age at maturity	13.1 years	**2**
Average maximum age	43-57 years	**3**

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[198]
https://www.fishbase.se/popdyn/KeyfactsSummary_1.php?ID=76&GenusName=Helicolenus&SpeciesName=dactylopterus&vStockCode=85&fc=573

Table 14. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Fecundity	between 11,000 and 87,000 eggs, of about 500 µm in diameter[199]	**1**
Average maximum size Not scored for invertebrates	50 cm	**1**
Average size at maturity Not scored for invertebrates	31.6 cm	**1**
Reproductive strategy	The reproductive mode is a zygoparous form of oviparity, intermediate between oviparity and viviparity. Eggs covered with gelatinous material are fertilised in the ovary. Eggs are released into the seabed at various stages of development and larvae assumes a planktonic existence once the gelatinous covering dissolves	**2**
Trophic level	3.5 estimated from diet data.	**3**
Density dependence Invertebrates only	NA	
Susceptibility		
Fishery Only where the scoring element is scored cumulatively	*NA*	
Attribute	**Rationale**	**Score**
Areal Overlap	Based on fishbase information and maps the stock appears to be distributed across the Mediterranean. Considering that the UoA fishing activities take place in the Aegean Sea, and the wider distribution of the stock in the Mediterranean basin, the overlap with the stock is considered to be low (<10% overlap).	**1**
Encounterability	Blackbelly rosefish adults are found in soft bottom areas of the continental shelf and upper slope, usually at depths of 150 - 600 m. *A. foliacea* lives on mud and sandy bottoms where the bottom trawls operate on at around 500-700 m depth (mostly above 600 m in the Aegean). The encounterability or overlap of the gear type with this species is considered high.	**3**
Selectivity of gear type	The mesh size of the bottom trawl is 50 mm, while the common length of blackbelly rosefish adults is 25.0 cm TL male/unsexed, while the average length at maturity is 31.6 cm. We can determine that individuals < size at maturity would be frequently caught in the gear under assessment.	**3**
Post capture mortality	Owing to barotrauma, it is likely that fish caught at such depths would be dead when hauled on the deck of the vessel. The majority would be dead even in the case of release.	**3**
Catch (weight) Only where the scoring element is scored cumulatively	NA	

Table 15. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Performance Indicator	2.2.1
Productivity	

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[199] https://www.cambridge.org/core/journals/journal-of-the-marine-biological-association-of-the-united-kingdom/article/reproductive-indices-and-fecundity-of-helicolenus-dactylopterus-dactylopterus-teleostei-scorpaenidae-in-the-catalan-sea-western-mediterranean/C914F56D1AEA195D13ED379C52ED3E5D

Table 15. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Scoring element (species)	Gulper shark *Centrophorus granulosus*. Evidence collected primarily from Fishbase's life history tool[200]	
Attribute	**Rationale**	**Score**
Average age at maturity	6.1 years	**2**
Average maximum age	28.8 years	**3**
Fecundity	Number of litter recorded, one in Mediterranean females, and possibly 1 or 2 for the species.	**3**
Average maximum size Not scored for invertebrates	145 to 170 cm	**2**
Average size at maturity Not scored for invertebrates	56.4 cm	**2**
Reproductive strategy	Internal live bearer	**3**
Trophic level	4.1 +/- s.e. 0.37 estimated from diet data.	**3**
Density dependence Invertebrates only	NA	
Susceptibility		
Fishery Only where the scoring element is scored cumulatively	NA	
Attribute	**Rationale**	**Score**
Areal Overlap	Based on fishbase information and maps the stock appears to be distributed across the Mediterranean (also see Ragonese et al 2013[201]). Considering that the UoA fishing activities take place in the Aegean Sea, and the wider distribution of the stock in the Mediterranean basin, the overlap with the stock is considered to be low (<10% overlap).	**1**
Encounterability	Gulper sharks are a common deepwater dogfish of the outer continental shelves and upper slopes, commonest below 200 m, usually benthic and epibenthic at depths from 50-1440 m with most records from 200-600 m. *A. foliacea* lives on mud and sandy bottoms where the bottom trawls operate on at around 500-700 m depth (mostly above 600 m in the Aegean). The encounterability or overlap of the gear type with this species is considered high.	**3**
Selectivity of gear type	The mesh size of the bottom trawl is 50 mm, while the average size at maturity of gulper sharks is 56.4 cm while the average max. size is 145 to 170 cm. We can determine that individuals < size at maturity would be frequently caught in the gear under assessment.	**3**
Post capture mortality	These bottom trawlers do not use excluder devices that may exclude large animals such as turtles or sharks from the catch. Sharks do not possess a swimming bladder which means that bycatch related barotrauma effects common to other deep-water fish do not affect them as much[202]. However, the short-term (a few days) probability of survival following discard from trawlers was estimated to be 55% by Enever et al. (2009) and 60% by Kaiser	**2**

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[200]

https://www.fishbase.se/popdyn/KeyfactsSummary_1.php?ID=648&GenusName=Centrophorus&SpeciesName=granulosus&vStockCode=664&fc=558

[201] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3781099/

[202] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3781099/

Table 15. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

	and Spence (1995) (as referenced in Kynoch et al 2015[203]). Hence there is some evidence of some released post-capture and survival.	
Catch (weight) Only where the scoring element is scored cumulatively	NA	**NA**

Table 16. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Performance Indicator	2.2.1	
Productivity		
Scoring element (species)	Mediterranean slimehead *Hoplostethus mediterraneus*. Evidence collected primarily from Fishbase's life history tool[204]	
Attribute	Rationale	Score
Average age at maturity	5.6 years	**2**
Average maximum age	21.7 years	**2**
Fecundity	Unknown but likely to be relatively similar to the fecundity of *Hoplostethus atlanticus* at 30K to 80K eggs[205] a year	**1**
Average maximum size Not scored for invertebrates	42 cm	**1**
Average size at maturity Not scored for invertebrates	16.1 cm	**1**
Reproductive strategy	Pelagic broadcast spawner[206]	**1**
Trophic level	3.5 +/- s.e. 0.53 estimated from food data.	**3**
Density dependence Invertebrates only	NA	
Susceptibility		
Fishery Only where the scoring element is scored cumulatively	*NA*	
Attribute	Rationale	Score
Areal Overlap	Based on fishbase information and maps the stock appears to be distributed across the Mediterranean. Considering that the UoA fishing activities take place in the Aegean Sea, and the wider distribution of the stock in the Mediterranean basin, the overlap with the stock is considered to be low (<10% overlap).	**1**
Encounterability	Mediterranean slimehead are benthopelagic and occur at a depth range 100 - 1175 m, and are found over muddy bottoms. *A. foliacea* lives on mud and sandy bottoms where the bottom trawls operate on at around 500-700	**3**

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[203] https://academic.oup.com/icesjms/article/72/6/1861/921176

[204] https://www.fishbase.de/popdyn/KeyfactsSummary_1.php?ID=4964&GenusName=Hoplostethus&SpeciesName=mediterraneus&vStockCode=5197&fc=236

[205] http://www.fao.org/3/ca1870en/CA1870EN.pdf

[206] https://www.cambridge.org/core/journals/journal-of-the-marine-biological-association-of-the-united-kingdom/article/evidence-of-trawling-impact-on-hoplostethus-mediterraneus-in-the-centraleastern-mediterranean-sea/D029398763A99C54C254746C47B89CD4

Table 16. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

	m depth (mostly above 600 m in the Aegean). The encounterability or overlap of the gear type with this species is considered high.	
Selectivity of gear type	The mesh size of the bottom trawl is 50 mm, while the average size at maturity of the Mediterranean slimehead is 16.1 cm. We can determine that individuals < size at maturity would be frequently caught in the gear under assessment.	**3**
Post capture mortality	This fish species has a swim bladder[207]. Owing to barotrauma, it is likely that fish caught at such depths would be dead when hauled on the deck of the vessel. The majority would be dead even in the case of release.	**3**
Catch (weight) Only where the scoring element is scored cumulatively	*NA*	

Table 17. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Performance Indicator	2.2.1	
Productivity		
Scoring element (species)	Red shrimp (*Aristeus antennatus*)	
Attribute	**Rationale**	**Score**
Average age at maturity	One year[208].	**1**
Average maximum age	Likely around 7[209] and most likely <10 years.	**1**
Fecundity	The average absolute fecundity of *A. antennatus* was 200 472 oocytes/female[210].	**1**
Average maximum size Not scored for invertebrates	NA	**-**
Average size at maturity Not scored for invertebrates	NA	**-**
Reproductive strategy	Broadcast spawner.[211]	**1**
Trophic level	3.3	**3**
Density dependence Invertebrates only	Compensatory dynamics at low population size are demonstrated or likely (Fabio Fiorentino pers. comm.).	**1**
Susceptibility		
Fishery Only where the scoring element is scored cumulatively	*NA*	
Attribute	**Rationale**	**Score**
Areal Overlap	Because the stock is found in the Aegean sea where the fishery operates, and the stock appears to be retained (and perhaps targeted) the aereal overlap is considered high.	**3**

[207] https://link.springer.com/article/10.1007/BF00403452
[208] https://www.hindawi.com/journals/ijz/2009/979512/
[209] https://gfcmsitestorage.blob.core.windows.net/documents/SAC/SAFs/DemersalSpecies/2016/ARA_GSA_05_2016_ESP.pdf
[210] https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1463-6395.2006.00237.x
[211] https://www.nature.com/articles/s41598-019-43523-w

Table 17. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Encounterability	Taking into account the that the depth distribution of the stock is usually between 350 - 800 m and the fishery is mainly occurring at 400-600 m the encounterability is assumed high.	**3**
Selectivity of gear type	The mesh size of the bottom trawl is 50 mm, while the average size at maturity of the red shrimp is around 4.2 cm[212]. Individuals < size at maturity are regularly caught.	**2**
Post capture mortality	Default value as it is retained.	**3**
Catch (weight) Only where the scoring element is scored cumulatively	*NA*	

Table 18. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Performance Indicator	2.2.1	
Productivity		
Scoring element (species)	Shortnose greeneye *Chlorophthalmus agassizi.* Evidence collected primarily from Fishbase and its life history tool[213]	
Attribute	Rationale	**Score**
Average age at maturity	3.2 years	**1**
Average maximum age	11.7 years	**2**
Fecundity	Absolute fecundity ranges from 1,499 to 15,730 oocytes (mean value = 5,421±3,855 oocytes)[214]	**2**
Average maximum size Not scored for invertebrates	40 cm	**1**
Average size at maturity Not scored for invertebrates	12 cm	**1**
Reproductive strategy	Broadcast spawner[215]	**1**
Trophic level	3.7 ±0.0 se; Based on diet studies.	**3**
Density dependence Invertebrates only	NA	
Susceptibility		
Fishery Only where the scoring element is scored cumulatively	*NA*	
Attribute	Rationale	**Score**
Areal Overlap	This species appears to occurs in areas where the fishery occurs in the Aegean Sea. The areal overlap appears to be high.	**3**
Encounterability	This species has a depths range of depth range 50 - 1000 m and the fishery is mainly occurring at 400-600 m. The overlap with the fishing gear is considered high.	**3**

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[212] https://www.hindawi.com/journals/ijz/2009/979512/

[213]

https://www.fishbase.se/popdyn/KeyfactsSummary_1.php?ID=1808&GenusName=Chlorophthalmus&SpeciesName=agassizi&vStockCode=2005&fc=163

[214] https://link.springer.com/article/10.1007%2Fs00227-005-0231-y

[215] http://www.biologia.uniba.it/scuola/PhD_programs/publication/pdf/tursi2/4.pdf

Table 18. Productivity Susceptibility Analysis (PSA) productivity attributes and scores.

Selectivity of gear type	Given the average size at maturity of this fish is 12 cm and the mesh size of the bottom trawl is 50 mm, individuals < size at maturity are frequently caught.	**3**
Post capture mortality	They would be likely dead after release considering trawl time can average a few hours.	**3**
Catch (weight) Only where the scoring element is scored cumulatively	*NA*	

The scores resulting from the P2 PSA tables above are presented below. The MSC score for the 5 scoring elements (i.e. species) would be 75 (pass with condition).

Family name	Scientific name	Common name	Species type	Fishery descriptor	Average age at maturity	Average max age	Fecundity	Average max size	Average size at Maturity	Reproductive strategy	Trophic level	Density Dependance	Total Productivity (average)	Availability	Encounterability	Selectivity	Post-capture mortality	Total (multiplicative)	PSA Score	Weighted PSA Score	MSC PSA-derived score	Risk Category Name	MSC scoring guidepost
Sebastidae	*Helicolenus dactylopterus*	Blackbelly rosefish	Vertebrate	Bottom trawl	2	3	1	1	1	2	3		1.86	1	3	3	3	1.65	2.48		86	Low	≥80
Centrophoridae	*Centrophorus granulosus*	Gulper shark	Vertebrate	Bottom trawl	2	3	3	2	2	3	3		2.57	1	3	3	2	1.43	2.94		75	Med	60-79
Trachichthyidae	*Hoplostethus mediterraneus*	Mediterranean slimehead	Vertebrate	Bottom trawl	2	2	1	1	1	1	3		1.57	1	3	3	3	1.65	2.28		91	Low	≥80
Chlorophthalmidae	*Chlorophthalmus agassizii*	Shortnose greeneye	Vertebrate	Bottom trawl	1	2	2	1	1	1	3		1.57	3	3	3	3	3.00	3.39		62	Med	60-79
Aristeidae	*Aristeus antennatus*	Red shrimp	Invertebrate	Bottom trawl	1	1	1			1	3	1	1.33	3	3	2	3	2.33	2.68		82	Low	≥80

9   Template information and copyright

This document was drafted using the 'MSC Pre-Assessment Reporting Template v3.2'. Note amendments have been made to formatting in order to comply with Global Trust Certification/SAI Global's corporate identity; however, content and structure follow that of the original template.

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Template version control		
Version	Date of publication	Description of amendment
1.0	15 August 2011	Date of first release
1.1	31 October 2013	Updated in line with changes to CR v1.3
2.0	08 October 2014	Confirmed background sections (Section 3) as optional (use of 'may' statements). Modified Table 6.3 to create a simplified scoring sheet to be completed in place of full evaluation tables. Made amendments to PIs based on Fishery Standard Review changes (e.g. removed original PIs 1.1.2, 3.1.4 and 3.2.4).
2.1	9 October 2017	Inclusion of optional full evaluation tables
3.0	17 December 2018	Release alongside Fisheries Certification Process v2.1
3.1	29 March 2019	Minor document changes for usability
3.2	25 March 2020	Release alongside Fisheries Certification Process v2.2.

A controlled document list of MSC program documents is available on the MSC website (www.msc.org).

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