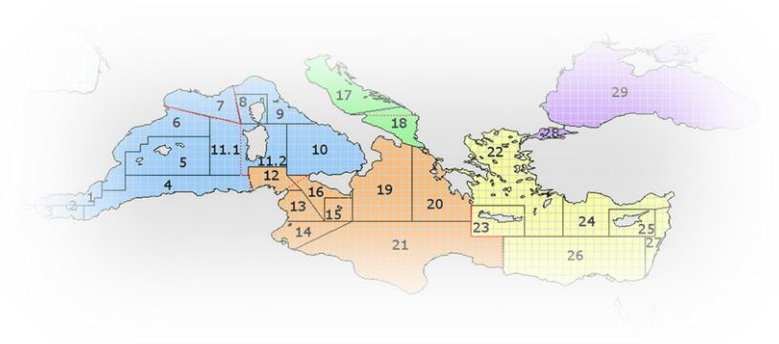
Food and Agriculture Organization of the United Nations

General Fisheries Commission for the Mediterranean
Commission générale des pêches pour la Méditerranée

GFCM DCRF

DATA COLLECTION REFERENCE FRAMEWORK



VERSION 2016.2

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Version: 2016.2

GFCM - DCRF
DATA
COLLECTION
REFERENCE
FRAMEWORK

- PART 1 -

Structure of the data collection

- PART 2 -

Common practices in data collection

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Acronyms

- DCRF Data Collection Reference Framework
- FAO United Nations Food and Agriculture Organization
- FMSY Fishing Mortality Rate of Maximum Sustainable Yield
- GFCM General Fisheries Commission for the Mediterranean
- GSA Geographical Subarea
- ICES International Council for the Exploration of the Sea
- IUCN World Conservation Union (International Union for the Protection of Nature)
- MPA Marine Protected Area
- MSY Maximum Sustainable Yield
- RFMO Regional Fisheries Management Organization
- SAC Scientific Advisory Committee
- SC Subcommittee
- SCSA Sub-Committee on Stock Assessment
- SCSE Sub-Committee on Economics and Social Sciences
- TAC Total Allowable Catch
- WGBS Working Group on the Black Sea

INTRODUCTION

What is the GFCM Data Collection Reference Framework (DCRF)?

The DCRF is the first GFCM comprehensive framework for the collection and submission of the fisheries-related data that are requested as per existing GFCM Recommendations and are necessary for relevant GFCM subsidiary bodies to formulate advice in accordance with their mandate.

The DCRF is a GFCM instrument, developed by the technical subsidiary bodies responsible for scientific advice, as a concrete response to the need to strengthen the collection and processing of data on fisheries in the GFCM area (Mediterranean and Black Sea). It aims to be instrumental in achieving a more efficient data collection programme in the whole region, and to better integrate data collection and subregional multiannual management plans. The DCRF should be regularly reviewed by relevant GFCM subsidiary bodies in light of possible requirements emanating the Commission, including through new recommendations.

Historical background

Performance review and modernization of the GFCM

As all Regional Fisheries Management Organizations (RFMOs) and upon a call made by the United Nations General Assembly and the FAO Committee of Fisheries[1] to review and modernize their mandates, the GFCM undertook its performance review from 2009 to 2010. During the review, the GFCM Agreement was assessed along with the extent to which measures adopted by the GFCM had achieved the objectives of the Commission. A "Task Force" was established to build upon the strengths and address the weaknesses identified. Amongst the main topics to be addressed for enhancing a sound and scientifically based decision making process, the need to strengthen data collection systems in the region was prioritised.

Framework programme (FWP) and data collection activities

As an instrument to assist on the actions identified by the Task Force, the Commission established a platform to help strengthen intra-institutional coordination with FAO regional projects and other intergovernmental organizations through multiannual and multidonor arrangements. The GFCM Framework Program (2013-2018) was structured around five work programmes (WP): Governance (WP01), Data collection (WP02), Aquaculture (WP03), Small-scale fisheries (WP04), Subregional cooperation and Technical assistance (WP05).

The development of WP02 since 2013 has entailed a series of coordinated actions with the aim to strengthen data collection systems and to standardize the submission process. The different national data programmes were assessed and their main characteristics and drawbacks analysed in four sub regional workshops held in 2013 and 2014 in the Mediterranean and Black sea[2] [3] [4] [5].

The main gaps, difficulties, proposals and recommendations that emerged during these workshops were used as a basis to propose possible modifications and/or improvements to GFCM data and information requirements. Three main indications were of general agreement: i) to simplify data aggregation; ii) to clarify variables definitions and iii) to improve online procedures for data submission by members.

[1] COFI Report on Strengthening regional fisheries management organizations and their performances including the outcomes of the 2007 tuna RFMOs meeting, twenty-seventh session (Rome, 5–9 March 2007).
[2] Report of the Workshop on fisheries data collection and management plans in the Adriatic Sea
[3] Report of the FWP subregional meeting on data collection for Western, Central and Eastern Mediterranean
[4] Report of the FWP workshop on fisheries data collection in the Black Sea
[5] Report of the Workshop on the implementation of the DCRF in the Mediterranean and the Black Sea

The DCRF manual

This manual outlines the DCRF principles by encompassing all the necessary indications for the collection of fisheries data by GFCM Members and its submission to the GFCM in a standardized way, in order to empower the relevant GFCM subsidiary bodies with information needed for the formulation of advice.

Preparation

The DCRF manual has been prepared by the GFCM Secretariat under the umbrella of SAC and taking into account the comments provided by the Working Group on the Black Sea (WGBS), in response to the mandate given by the thirty-eighth session of the Commission (May 2014). It took into account GFCM binding decisions in force, as well as SAC and WGBS national reports, stock assessment forms, *ad hoc* questionnaires and other available sources[6].

The manual has been completed thanks to inputs provided by experts on the occasion of several technical meetings held during the intersessional period 2014-2015*:* Working Groups on Stock Assessments of demersal and small pelagic species (GFCM headquarters, November 2014); Workshop on the implementation of the DCRF in the Mediterranean and the Black Sea (Spain, December 2014); Subcommittee on Stock Assessments and Subcommittee on Social and Economic Sciences (GFCM headquarters, February 2015); Working Group on the Black Sea (Turkey, February 2014 and Georgia, March 2015).

The manual is composed of two main parts: *Structure of data collection* and *Common practices in data collection*. The first one was adopted by the sixteenth session of the Scientific Advisory Committee (SAC) in March 2014 and was enriched with a practical section (second part) upon the request of the thirty-eighth session of the Commission (GFCM, 2014a).

The DCRF manual was endorsed by the Commission at its thirty-ninth session.

The current version (2016.2) has been enriched with inputs received by the GFCM Secretariat from the countries that participated in the DCRF pilot study, which was launched in October 2015 with a view to finalizing the online data submission tools made available through the DCRF IT platform.

Main characteristics of the DCRF

The DCRF aims at optimizing the GFCM fisheries data collection through:

- clear identification of the main thematic areas of the data collection (defined as "tasks") together with the definition of their purposes in line with the objective of the GFCM[7];
- detailed description of all the data variables;
- simplified level of data aggregation for requested variables (in this regard, the concept of "operational units" has been superseded);
- more flexible and easier fleet segmentation scheme;
- simpler measures of fishing effort;
- new concept of priority species group whereby species are identified at the level of the five GFCM subregions (Western Mediterranean Sea, Ionian Sea, Adriatic Sea, Eastern Mediterranean Sea and Black Sea);
- well-defined data collection practices;
- improved online data submission procedures.

[6] CopeMed, 1999, 2002; Cingolani & Santojanni, 2003; Coppola, 2007; Council Regulation, 2008; Dimech et al., 2012; Pinello & Dimech, 2013; FAO EastMed, 2014

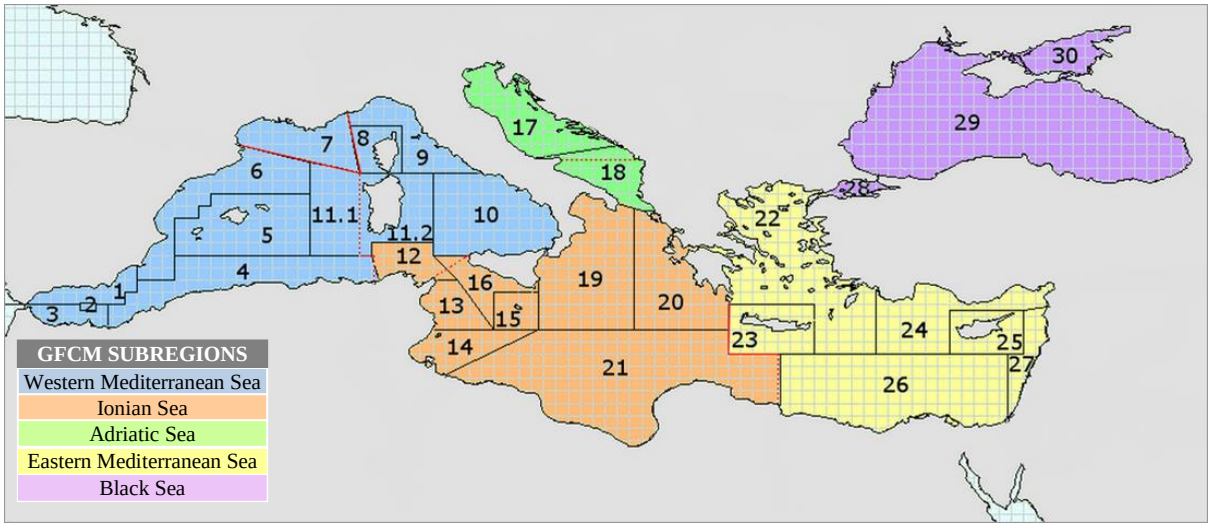
[7] GFCM basic texts (Article 8 of the Amended Agreement for the establishment of the General Fisheries Commission for the Mediterranean, 24 May 2014)

PART 1

STRUCTURE OF THE DATA COLLECTION

Chapter 1 - The need for a Data Collection Reference Framework (DCRF)

The GFCM has the responsibility and authority to oversee the full process of fisheries management, undertake scientific evaluations and take decisions to ensure sustainability of fisheries resources in its area of application (Figure 1 and Appendix L). The collection of data required to achieve an appropriate management of fisheries is crucial and countries should therefore provide their best available information in terms of quality and comprehensiveness.



GFCM GSAs

01 - Northern Alboran Sea	07 - Gulf of Lion	13 - Gulf of Hammamet	19 - Western Ionian Sea	25 - Cyprus
02 - Alboran Island	08 - Corsica	14 - Gulf of Gabes	20 - Eastern Ionian Sea	26 - South Levant Sea
03 - Southern Alboran Sea	09 - Ligurian Sea and Northern Tyrrhenian Sea	15 - Malta	21 - Southern Ionian Sea	27 - Eastern Levant Sea
04 - Algeria	10 - South and Central Tyrrhenian Sea	16 - Southern Sicily	22 - Aegean Sea	28 - Marmara Sea
05 - Balearic Islands	11.1 - Sardinia (west) 11.2 - Sardinia (east)	17 - Northern Adriatic Sea	23 - Crete	29 - Black Sea
06 - Northern Spain	12 - Northern Tunisia	18 - Southern Adriatic Sea	24 - North Levant Sea	30 - Azov Sea

Figure 1: Map of the GFCM area of application
(Subregions and Geographical Subareas)

On basis of the new GFCM agreement[8] that refers to the "*subregional approach to fisheries management and aquaculture development in order to better address the specificities of the Mediterranean and the Black Sea*", the concept of subregions has been introduced during the revision process of the fishery data collection framework of GFCM and then reflected into the DCRF document. As agreed at several GFCM technical meetings held during the intersessional period 2013-2015, the subregional approach answers specific needs in managing the Mediterranean and Black Sea by considering the specificity of each identified area, including its fisheries. The identified five subregions (Western Mediterranean Sea, Ionian Sea, Adriatic Sea, Eastern Mediterranean Sea and Black Sea) aim at facilitating the integration between data collection and subregional multiannual management plans.

The need to establish functional data collection systems in the GFCM area has always been a key issue for internal discussion. Many efforts have been made to develop useful tools for the creation of GFCM information systems, associated databases and protocols for data submission (e.g. Task 1 – Rec. GFCM/33/2009/3). However, notwithstanding the steps taken since 2010 to encourage and

[8] *www.fao.org/gfcm/background/legal-framework*

support GFCM Members to submit data, the level of compliance still needs to be enhanced. Many datasets have been received in an incomplete state, thus hindering the capacity of the GFCM to use these data to fulfil its mandate.

The rationale behind the design of this framework is to reduce data requirements and encompass them into a single, simple and easy-to-understand document, providing Members with the necessary indications for the collection and transmission of data related to fisheries to the GFCM Secretariat. Moreover, the information gathered should be sufficient and reliable enough to review the status of the different resources, to assess the economic and social dimensions of the fleets and to provide scientific advice on the status of the resources, as well as to allow Members to prepare recommendations to manage those resources.

In order to fulfil the GFCM objectives, the data collected within the DCRF encompass area-based information on national fleets and their activities, catch and effort and biological information on main species, including discards and incidental catch of vulnerable species. Socio-economic data is also required in order to assess the economic situation of fishing enterprises and employment trends. Within the DCRF, GFCM Members should guarantee the quality and completeness of the data at the requested aggregation level and, according to an agreed format, submit them in a timely manner to the GFCM Secretariat.

The DCRF is based on seven different tasks:

- T1 – Global figures of national fisheries
- T2 – Catch (landing data, catch data per species)
- T3 – Incidental catch of vulnerable species
- T4 – Fleet
- T5 – Effort
- T6 – Socioeconomics
- T7 – Biological information (stock assessment, length data, other biological data, dolphin fish, red coral, European eel, ecosystem indicators)

Chapter 2 - Components of the DCRF

"It is essential to know exactly what is currently being fished from the wild population, as this affects the stock's ability to survive and, more importantly to reproduce" (FAO, 2002).

This chapter describes basic fisheries data needed for an effective conservation and management of marine living resources in the Mediterranean and Black Sea area, subdivided according to the seven main components, namely "tasks" identified within the DCRF. Each task is briefly introduced with a short description. Information is given on the countries concerned, the type of obligation (mandatory and/or optional data) and the requested variables, as well as the frequency of data submission and the deadline for submission.

Structure of each DCRF-Task

- Description
- Countries involved
- Data (mandatory, optional)
- Confidentiality
- Frequency and deadline of transmission

To gather all the necessary information, the GFCM Secretariat for each DCRF task will launch formal data calls every year. Full details on parameters, aggregation levels and transmission instructions will be indicated in the data calls and will follow this manual. Members should proceed to the timely transmission of their data through the national focal points for data collection, using a dedicated electronic format provided by the Secretariat. The datasets gathered by the Secretariat will then be checked for compliance and quality before their final upload in the information systems. Data will be made available to experts participating in the GFCM scientific subsidiary bodies (e.g. working groups, subcommittee, SAC and WGBS), according to ruling data confidentiality policies and procedures. The GFCM Secretariat will send each national focal point a short report about the status of the transmitted data (i.e. completeness and accuracy) and liaise with them in the event that corrections are needed.

Thereafter, the information will be put at disposal of the relevant GFCM subsidiary bodies for the provision of advice. Also, the GFCM Secretariat will provide, through a biennial report, a regular overview on the status of national/regional fisheries based on the information received through the DCRF.

In developing information systems to collect, validate, analyse and disseminate data, the GFCM Secretariat will pay particular attention to international codifications and standards (e.g. fishing gear, species, fishing areas, etc.), as well as to all aspects related to data security and confidentiality (Resolution GFCM/35/2011/2).

The DCRF shall assist countries to collect the minimum sets of information required to assess the status of their fisheries and the status of the main stocks, to manage their own resources and to comply with the GFCM requirements. In this regard, classifications of priority species have been made by taking into account different criteria, such as abundance, economic value and conservation status (Appendix A).

The data requirements of the DCRF, together with its main purposes and the relation to current data requirements described in existing GFCM decisions is detailed in Table 1.

Data can be transmitted separately for each DCRF task, according to the data submission calendar (Appendix O).

Table 1 – GFCM-DCRF tasks: data and purposes

DCRF TASKS (T)			DATA	PURPOSES	RELATED RECOMMENDATIONS
ID	**TASK**	**SUBTASK**			
T. I	**GLOBAL FIGURES OF NATIONAL FISHERIES**	-	Annual data on total landing, number of vessels, total capacity and total engine power by country.	General overview of the fishery in each country with indication of capacity and total landings.	–
T. II	**CATCH**	**II.1) Landing data**	Annual data on total national captures (i.e. landing) by country, area and fleet segment.	Monitoring of total annual biomass landed by fleet segment, country and area.	–Rec. GFCM/33/2009/3
		II.2) Catch data per species	Annual data on total catch (i.e. landing and discards) for the main commercial species reported by country, area and fleet segment.	Monitoring the trend of total catches (landing and discards) of the main commercial species.	–Rec. GFCM/33/2009/3
T. III	**INCIDENTAL CATCH OF VULNERABLE SPECIES**	-	Annual data (i.e. number of individuals) on incidental catch of vulnerable species (i.e. seabirds, turtles, marine mammals and shark species) by area, country and fishing gear.	Quantification of incidental catches of vulnerable species by fleet segment and assessment of the impact of fisheries on species of conservation concern.	–Rec. GFCM/35/2011/5 –Rec. GFCM/36/2012/3 –Rec. GFCM/35/2011/4 –Rec. GFCM/36/2012/2
T. IV	**FLEET**	-	Register of fishing vessels with identification features (i.e. vessel name, registration number, port, fishing gear, geographical subarea, etc.) and information on technical features (i.e. gross tonnage, kilowatt, overall length etc.) of fleets operating in the GFCM area.	Monitoring of fishing capacity in the GFCM area.	–Res. GFCM/35/2011/1 –Rec. GFCM/33/2009/5 –Rec. GFCM/33/2009/6 –Rec. GFCM/33/2009/2 –Rec. GFCM33/2009/1 –Rec. GFCM/33/2009/3 –Rec. GFCM/30/2006/3
T. V	**EFFORT**	-	Fishing effort data calculated as a combination of capacity and activity by country, area, fleet segment and fishing gear. Information on catch per unit effort (CPUE) for the main commercial species.	Accounting for the amount of effort deployed and evaluating fishing pressure and trends in CPUE.	–Rec. GFCM/33/2009/3
T. VI	**SOCIO-ECONOMICS**	-	Data related to economic and social variables of fishery by country, area and fleet segment.	Assessing the economic value and social implications of fisheries.	–Rec. GFCM/33/2009/3

DCRF TASKS (T)			DATA	PURPOSES	RELATED RECOMMENDATIONS
ID	**TASK**	**SUBTASK**			
T. VII	**BIOLOGICAL INFORMATION**	**VII.1) Stock assessment**	Annual data on stock identification and stock biological information on priority species: growth parameters, length/weight relationships, recruitment, biomass. Information on environmental factors that may affect population dynamics.	Assessing the status of stocks and provision of scientific advice.	– Rec. GFCM/33/2009/3
		VII.2) Length data	Data related to the observed size distribution, in the landing, of identified priority species per area and fleet segment.	Monitoring the structure of exploited populations.	– Rec. GFCM/33/2009/3
		VII.3) Other biological data	Information on some biological variables (i.e. sex and maturity) of identified priority species per area and fleet segment.	Monitoring the biological rates and dynamics of the exploited species.	– Rec. GFCM/33/2009/3
		VII.4) Dolphin fish	Annual data on total landing, fishing period and the area of fishing operations regarding dolphin fish *Coryphaena hyppurus*.	Monitoring the population status of dolphin fish and assessing the effect of seasonal closure on the fishery.	– Rec. GFCM/30/2006/2
		VII.5) Red coral	Information on red coral harvesting, weight, effort and average diameter	Assessing the status and regulating the exploitation of red coral.	– Rec. GFCM/35/2011/2 – Rec. GFCM/36/2012/1
		VII.6) European eel	Annual data on total catch, gear types and fishing days, by country and for the different life stages.	Monitoring the status and assessing the level of escapement of European eel	-
		VII.7) Ecosystem indicators	The selected common indicators will refer to spawning stock biomass, total landings, fishing mortality, effort and incidental catch of vulnerable and non-target species	Monitoring the impact of fishing activities on exploited living resources.	-

For the purpose of this framework, the following definitions have been used:

FLEET SEGMENT:	Combination of a group of vessels of the same size, using the same gear for more than 50 percent of the time at sea during a year[9].
ACTIVE/INACTIVE VESSEL:	In terms of operational status, a vessel is considered active when it executes at least one fishing operation during the reference year in the GFCM area.
POLYVALENT VESSELS:	All vessels using more than one gear with a combination of passive and active gears, none of which exceeding more than 50 percent of the time at sea during the reference year.
FISHING GEAR:	Equipment used for fishing (e.g. gillnet, harpoon, and haul seine, longline, midwater trawl, purse seine, rod-and-reel, trap and trawler), according to the international standard classification (FAO, 1980) (Appendix D).
CATCH:	Amount of marine biological resource taken by the fishing gear which reaches the deck of the fishing vessel. This includes catches of individuals of the target species, which are usually kept on board and retained, and bycatch, which refers to catches of species that are not targeted by the fishery, with or without commercial value.
LANDING:	Part of the catch retained on board and brought ashore.
BYCATCH:	Bycatch is the part of the catch that is unintentionally captured during a fishing operation in addition to target species. It may refer to the catch of other commercial species that are landed, commercial species that cannot be landed (e.g. undersized, damage individuals), non-commercial species, as well as to incidental catch of endangered, vulnerable or rare species (e.g. turtles, sharks, marine mammals etc.).
DISCARDS:	Part of the catch not retained on board and discarded at sea. It may include the catch of target species or any other species (both commercial and non-commercial) discarded at sea.

[9] In order to define the fleet segments, the GFCM classification currently in force has been slightly modified to accommodate the most recent developments (Appendix B).

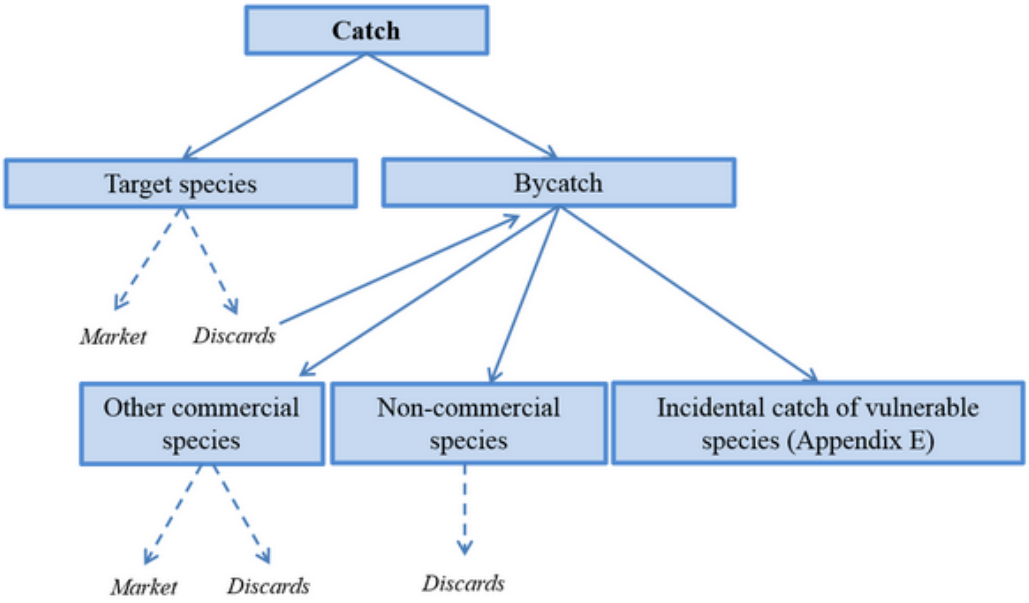


Figure 2: Scheme representing the different components of the catch

The same species can move from one category (i.e. market or discards) to another, depending on size, market demand, season or other criteria. Similarly, other species may be undesirable, or of limited value, in one subregion, but appreciated in others (Figure 2).

2. Task I: Global figures of national fisheries

Description – The objective of this task is to provide a general overview of the fishery in each country, with an indication of total capacity and total landing. Data reported here are totals of some important variables, and must therefore be in line with the data/information provided through the other tasks and subtasks of the present document.

Countries involved – This task is addressed to all countries operating in the GFCM area of application.

Data (Mandatory) – Countries should submit information about total amount of landing, in weight, together with the total number of vessels, the corresponding total capacity (GT) and engine power (kW).

Table I.1 *Global figures of national fisheries*: General overview
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
Number of vessels	*The corresponding number of all vessels operating in the country during the reference year*
Total landing	*The whole part of the catch that is landed (in tons) by all vessels during the reference year*
Total capacity (GT)	*The total capacity (sum), in gross tonnage (GT), of all vessels operating in the country*
Total engine power (kW)	*The total engine power (sum), in kilowatt (kW), of all vessels operating in the country*

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 31st May of each calendar year (n). Data requested (Table I.1) are mandatory (Appendix O).

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information in Table I.1 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

2.1 Task II: Catch

Knowledge of the biomass removed from the ecosystem by fishing operations is fundamental so as to monitor the status of stocks, as well as the impact of fishing on fish populations.

Subtask II.1 – Landing data

Description –This subtask refers to the total amount of landing. The total amount of all landed species, in weight (tonnes) by fleet segment, together with the total number of vessels, should be reported by country and area (GSA). Total landing figures can be obtained from different sources (e.g. logbooks, sales notes, sampling and interviews).

In order to optimise the sampling, and according to the inputs received by the Subcommittee on Stock Assessment and the Subcommittee on Economic and Social Sciences (GFCM, 2015a, 2015b) fleet segments could be merged (i.e. aggregating length classes) if they:

- have similar exploitation patterns (targeting the same species);
- exploit the same portion of the population (i.e. juveniles or adults).

When a country proposes to aggregate fleet segments, the rationale and corresponding references (e.g. existing scientific studies) should be brought to the attention of the relevant subsidiary bodies, which in turn should confirm the similarity/homogeneity of the combined cells[10]. In the case of merged

[10] Fleet segments aggregation described in Recommendation GFCM/33/2009/3 could be used as guidance.

segments, the code to identify the newly defined fleet segment will be provided by the GFCM Secretariat (section 6.2 Chapter 6).

Countries involved – This task is addressed to all countries operating in the GFCM area of application.

Data (Mandatory) – Landing data (in tons) and number of vessels (Table II.1.1), are requested by fishing area (GSA) and for all fleet segments, as identified in Appendix B.

Table II.1.1 *Catch*: Total landing data
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Fleet segment	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Number of vessels	*The corresponding number of all vessels (by GSA) operating in the identified fleet segment, during the reference year*
Total landing	*The whole part of the catch that is landed (in tons) by the operating fleet segment in the GSA*

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 30th June of each calendar year (n). Landing data (Table II.1.1) are mandatory (Appendix O).

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information in Table II.1.1 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

Subtask II.2 – Catch data per species

Description – For the main commercial species[11], identified at national level, countries should submit information on total catch by area (GSA) and fleet segment. Total catch should be considered as the weight of the total yearly catches, including retained catch (landing) and the discarded fraction (discards).

Discards data, if available, should be collected and reported in the corresponding table according to identified fleet segments and commercial species. The collection of discards information (i.e. weight in tons for the main commercial species) is only compulsory for fleet segments (e.g. trawlers 12-24 m) for which the discard rate is assessed as significant. The discard rate can be considered as being significant when it exceeds 10 percent of the total volume of catch for a given fleet segment in a given GSA. Should the discard level be assessed as insignificant, there is no need to collect information on discards for the pertaining segment. Discard estimates can also be obtained from fishers (section 6.1

[11] "main commercial species" are currently those which summed up together, represent 90% in weight of total landing in the country

Self-sampling). Current national experiences as well as existing scientific papers and reports on the topic (Cochran, 1977; ICES, 2007) can be used for the estimation of discards values.

Countries involved – This task is addressed to all countries operating in the GFCM area of application.

Data (Mandatory) - Countries should submit the total catch data (weight), including landing and discards (if present and recorded), by main commercial species, fleet segment (Appendix B) and area (GSA) (Table II.2.1).

Table II.2.1 *Catch*: Catch data per species
Mandatory

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Fleet segment	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Species	*The 3-alpha code identifying the main commercial species*[12].
Total landing per species	*The total landing (in tons) of the mentioned commercial species for the identified fleet segment in the GSA*
Total discards per species*	*The total volume (in tons) for the mentioned commercial species discarded by the identified fleet segment in the GSA*
Total catch per species	*The total catch, landing+discard (in tons), of the mentioned species for the operating fleet segment in the GSA. If there is no discard, this field should match that of total landing*

* if any

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 30th June of each calendar year (n) (Appendix O). Countries are encouraged to respect this deadline and provide all requested data. Catch data per species (Table II.2.1) are mandatory.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information in Table II.2.1 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

2.2 Task III: Incidental catch of vulnerable species

Description – This section refers to the specific reporting of incidental catch of seabirds, sea turtles, seals, cetaceans, sharks and rays species (Appendix E.1) as identified in a number of GFCM

[12] *www.fao.org/fishery/collection/asfis*

recommendations (GFCM/35/2011/3, GFCM/35/2011/4, GFCM/35/2011/5, GFCM/36/2012/2 and GFCM/36/2012/3) and included in Annex II (*List of Endangered or Threatened Species*) and Annex III (*List of species whose exploitation is regulated*) of the *Protocol concerning Specially Protected Areas and Biological Diversity SPA/BD in the Mediterranean of the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean* (Barcelona Convention). Moreover, any incidental taking of rare sharks and rays (Appendix E.2), even if not mentioned in the Barcelona Convention, should also be reported.

Available information to identify fisheries with incidental catches of vulnerable species is still limited. It is therefore important to collect existing data and identify additional/alternative sources of information to guide any possible revision of monitoring schemes. Data regarding the number of individuals taken as well as fleet segments and gear types (if available) should be reported. Suitable methods for recording incidental catch include for example on-board observers and/or self-sampling (Chapter 6).

Countries involved – This task is addressed to all countries operating in the GFCM area of application.

Data (Mandatory) – A minimum set of parameters, such as the number of individuals caught per fleet segment (Appendix B) and/or per fishing gear (Appendix D), should be reported. Countries should transmit this information only in the event of incidental catch of vulnerable and rare species (i.e. seabirds, sea turtles, cetaceans, monk seal and sharks), as specified in Table III.1 (Appendix E).
Data should be aggregated by area (GSA) and by species group and/or family, if the detailed information by species is not available (e.g. when individual could not be identified at species or genus level, as in the case of recording seabirds, which include a large number of possible species). It is also important to report the total number of individuals caught, whether they have been released alive, dead or in unknown status.

Table III.1 Incidental catch of vulnerable species
Mandatory data for species listed in Appendix E

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
Date	*The date (dd/mm/yyyy) when the vulnerable species have been recorded*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Source of data	*Source of data:* ***BS*** *(biological sampling on board, at landing place, at market, self-sampling, others)* ***SU*** *(scientific survey) or* ***OT*** *(other)*
Fleet segment	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Fishing gear*	*The code of the fishing gear, as reported in Appendix D (e.g. GNS)*
Group of vulnerable species	*The name of the group of vulnerable species, as reported in Appendix E (e.g. Cetaceans)*
Family*	*The name of the Family, as reported in Appendix E (e.g. Delphinidae)*
Species*	*The scientific name of the species, as reported in Appendix E (e.g.* Orcinus orca*)*
Total number of individuals caught	*The total number (sum) of individuals caught (regardless of their release) with that particular gear (or at level of fleet segment if information on the gear is not available) in the GSA*
Total weight of individuals caught*	*If available, the total weight (tons) of individuals caught (regardless of their release) with that particular gear (or at level of fleet segment if information on the gear is not available) in the GSA*
Number of individuals released alive*	*If available, the number (sum) of individuals caught that have been released alive; (if none enter 0)*
Number of dead individuals*	*If available, the number (sum) of dead individuals; (if none enter 0)*
Number of individuals released in unknown status*	*If available, the number (sum) of individuals caught, for which there is no information about status during release (e.g. partially damaged); (if none enter 0)*

* if available

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 31st July of each calendar year (n) (Appendix O).

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information in Table III.1 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

2.3 Task IV: Fleet

Description – The overall objective of this task is to provide information on the fleet operating in the GFCM area of competence, in order to compile reliable statistics on fishing capacity for management purposes at regional and subregional level.

Countries should submit information about all national vessels, boats, ships or other craft that are equipped and used for commercial fishing purposes in the GFCM area of competence. Particular attention should be paid to small-scale vessels.

Data collected under this task will make it possible to obtain:

- an accurate source of statistics for the Mediterranean and Black Sea fishing fleet;
- a complete picture of the regional, subregional, and national fishing capacity;
- a better knowledge at regional/subregional level of the age of fleets (safety indicator);
- a picture of historical events: entry into and exit from the fleet, modifications and characteristics.

Countries involved – This task is addressed to all countries operating in the GFCM area of application.

Data (Mandatory) – Data within this task can be grouped into the following categories:

- Administrative (name, port, registration number, etc.)
- Technical (length, tonnage, power, fishing gear etc.)
- Personnel (operator, crew etc.)

The list of mandatory fields is summarized in Table IV.1. Additional information should only be reported for vessels over 15 metres (Table IV.2).

Table IV.1 *Fleet*: Description of vessels
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
Registration authority	*Name of the authority that issued the vessel registration*
Vessel name*	*Name of vessel (in Latin characters)*
Vessel registration number	*The code representing the national registration number of the vessel (ISO 3-alpha code of the country plus 9 digits)*
Operational status (active indicator)	*Active/inactive. Permanent status until receives allowance to return to activity; indicator Y/N*
Port of registration	*Full name of the port where the vessel is registered.*
GSA (main geographical fishing area)	*The GSA where the vessel is authorized to fish and operates the majority of the year (see geographical subarea code as reported in Appendix L - Res. GFCM/33/2009/2)*
Secondary fishing statistical area (GSA)*	*If any, the GSA where the vessel is authorized to fish and operates occasionally (Appendix L)*
Tertiary fishing statistical area (GSA)*	*If any, the GSA where the vessel is authorized to fish and operates occasionally (Appendix L)*

Fields	Definition of variables
Year of entry into fishing activity*	*The year in which the vessel commenced its fishing activity*
Authorization to fish (licence indicator)	*Any authorization to fish, e.g. licence, permit or any other official denomination; indicator Y/N*
Main fishing gear used	*The main gear, according to the fishing licence of the vessel or the owner/operator, using the International Standard Statistical Classification of Fishing Gear (ISSCFG), which was adopted during the 10th Session of the Coordinating Working Party on Fishery Statistics (CWP - Madrid, 22-29 July 1980 – FAO, 1980) (Appendix D).*
Secondary fishing gear*	*The secondary gear, according to the fishing licence of the vessel or the owner/operator, using the same International Standard Statistical Classification of Fishing Gear as in "main fishing gear used" (Appendix D).*
Third fishing gear*	*The tertiary gear, according to the fishing licence of the vessel or the owner/operator, using the same International Standard Statistical Classification of Fishing Gear as in "main fishing gear used" (Appendix D).*
Length Overall (LOA)	*The vessel's Length Overall, in metres, which represents the main longitudinal dimension of the hull of the vessel. This value should be provided with an accuracy of 2 digits*
Gross tonnage (GT)	*The Gross Tonnage, according to the International Convention on Tonnage Measurement of Ships, London, 1969 (in use since 1996)*
Power of the main engine (kW)	*The total maximum continuous rated output power, in kW, of all the vessel's main propulsion machinery, which appears on the vessel's certificate or registry or other official document, according to the International Convention on Standards of Training, Certification and Watch keeping for Fishing Vessel Personnel (STCW-F)*
Construction year of vessel	*The year in which the vessel was constructed*
VMS indicator (presence/absence)	*Indicating whether the vessel is equipped with a VMS device. Enter Yes (Y) or No (N)*

* if any

Table IV.2 *Fleet*: Additional information for vessels over 15 metres
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
Registration authority	*Name of the authority that issued registration of the vessel*
Vessel name*	*Name of vessel (in English if available)*
Vessel registration number	*The code representing the national registration number of the vessel (ISO 3-alpha code of the country plus 9 digits)*
IMO registration number*	*The IMO identification number assigned to the vessel by Lloyds company*
Owner (details)	*Details of the owner(s): name and address*
Operator (if different from owner)*	*Details of the operators(s): name and address*
Min. number of crew	*The minimum number of crew required to conduct fishing operations during the reference year*
Max. number of crew*	*The number of crew required to conduct a specific fishing operation, if superior to the value of "Min. number of crew"*

* if any

In addition, countries whose vessels conduct fishing activities in Fisheries Restricted Areas (FRA - Appendix C; Recommendations GFCM/30/2006/3 and GFCM/33/2009/1) should adequately report *ad hoc* information (Table IV.3). Vessels operating in a fishery for which a management plan exist (e.g. as in Recommendation GFCM/36/2013/1) should also comply with the information required in the management plan.

Table IV.3 *Fleet*: Vessels operating in Fisheries Restricted Areas (FRA)
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
Registration authority	*Name of the authority that issued registration of the vessel*
Vessel name*	*Name of vessel (in English if available)*
Vessel registration number	*The code representing the national registration number of the vessel (ISO 3-alpha code of the country plus 9 digits)*
Fishery Restricted Area	*Name of the Fishery Restricted Area as reported in Appendix C*
Number of fishing days	*The number of fishing days operated by the vessel in the Fishery Restricted Area during the year*
Fishing gear used in the Fishery Restricted Area	*Name of the gear used to fish in the Fishing Restricted Area, according to the International Standard Statistical Classification of Fishing Gear (ISSCFG)*
Period authorized (if applicable) for fishing in the Fishery Restricted Area*	*Period authorized for fishing in the Fishing Restricted Area (FRA)*

* if any

Data (Optional) – Countries are also encouraged to provide additional information regarding the equipment of the vessel (refrigeration, navigation, communication, fish processing etc.), even if only one or few optional data fields are available, and to communicate information on its earlier history, if available (previous vessel name and flag state etc.). The full list of optional data fields is included in Table IV.4.

Table IV.4 *Fleet*: Additional vessel equipment information
Optional data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
Registration authority	*Name of the authority that issued registration of the vessel*
Vessel name	*Name of vessel (in English if available)*
Vessel registration number	*The code representing the national registration number of the vessel (ISO 3-alpha code of the country plus 9 digits)*
Previous vessel name	*The previous name of the vessel, if applicable*
Previous flag State	*The previous flag of the vessel, if applicable (refer to the code list at www.fao.org/countryprofiles/iso3list.asp.)*
Previous details of deletion from other registries	*If applicable, the reason why the vessel was deleted from other registries and moved to the current register*
International radio call sign	*The international radio call sign of the vessel, if applicable. This element is only request for vessels with LOA>=24 m*
Period authorized for fishing and/or trans-shipping	*The time period authorized for fishing and/or trans-shipping*
Power of auxiliary engine(s) kW	*The total installed engine power not included in the value of "power of the main engine"*
Hull material	*Enter the hull material of the vessel*
Powered/motorized	*The value indicating whether the power of the vessel's main engine > 0; indicator Y/N*
Fish hold capacity (m^3)	*The capacity, in m3, of the vessel's fish hold*
Lights for fishing	*The number of lights on the fishing vessel, in the case of fishing operations requiring light*
Navigation equipment	*The type of navigation equipment being reported*
Communication equipment	*The type of communication equipment being reported*
Fish finder	*The type of fish finder equipment being regularly used*
Deck machinery	*The deck machinery used to operate fishing gear, listed according to the vessel on which each item is present and the event being reported*
Refrigeration equipment	*Textual description of refrigeration equipment being reported*
Fish processing equipment	*Textual description of fish processing equipment being reported*
Safety equipment	*Textual description of the main item of safety equipment being reported*
Period authorized for fishing with demersal trawl gear	*The period authorized for fishing with demersal trawl gear (if applicable)*

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 31st May of each calendar year (n) (Appendix O). Data of vessels over 15 metres in overall length should be transmitted as any changes occur, with particular attention to the authorized fishing

period, for which information should be kept updated[13]. Countries are encouraged to respect the deadline and to provide all requested data. Tables IV.1, IV.2 and IV.3 are mandatory. Countries are also invited to provide data as reported in Table IV.4.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information in Tables IV.1, IV.2, IV.3 and IV.4 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

Exception is made for information related to the owner, operator and crew in Table IV.2, which shall be made available to a restricted audience only, and in accordance with agreed security provisions.

2.4 Task V: Effort

Description – Fishing effort is a measure of the amount of fishing activity deployed. It can be calculated through a combination of inputs related to capacity, gear and time. Effort information is needed to analyse changes in the amount of catch and it is crucial for developing multiannual management plans. Usually, fishing effort is calculated by multiplying the fishing capacity deployed (i.e. total GT or power, number of hooks in longlines) by the period of time (number of hours or days spent fishing) and can be obtained through various sources (logbooks, sampling, census, port surveys, etc.).

Also, effort is combined with catch to estimate the rate of catch per unit effort. The catch per unit of fishing effort (CPUE) is a relative measure of fish stock abundance and can be used to estimate absolute abundance; it could be an indicator of fishing efficiency, both in terms of abundance and economic value. In its basic form, the CPUE could be expressed as the captured biomass for each unit of effort applied to species/stock (e.g. total catch of a species divided by the total fishing: kg/number of fish per longline hook days). Declining trends of this estimator could indicate overexploitation, while unchanging value could indicate sustainable fishing.

For the purpose of this framework, the CPUE should be reported only for the priority species belonging to Group 1 and Group 2 (Appendixes A.1 and A.2 – Priority species). CPUE should be calculated as the ratio between total catch (by gear and species) and the nominal effort (by gear as reported in Appendix F.2): CPUE = total catch/nominal effort.

Countries involved – This task is addressed to all countries operating in the GFCM area.

Data (Mandatory) – In order to compare and harmonize data at the regional and subregional level, standard effort information is requested both for fishing capacity (e.g. GT, number of hooks) and activity (e.g. fishing days). Effort data (Table V.1) should be reported by GSA and for all fleet segments operating in the country (Appendix B). Countries are also requested to provide estimates of fishing days by fishing gear (Table V.2).

CPUE data (Table V.3) should be reported, by fishing gear and by established nominal effort, for the identified species belonging to Group 1 and Group 2 (Appendixes A.1 and A.2 – Priority species). Mandatory fishing effort measurements are described in Appendix F.

[13] For the purpose of Recommendation GFCM/33/2009/6, vessels larger than 15 metres in overall length not entered into the GFCM Authorized Vessel list are deemed not to be authorized to fish for, retain on board, trans-ship or land species covered by the Commission.

Table V.1 *Effort*: Effort data per fleet segment
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Fleet segment	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Fishing days (by fleet segment)	*The total number of fishing days (sum) per fleet segment in the corresponding GSA during the reference year*
Capacity (by fleet segment)	*The total (sum) capacity value (e.g. GT or Net length) per fleet segment (Appendix F.1) in the GSA*
Nominal effort (by fleet segment)	*The value of the nominal effort per fleet segment, and by GSA, as requested in Appendix F.1*
Number of vessels (by fleet segment)	*The corresponding number of all vessels (by GSA) operating in the identified fleet segment, during the reference year*

Table V.2 *Effort*: Effort data per fishing gear
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Fishing gear	*The fishing gear code (Appendix D)*
Fishing days (by fishing gear)	*Total number of fishing days (sum) per fishing gear in the corresponding GSA during the reference year*

Table V.3 *Effort*: CPUE
Mandatory data for species Group 1 and Group 2

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Fishing gear	*The code of the fishing gear (Appendix D)*
Species	*The 3-alpha code identifying the species (Appendix A)*
Nominal effort	*The value of the nominal effort per fishing gear, and by GSA, as requested in Appendix F.2*
CPUE	*The CPUE value per species and per fishing gear in the reference year. CPUE should be calculated as the ratio between total catch and nominal effort by gear (as defined in Appendix F.2)*

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 30th June of each calendar year (n) (Appendix O). Countries are encouraged to comply with this deadline and to provide all requested data.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information in Tables V.1, V.2 and V.3 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

2.5 Task VI: Socio-economics

Description – The objective of this task is to collect information in order to monitor the economic status of the fishing sector. Data collected under this task is needed to develop appropriate policies and strategies, especially in relation to promoting the long-term sustainability of resources and fleets. Economic data can help to explain fisher behaviour and the overexploitation of fisheries resources. The species that fishers target, the level of exploitation, and the gear that they use are all influenced by the benefits they receive (i.e. the revenue) and the costs they incur.

The systematic collection of socio-economic data is necessary so as to assess the economic consequences of different management options on the varying groups, based on the incentives that these create. Economics provide a framework for the optimal allocation of marine resources for the benefit of society. It provides an approach to valuing the different activities, allowing trade-offs between activities to be assessed and impacts to be measured in a consistent manner.

Economic and social information should be collected by area (GSA) and by fleet segment. Countries collecting these data on a yearly basis are requested to submit them annually (reference year – 2). Biennial submission is requested for those countries that do not have annual economic surveys in place.

Economic and social data are generally collected through sampling surveys using questionnaires, but for some fleet segments and some variables, other data sources could be used (e.g. administrative records, auction sales, and census).

Data collected under this task will help to obtain:

- trends in economic performance and social indicators;
- time series analysis of average annual prices for commercial species;
- analysis of the profitability of fleets (income, gross value added, operating cash flow);
- an accurate source of statistical data for landing values and prices;
- a better knowledge of fleet costs and their breakdown in different categories;
- a complete picture of regional, subregional and national employment in the fishery sector.

Exhaustive definitions of concepts related to capital value and costs as well as methodologies for calculating these variables have been detailed in various reports (Franquesa et al., 2001; IREPA, 2006) and workshops (WS on calculating capital value using PIM - Perpetual Inventory Method - and definition of EU-DCF variables. Anonymous, 2011 - see section 5.2 Chapter 5).

Countries involved – This task is addressed to all countries operating in the GFCM area of application.

Data (Mandatory) – The list of data fields and related definitions is reported in Table VI.1, Table VI.2 and Table VI.3. All types of information should refer to one single year of activity. Data are requested by fishing area (GSA) and fleet segment (Appendix B).

Table VI.1 includes data related to capacity, number of vessels, total landing values and total days at sea. Information on personnel costs, fuel consumption and price, and other operating costs should be reported in Table VI.2.

Table VI.3 requires reporting information on volume and value of landing by commercial species. Data on prices, income and costs should be reported in national currency.

Table VI.1 data are mandatory and based on annual submission. Tables VI.2 and VI.3 data are mandatory and should be submitted on a biennial basis. Biennial submission should only take place for those countries that do not have annual economic surveys in place. Countries collecting these data on a yearly basis are requested to submit them annually (keeping reference year – 2).

Table VI.1 Socio-economics: *Economic and social data*
Mandatory data (on annual basis)

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Fleet segment	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Capacity (gross tonnage)	*The total capacity, expressed as gross tonnage (GT), of all fishing vessels belonging to that fleet segment*
Capacity (engine power)	*The total capacity, expressed as engine power (kW), of all fishing vessels belonging to that fleet segment*
Number of vessels	*The corresponding number of all vessels (by GSA) operating in the identified fleet segment, during the reference year*
Total landing value	*The total value of landing of all vessels belonging to that fleet segment*
Total days at sea	*The total number of fishing days carried out by all vessels classified in that fleet segment*

Table VI.2 Socio-economics: *Operating costs*

Mandatory data (on biennial basis)

Biennial submission should only take place for those countries that do not have annual economic surveys in place. Countries collecting these data on a yearly basis are requested to submit them annually (reference year – 2)

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Fleet segment	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Number of vessels	*The corresponding number of all vessels (by GSA) operating in the identified fleet segment, during the reference year*
Personnel costs	*Crew wages, including social security costs and imputed value of unpaid labour (for example, the vessel owner's own labour)*
Fuel consumption*	*Consumption in litres of fuel (regardless of fuel type)*
Fuel price*	*Average price of fuel over the reference year (regardless of fuel type) in local currency per litre*
Total fuel cost*	*Total amount paid for fuel in local currency. These data should be submitted if no data for "Fuel consumption" or "Fuel price" are available*
Repair and maintenance costs	*Costs for maintenance and repairs of fishing equipment, gear and vessel parts*
Commercial costs	*Costs related to sales of vessel output. This includes fish market or wholesaler's fees, transportation of production, purchasing of ice, boxes and packaging*
Other variable costs	*All purchased inputs (good and services) related directly or indirectly to fishing effort (for example, bait, food consumed during the fishing operation) plus the purchase of components of assets (gear or vessel), but only if these do not improve the lifetime of the asset itself (consumed within the given year)*
Capital costs	*Depreciation costs plus Opportunity costs. Depreciation costs: consumption of fixed capital; this represents the reduction in value of the fixed assets used in production during the accounting period resulting from physical deterioration, normal obsolescence or normal accidental damage.* *Opportunity costs: the capital value is related to the opportunity cost of capital, or the required rate of return that is the rate of return that a company would otherwise be able to earn at the same risk level as the investment that has been selected. The opportunity cost of production is the value of the firm's best alternative use of its resources.*
Value of physical capital	*Value of the vessel, i.e., the hull, engine, all on board equipment and gear. The capital stock must be valued at the prices of the current year and should be depreciated*

Fields	Definition of variables
Fixed costs	*The costs not directly connected with the operational activities (i.e. effort and catch/landing), which could include bookkeeping, vessel insurance, legal and/or bank expenses, annual quota for fishers' associations, dock expenses, renewal of fishing licences, etc.*
Employment	*The number of persons working on the vessels, both on a part-time and full-time basis*
Currency	*The currency denomination of the country*

* if available

Table VI.3 Socio-economics: *Species value*

Mandatory data for species Group 1 and Group 2 (on biennial basis)

Biennial submission should only take place for those countries that do not have annual economic surveys in place. Countries collecting these data on a yearly basis are requested to submit them annually (reference year n-2)

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Fleet segment	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Number of vessels	*The corresponding number of all vessels (by GSA) operating in the identified fleet segment, during the reference year*
Species	*The 3-alpha code identifying the species (Appendix A)*
Total landing volume	*The total landing (tons) of the species mentioned for that fleet segment*
Total landing value	*The total value of the landing (currency unit, for example, euro), for the species mentioned, of all vessels belonging to that fleet segment*
Prices by commercial species	*The average value of species' prices during the reference year*
Currency	*The currency denomination of the country*

Data (Optional) – Countries are encouraged to provide additional information regarding socioeconomic aspects, such as operating subsidies, number of people involved in the crew and divided by age, investments in physical capital, even if only one or few optional data fields are available. The full list of optional data fields is summarized in Table VI.4. Data requested in Table VI.4 are optional and may be submitted on a biennial basis.

Table VI.4 Socio-economics: *Other economic aspects*

Optional data (on biennial basis)

Biennial submission should only take place for those countries that do not have annual economic surveys in place. Countries collecting these data on a yearly basis are requested to submit them annually (reference year n-2)

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Fleet segment	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Operating subsidies	*Includes direct payments, e.g. compensation for halting fishing, refunds of fuel duty or similar lump sum compensation payments.* *Excludes social benefit payments, indirect subsidies, e.g. reduced duty on inputs such as fuel, investment subsidies*
Investments in physical capital	*Improvements to existing vessel/gear during the given year. These investments aim to improve the lifetime of the assets and are not consumed within the given year*
Other income	*Includes other income from use of the vessel, e.g. recreational fishing, tourism, oil rig duty, etc. Also, insurance payments for damage/loss of gear/vessel*
Full-time equivalent (FTE)	*Full-time equivalent employment, which equals the number of full-time equivalent jobs, is defined as total hours worked divided by the average annual number of hours worked in full-time jobs*
Number of persons in the crew < 25 years-old	*For that fleet segment, the total number of persons in the crew who are younger than 25*
Number of persons in the crew 25-40 years-old	*For that fleet segment, the total number of persons in the crew who are between 25 and 40 years-old*
Number of persons in the crew > 40 years-old	*For that fleet segment, the total number of persons in the crew who are older than 40*
Currency	*The currency denomination of the country*

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1, as requested in Table VI.1, by the 30th November of each calendar year (n) (Appendix O). Information in Tables VI.2, VI.3 and VI.4, pertaining to year n-2, should be submitted on a biennial basis by the 31st May of each calendar year (n).

Biennial submission is foreseen for countries that do not have annual economic surveys in place. Countries that collect such information on a yearly basis are requested to submit these data (Tables VI.2, VI.3 and VI.4) annually, always considering year n-2.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information in Tables VI.1, VI.2, VI.3 and VI.4 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

2.6 Task VII: Biological information

Subtask VII.1 – Stock assessment

Description – Stock assessments are based on models of population dynamics requiring three primary categories of information: catch, abundance and biology (e.g. growth, size at first maturity and size at recruitment). All data needed to run these models and to analyse their results must be submitted using the stock assessment forms.

Regular fish stock assessments provide fisheries managers with reliable figures for sound decision-making regarding stock management. Conservation and management measures should be based on the best scientific advice produced by the relevant subsidiary bodies. The main task of SAC and the WGBS is assessing the status of (major) stocks exploited in the GFCM area. It is therefore fundamental to have timely provision by countries of relevant and accurate data concerning inputs (fleets, efforts) and outputs (catches, including discards). For this purpose, SAC, taking into account the comments from the WGBS, has developed standard forms Stock Assessment Form (SAF) and procedures to present data and results on stock assessment in the Mediterranean and Black Sea.

On a yearly basis, SAC and the WGBS will identify those species/stocks that should be assessed and for which stock assessment form should be provided.

Relevant GFCM subsidiary bodies have identified a series of criteria for the selection of the stocks for which assessments should be carried out on a yearly basis (GFCM, 2015a). Some of these criteria are of a scientific nature while others are of economic or social importance. The list of criteria is reported below:

- Commercial importance.
- Shared stocks.
- Data availability.
- Social significance (sector of the fleet and or the workforce involved).
- Problematic assessment in previous years with indications of possible solutions by the WGs.
- Ecological aspects (e.g. most discarded species, species belonging to a relevant trophic level, unbalanced population, competing species, low fecundity species that are most vulnerable such as sharks and rays).
- Stability *vs.* fluctuating trends in the time series. Those stocks presenting quite stable dynamics can be assessed every two or three years, while most fluctuating ones (short lived species) should be assessed annually.
- Frequency of assessments. Priority should be given to stocks never or poorly assessed before.
- Stocks that are subject to a management plan that is existing or in the process of being developed.
- Species that can be representative of the exploitation pattern for the whole fishery.

Countries whose fisheries are based on the same stock (i.e. shared stocks) are encouraged to submit a single stock assessment form. According to the SAC glossary, shared stocks[14] are the "stocks fished by two or more countries". The list of identified shared stocks is reported in Appendix I (GFCM, 2006).

Countries involved – This task is addressed to all countries operating in the GFCM area of application.

[14] In the Mediterranean, although the importance of shared fishery resources is widely recognized, the list of priority shared fishery stocks would require a more in-depth analysis, both in terms of consistency and homogeneity, as discussed during the 31st session of the GFCM (GFCM, 2007).

Data (Mandatory) – All information required to perform stock assessment should be submitted by countries through the SAF[15]. It includes catches, fishing gear, a short description of the fleet, historical trends and biological parameters of growth and maturity, as well as a series of reference points (i.e. F, SSB etc.).

Frequency and deadline of transmission – Countries should submit the stock assessment form, pertaining to year n-1, by the 30th September of each calendar year (n) (Appendix O). The date of data submission will be linked to the scheduling of the GFCM stock assessment working groups and therefore may differ from year to year.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information under Subtask VII.1 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

Subtask VII.2 – Length data

Description – Length data refer to the observed size frequency of fish, measured according to a given biological sampling plan. The scope of this subtask is to investigate the length distribution of the main commercial species (Appendix A - Groups 1, 2 and 3) by area and fleet segment. Samples might derive (i.e. source of data) from fishery-dependent data and/or fishery-independent data sources: experimental scientific surveys, observers on board, observers at landing place, at market or from any other fishery sampling programme. Measurements (see section 6.3.1) should be reported within size class intervals of one centimetre or half centimetre for fish (including elasmobranchs) and cephalopods. Size classes of one millimetre should be used for crustaceans. A different level of size aggregation could be requested by relevant subsidiary bodies through the stock assessment forms. For sampling purposes, the three groups of priority species (Appendix A) should be considered. Countries are requested to collect length data for all the species identified in all GFCM subregions where their fisheries take place. Exceptions can be applied according to the criteria reported in section 6.3.

Countries involved – This task is addressed to all countries operating in the GFCM area of application.

Data (Mandatory) – For all the species selected in Group 1, Group 2 and Group 3 (Appendix A), a minimum set of parameters, including the sampled number of individuals per different length class by fleet segment (Appendix B), should be reported (Table VII.2). In order to expand the sample (i.e. number of measured individuals for each length class) to the total production (e.g. landing) of that fleet segment, it is also important to report the weight of the sample by different length class. The computation of the total weight of the individuals in the sample, per fleet segment and length class, can require an estimate through appropriate length-weight regression equation.

[15] *www.fao.org/gfcm/data/reporting/stock-assessment*

Table VII.2 *Biological information*: Length data
Mandatory data for species Group 1, Group 2 and Group 3

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Source of data	*Source of data: **BS** (biological sampling on board, at landing place, at market, self-sampling, others) or **SU** (scientific survey)*
Name of the scientific survey**	*Full name of the scientific survey. If more than one survey is in place, this line should be repeated*
Fleet segment*	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Species	*The 3-alpha code identifying the species (Appendix A)*
Length	*The value of the length class of the measured individuals. Length classes should be reported in centimetres (cm), as a whole number, or in half centimetres (e.g. 0.5, 1.0, 1.5 cm, etc.) for fish (including elasmobranchs) and cephalopods. For crustaceans, length classes should be reported in millimetres (e.g. 1, 2, 3, 4 mm, etc.) (see section 6.3.1)*
Number of individuals sampled (per length classes)	*The total number (n) of individuals measured for that fleet segment and length class for the reference year*
Weight of individuals sampled (per length classes)	*The total weight (kg) of all individuals measured for that fleet segment and length class for the reference year*
Number of individuals expanded (per length classes)	*The total number of individuals, for a given length class, expanded to the total production (e.g. landing) of each fleet segment.* *In case of an experimental survey, it should be expanded to the total catch of that survey*

* only if from fishery-dependent data
** if any

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 31st July of each calendar year (n) (Appendix O). Length data (Table VII.2) are mandatory for all the species identified in the priority list of species (Appendix A). Exceptions can be applied according to the criteria reported in section 6.3. Countries are encouraged to comply with this deadline and provide all requested data.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information in Table VII.2 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

Subtask VII.3 – Other biological data

Description – The objective of this subtask is to monitor and investigate the population dynamics of the most important species in the different subregions. The following variables, for at least the Group 1 species identified and listed in Appendix A, should be reported:

- length at first maturity at species level;
- individual information on maturity state;
- individual information on sex.

Samples may be collected during fishery independent surveys (if more than one survey is in place, countries should provide both data) and/or obtained from observers on board and/or at landing place, or in any other fishery sampling programme. Age data are not explicitly requested in this subtask, but should be submitted through stock assessment forms as appropriate.

Countries involved – This task is addressed to all countries operating in the GFCM area of application.

Data (Mandatory) – The length at first maturity (L_{50}) is conventionally the size at which 50 percent of the population attains an advanced stage of gonad development. The mentioned parameter is a species-specific value that could be influenced by environmental factors (i.e. temperature, food availability) and by population (i.e. density) factors. The data needed to estimate the size at first maturity can be obtained by calculating the percentage of mature individuals per size-class (number of mature individuals/total number per size-class). The number of individuals in each size-class must be sufficient (at least a minimum of 20 per size-class) and the individuals must be collected in the period just before, or very close to, the spawning peak of the species.

Countries should provide the GFCM Secretariat with the values (Tables VII.3.1) of the size at first maturity (L_{50}), for the species belonging to Group 1 (Appendix A.1). If the size at first maturity is not estimated through sampling but taken from literature, countries should provide all references. If available (optional), countries are encouraged to provide these data also for species belonging to Groups 2 and 3.

Only for the priority species identified in Group 1, countries should provide the GFCM Secretariat also with the number of fish individuals measured by sex and maturity (Tables VII.3.2) and per the identified fleet segment (Appendix B). Exceptions can be applied according to the criteria reported in section 6.3.

In order to expand the sample (e.g. number of individuals for each length class) to the total production (e.g. landing) of that fleet segment, it is also important to report the weight of the sample by different length class.

Table VII.3.1 *Biological information*: Size at first maturity
Mandatory data for species Group 1

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Species	*The 3-alpha code identifying the species (Appendix A)*
Sex	*The code for the sex: **M** (Male), **F** (Female**) F+M** (sex combined)*
L_{50}	*The size at first maturity (L_{50} - length at which 50% of the fish are mature), for that species*
Reference*	*If the size at first maturity is not estimated through sampling but taken from literature, enter the complete bibliographic reference. If available, please enter reference data also for Group 2 and Group 3 species.*

*if any

Table VII.3.2 *Biological information*: Maturity data
Mandatory data for species Group 1

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Source of data	*Source of data: **BS** (biological sampling on board, at landing place, at market, self-sampling, others) or **SU** (scientific survey)*
Name of the scientific survey**	*Full name of the scientific survey. If more than one survey is in place, this line should be repeated*
Fleet segment*	*The fleet segment code (Appendix B) or the code corresponding to the merged fleet segments (see section 6.2)*
Species	*The 3-alpha code identifying the species (Appendix A)*
Length	*Value of the length class of the measured individuals. Length classes should be reported in centimetres (cm), as a whole number, or in half centimetres (e.g. 0.5, 1.0, 1.5 cm etc.) for fish (including elasmobranchs) and cephalopods. For crustaceans, length classes should be reported in millimetres (e.g. 1, 2, 3, 4 mm, etc.). (see section 6.3.1)*
Sex	*The code for the sex of sampled individuals: **M** (Male), **F** (Female)*
Maturity	*The corresponding maturity stage, as reported in Appendix G*
Number of individuals sampled (per length class, sex and maturity stage)	*The total number (n) of individuals measured per fleet segment, length class, sex and maturity stages for the reference year*
Weight of individuals sampled (per length class, sex and maturity stage)	*The total weight (kg) of all individuals measured per fleet segment, length class, sex and maturity stages for the reference year*
Number of individuals expanded (per length class, sex and maturity stage)	*The total number of individuals per length class, sex and maturity, expanded to the total production (e.g. landing) of each fleet segment. In case of an experimental survey, it should be expanded to the total catch of that survey*

* only if from fishery-dependent data
** if any

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 31st July of each calendar year (n) (Appendix O). Data requested in Tables VII.3.1 and VII.3.2 are mandatory only for species identified in the Group 1 list (Appendix A.1). If available, countries are encouraged to also submit data for all other species identified in the priority list of Group 2 and Group 3 species (Appendixes A.2 and A.3). Countries are encouraged to comply with this deadline and provide all requested data.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the

information in Tables VII.3.1and VII.3.2 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

Subtask VII.4 – Dolphin fish

Description – The objective of this task is to collect information on fishing activities related to dolphin fish (*Coryphaena hyppurus)*. Dolphin fish is an epipelagic species living in open waters, but which also approaches the coast, following ships and gathering in small groups below floating objects. Commonly, fishing Aggregation Devices (FADs) are used to concentrate dolphin fish before the nets are set. This is a traditional fishery, particularly for the western–central Mediterranean.

Countries involved – This task is addressed to Greece, Italy, Libya, Malta, Spain and Tunisia.

Data (Mandatory) – Countries should communicate to the GFCM Secretariat data on the year, fishing period, GSAs of fishing operation, total landing and number of vessels involved (Table VII.4.1).

Table VII.4.1 *Dolphin fish*: General information
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
Fishing period	*The starting (1-12) and the ending month (1-12) of the fishing period*
GSA	*The geographical subarea code, of the fishing operation, as reported in Appendix L (Res. GFCM/33/2009/2)*
Total landing	*The total landing (sum) of the dolphin fish during the reference year. Total landing is requested in tons*
Number of vessels	*The corresponding number of all vessels(by GSA) involved in the fishery of dolphin fish during the reference year*

Data (Optional) – Countries are encouraged to provide additional information, even if only one or few optional data fields are available on aspects related to the dolphin fish fishery. In order to better monitor the total effort, countries should possibly communicate the FADs that were visited and where no fish was found as well as the FADs that were visited and where net was deployed. The full list of optional data fields is included in Table VII.4.2.

Table VII.4.2 *Dolphin fish*: Dolphin fish statistics
Optional data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSAs	*The geographical subarea code, of the fishing operation, as reported in Appendix L (Res. GFCM/33/2009/2)*
Total GT of vessels	*Total (sum) gross tonnage (GT), of the vessels involved in the fishery of dolphin fish*
Length range of vessels (m)	*The minimum length (in meter) and the maximum length (in meter) of the vessels involved in the fishery of dolphin fish*
Average length of vessels (m)	*Value of the mean length (m) for the vessels involved in the fishery of dolphin fish*
Total number of FADs	*Total number (sum) of FADs employed during the reference year*
Total number of fishing trips	*Total number (sum) of trips carried out during the reference year*
Number of FADs targeted per fishing trip	*Average value of FADs fished per fishing trip where a net was deployed to catch aggregated fish*
Number of FADs visited per fishing trip	*Average value of FADs visited per fishing trip, including both FADs which were visited but where no dolphin fish were found and FADs where a net was deployed to catch aggregated fish*
Average size of fish caught during the fishing season	*Average size (in cm) of dolphin fish caught during the reference period*
Total transhipments	*If present, the weight (tons) value of total trans-shipment occurred during the reference year*
System of collection and treatment of catch and effort data	*"Yes" or "No" if in the country exists any system of collection and treatment of catch and effort data*

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 31st July of each calendar year (n) (Appendix O). Collection for data present in Table VII.4.1 is mandatory. However, if additional data are collected, countries are invited to provide these in Table VII.4.2.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the information in Tables VII.4.1 and VII.4.2 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

Subtask VII.5 – Red coral

Description – The GFCM has engaged in several initiatives to improve knowledge on red coral (*Corallium rubrum*) with the aim of developing a regional management plan. As a result, two recommendations (GFCM/35/2011/2 and GFCM/36/2012/1) involving data submission by countries harvesting red coral were issued.

Catch and effort data, by fishing ground, statistical grid[16] (Appendix M) and depth are presented together with their definitions in Table VII.5. Other information on red coral (e.g. biological data) from research projects should be requested through a stock assessment form when an assessment is being performed.

For the purpose of this framework, and for red coral only, the following definitions apply:

- *Fishing ground* – The name of the "area" to be provided in the harvest table. This refers to a distinct identifier, such as a national code or name designated by local authorities, or to a practical common sense designation to describe a distinct area where harvest takes place.
- *Population* – This refers to a set of patches that are not isolated from each other (i.e. larvae can be carried by the currents from one patch to another in a few days). For practical purposes, this can also be identified as a "bank". A fishing ground, in the sense defined above, can be constituted by more than one population.
- *Colony* – A coral colony refers to what we see as one coral. This is one whole "tree". It is actually a colony of many small white polyps. Polyps are individuals because they can be removed and grow a new colony through asexual reproduction (i.e. coral "tree"). Each coral starts as one larva that metamorphoses into a first polyp and then multiplies, building the whole colony. There are male and female polyps/colonies which reproduce sexually to create new larvae that settle and create a new coral.

Countries involved – This task is addressed to Algeria, Croatia, France, Greece, Italy, Morocco, Spain and Tunisia.

Data (Mandatory) – Total weight (kg), effort (days at sea), average diameter (mm) of the colonies (branch diameter measured at 1 cm above the base) as well as the percentage of the total weight which corresponds to colonies smaller than 7 mm in diameter recorded in the fishing ground are mandatory (Table VII.5). Data should be reported by GSA, statistical grid (Appendix M) and fishing ground.

[16] *www.fao.org/gfcm/data/map-statistical-grid*

Table VII.5 Red coral: *Harvest*
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer*
GSA	*The geographical subarea code as reported in Appendix L (Res. GFCM/33/2009/2)*
Statistical grid	*The statistical grid code[17] as per Appendix M of Rec. GFCM/35/2011/1*
Fishing ground (name)	*The name of the "fishing ground" as an alphanumeric string. This can be a name or a national code that identifies the specific area where the catches occur. This name should be assigned by the country.*
Name of landing port	*The name of the authorized port where red coral catches from the reported fishing ground are landed.*
Effort (number of days)	*Number of days at sea (with or without harvesting)*
Depth (exact or range in m)	*The exact depth (meter) of the dive at which the harvest took place, if available. If unavailable, a range (minimum and maximum depths) for the several dives of the season in the reported fishing ground.*
Total weight	*The total number of kg (sum) harvested in the reported fishing ground.*
Percentage (%) in weight of undersize colonies	*Percentage of the total weight of undersize colonies recorded in the fishing ground that correspond to colonies with less than 7 mm diameter (measured at 1 cm of the base).*
Average diameter (mm)	*Average diameter of the colonies referred to the weight recorded for the reported fishing ground*

Frequency and deadline of transmission – Countries should submit the data (Table VII.5) pertaining to year n-1 by the 30th June of each calendar year (n) (Appendix O). Countries are also invited to provide data relating to the biology of red coral (through a specific stock assessment form), if an assessment is being performed.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once received by the GFCM Secretariat, all information contained in Table VII.5 may be made available to an external audience following the specific criteria approved by the Commission (Chapter 9).

Subtask VII.6 – European eel

Description – The objective of this task is to collect information on fishing activities related to European eel (*Anguilla Anguilla*). The European eel is distributed across the majority of coastal countries in Europe and North Africa, with its southern limit in Mauritania (30°N) and its northern limit situated in the Barents Sea (72°N), and spanning all of the Mediterranean basin. The newly hatched leptocephalus larvae drift with the ocean currents to the continental shelf of Europe and North Africa where they metamorphose into glass eels and enter continental waters. The growth stage, known as "yellow eel", may take place in marine, brackish (transitional), or fresh waters. Once the maturing stage of "silver eel" is reached, the individuals then migrate to the Sargasso Sea where they spawn and die after spawning, an act not yet witnessed in the wild (ICES, 2014). Fisheries (e.g. fixed traps, fixed and mobile net gears, and rod and line – Appendix H.2) exploit the phase recruiting to

[17] www.fao.org/gfcm/data/map-statistical-grid

continental waters (glass eel), the immature growth phase (yellow eel) and the maturing phase (silver eel). The exploited life stage and the gear types employed vary between local habitat, river, country and international regions (Appendix H.1). Eel's data should be reported at country level.

Detailed information on eel (i.e. biological data, growth parameters) should be reported through a stock assessment form when an assessment is being performed.

Countries involved – This task is addressed to Albania, Algeria, Croatia, France, Egypt, Greece, Israel, Italy, Libya, Montenegro, Morocco, Spain, Syria, Tunisia, and Turkey.

Data (Mandatory) – Countries should communicate to the GFCM Secretariat, for each site and gear type, their data on the reference year, habitat (Appendix H.1), gear types (Appendix H.2), total catch per life stages, fishing days carried out by each gear as well as a the estimated effort (Table VII.6).

Table VII.6 *Eel*: General information
Mandatory data

Fields	Definition of variables
Country	*The ISO 3-alpha code of the country under which the vessel is operating (refer to the FAO country codes list)*
Reference year	*The year to which the collected data refer.*
Habitat	*The code of the habitat where at a given life stage (i.e. yellow, glass, silver) eels are fished (Appendix H.1).*
Site	*The name of the "site". This can be a name or a national code that identifies the specific area where the catches occur. This name should be assigned by the country.*
Gear types	*The code of the gear (Appendix H.2) used to fish eel.*
Mesh size*	*The smaller mesh size of the gear used (only in the case of nets)*
Number of fishermen	*Number of fishermen using the reported gear type targeting only eel in the reported site.*
Fishing days	*The total annual number (sum) of fishing days by gear type.*
Average number of "gear units" per day per fisherman*	*The daily average of gear units by fisherman. Gear units depend on the gear types (Appendix H.2). It could refers to the number of fyke nets, number of hooks, length of nets, etc.*
Total catch of silver eel*	*The total catch (kg) of eels at the silver eel life stage for the reported gear type*
Total catch of yellow eel*	*The total catch (kg) of eels at the yellow eel life stage for the reported gear type.*
Total catch of glass eel*	*The total catch (kg) of eels at the glass eel life stage for the reported gear type.*

*if any

Frequency and deadline of transmission – Countries should submit the data pertaining to year n-1 by the 30st September of each calendar year (n) (Appendix O). Data requested in Table VII.6 are mandatory.

Data confidentiality – Data transmitted by countries will be treated in accordance with all necessary measures to comply with the GFCM security and confidentiality provisions, and with the specific provisions of related Recommendations (see Table 1). Once transmitted to the GFCM, all the

information in Table VII.6 may be publicly available, in conformity with the criteria of data access policy approved by the Commission (Chapter 9).

Subtask VII.7 – Ecosystem indicators

Description – Indicators on the effects of fishing on marine communities are essential to support an ecosystem approach to fisheries management and to monitor the impact of fishing activities on the environment as well as the status of exploited fish stocks.

The *First MedSuit Regional Workshop on indicators and targets to ensure GES of commercially exploited marine populations in the GFCM area* (GFCM, 2014c) investigated possible common indicators for the definition of good environmental status (GES) of exploited marine living populations at the regional and subregional level.

A number of points were raised, including the following:

1) Due to the differences between riparian countries, the need for reliable data, and the desire to achieve coherence among different regional frameworks, it was recommended to reduce the number of common indicators and to prioritize them in order to facilitate data management.
2) Indicators should be widely applicable across all the subregions in the GFCM area. This would accommodate shared stocks and take into account natural species distribution.
3) Indicators should be linked to specific management actions or at least serve to flag up a change in stock status that could trigger appropriate management measures.
4) Some of the changes flagged up by indicators could be indicative of other phenomena not linked to fisheries affecting exploited populations and their ecosystems, such as eutrophication, climate change or the presence and abundance of non-native species.

Taking into account the proposal made by the SAC at its sixteenth session (GFCM, 2014d), the following set of common indicators to monitor fisheries resources in the Mediterranean areas was selected and endorsed by the workshop:

1) Spawning stock biomass
2) Total landings
3) Fishing mortality
4) Fishing effort[18]
5) CPUE (or LPUE as a *proxy*)[16]
6) Incidental catch of vulnerable and non-target species

Those indicators were proposed bearing in mind the feasibility of collecting associated data, including from fishery-dependent or fishery-independent sources. In general, these could be considered as common indicators throughout the GFCM area. Technical work will investigate the methodology to estimate the various indicators proposed, assess their performance as well as their aggregation at the regional and subregional level. It is expected that once the SAC have a clear description of each indicator, they will be incorporated in the DCRF. The information to be collected through the DCRF should enable the estimation of all proposed indicators. In this respect, the DCRF could play a regional monitoring role.

[18] Those indicators have been agreed upon during the GFCM Scientific Advisory Committee (SAC) at its seventeenth session (GFCM, 2015c).

PART 2

COMMON PRACTICES IN DATA COLLECTION

Introduction

The DCRF is the framework of the GFCM subsidiary bodies for the collection and submission of the fisheries-related data, as per existing GFCM Recommendations. These data are necessary for the provision of advice in support of decision making. Data collection is crucial to achieve appropriate fisheries management in the GFCM area. Countries should therefore provide their best available information in terms of quality and comprehensiveness. The DCRF aims to provide countries with all useful indications for the collection of fisheries data in a standardized way.

The fisheries data collection (FAO, 1999; Sparre, 2000) can be defined as the record of measures of one or more variables from members of a population (e.g. recording the number of trips from a population of fishing vessels).

Regarding sources, the methods for collecting useful information to assess the status of the resources can be derived from the following categories:

fishery-dependent data
: are data obtained from commercial fisheries. There are a variety of approaches for obtaining fishery-dependent data. These consist, for example, of sampling catches and effort at landing sites. Related socio-economic information (i.e. fuel, general costs of fishing trips) and biological information (i.e. species, length) can also be obtained through the use of on board observers, self-reporting, logbooks, sale notes, telephone surveys and/or other sources.

fishery-independent data
: are data obtained from scientific surveys. Surveys are designed to develop unbiased estimate (e.g. indices of abundance) which are independent from commercial fisheries. Since data from surveys are not influenced by specific management measures (e.g. mesh size, limits on number of hooks, seasonal closures), or socio-economic factors, they provided an unbiased image of the fishery.

The collection and accurate interpretation of both fisheries-dependent and independent data are of fundamental importance to understanding the status of exploited resources. Both types of methods should be combined, in order to gain a more accurate picture of the status of resources.

Chapter 3 - Sampling overview

Ideally, in any data collection, all members of a population should be measured. This is hardly feasible, and generally, there is a need to do some kind of sampling. Depending on the different size of the population to be measured, there are two basic data collection methods:

- by *census* (where all members of the whole population are measured);
- by *sampling* (where only a portion of members of the whole population is measured).

Fishery *census* is normally conducted by making a complete record of data from all individuals in the target population. The key advantage of a census is that the estimates are known with certainty. The main disadvantage is the considerable cost involved in collection (e.g. the cost of collecting/interviewing every fisher to obtain data would be prohibitive) and the subsequent compilation of all the data collected. This is generally beyond the budget of most fisheries research centres. For example, the use of a logbook to record fisheries data could be considered as a census, since it (theoretically) requires all vessels that meet certain characteristics to provide the required data. A successful logbook scheme should provide information on quantities of fish retained for landing (per species), fishing effort, landing per unit effort, fishing strategies and details of fishing vessels. The success of a logbook scheme as a census approach will partly depend on the attitudes of those compiling it and on the quality of the data that it may contain.

In a *sampling* procedure, the sample must be representative of the target population as a whole. The key advantage of the sample survey is that the amount of data to be collected and analysed is smaller than in the case of a census. Disadvantages of this system are that samples may not be fully representative, as well as problems of accuracy.

The most common groups of sampling procedures are random sampling and stratified sampling:

- *Random sampling* – this type of sampling involves a selection process in which each member of the population has an equal and independent chance of being selected. In random sampling, there is effectively no control over the sampling probabilities.

- *Stratified sampling* – in this type of sampling, not every member of a population has an equal chance (greater than zero) of being included in the sample. This type of sampling is less likely to produce representative samples than random sampling. In stratified sampling schemes, individuals can be selected on an opportunistic, or on an *ad hoc* basis.

When individuals are selected randomly within strata that have been previously defined, the procedure is called *stratified random sampling*. This system is commonly applied to fisheries.

Before designing a sampling strategy, whatever the sampling procedure, it is important to identify the target population (as a whole), the subset to be measured (i.e. the sample) and the nature of its individual members – the sampling units. The target population, the observable subset (sample) and the assumed link between them should be clearly identified. The sample size – the number *n* of sampling units to be included in a sample – must be estimated according to several criteria (e.g. cost, precision level, confidence level, variability within the population and availability of resources). However, as a rule of thumb, the sample size should be as large as possible, given the staff and resources available. In the case of a fishing fleet, the target population would comprise all the vessels in the fleet, but the observable population might only consist of those vessels which, for example, are accessible in nearby ports. Assuming that the unobserved part of the fleet behaves in the same way as the observed part, it would require a raising factor to convert sample estimates to the population of interest. For biological studies, the population of interest could be all fish in the stock. But the observable population might be restricted to the accessible part of total landings from that stock.

There is no single prescription for the optimum design of a data collection scheme. Generally, it is not feasible to design a perfect sampling strategy for all fisheries, because the underlying conditions may vary from place to place and between fisheries. In light of this, some degree of flexibility (e.g. adoption of alternative approaches) must be a key component of any strategy. The availability and capacities of human resources may vary and the data collection schemes should thus be designed to meet existing needs. Taking all these considerations into account, the data collection strategy might, over time, move from a census to a sampling approach (or *vice versa*), as knowledge develops and requirements or resources change.

Steps in data collection

1) *Define the variables of interest to be collected (e.g. landing, effort, catch, biological and/or economic data etc.).*
2) *Define the population.*
3) *Evaluate existing data sources in relation to the programme objectives.*
4) *Evaluate accessibility of the data.*
5) *Evaluate cost-effectiveness and operational considerations (institutional, financial and human resources).*
6) *Collecting data:*
    - *a) by census;*
    - *b) by sampling;*
        - *b.1) stratified sampling;*
            - *define the sample strata (e.g. fleet segment);*
            - *define the sample unit (e.g. vessel, fishing trip);*
            - *define the stratification criteria and scale (e.g. temporal, geographical);*
            - *define the optimum sample size in each stratum (e.g. how many sample units must be collected in each stratum?).*
        - *b.2) random sampling (random selection of a number of elements from the population as whole, or from each stratum in the stratified random procedure).*
7) *Provide an indicator of quality as estimated from the information collected.*

Another challenge is that the information provided is widely acknowledged as scientifically valid. Particular attention should be placed on acquiring the most reliable information in order to avoid a perception that collected data are of poor quality, and, by extension, that scientific and management advice based on such data is weak too. Appropriate statistical procedures must be applied to estimate the allowable margin of error. In the GFCM context, countries are responsible of data quality and should ensure the accuracy, minimum bias and completeness of the data submitted.

Countries are expected to:

- develop statistically robust sampling design methods, with the minimum degree of associated error;
- identify strata that are representative of the population and capable of providing sufficient data for the required population;
- take into account temporal (e.g. monthly/quarterly) and spatial (e.g. GSA) segregation.

Chapter 4 – Acquisition of landing and effort data

Landing is usually considered as the amount (weight) of the catch harvested from the sea and brought ashore. Fishing effort is the amount of time and fishing capacity (e.g. GT) used to harvest fish. Effort measurements therefore allow an estimation of the pressure placed by fishing activities on fish stocks.

Landing and effort data may come from different sources and are usually derived from a combination of catch reports, logbooks, observers, market and/or landing survey or landing statistics from port authorities. They can be measured and classified by species, area, fishing gear used, and other factors, and can be collected during the same sampling process, or independently from each other.

Monitoring, both landing and effort, is fundamental to evaluate the performance of a fishery. This information, which could be also coupled with information on fish prices (Chapter 5), will make possible to keep track of the growth of a fishing fleet, evaluating changes in the status of the resources and performing basic analysis of the economic performance of fishing vessels.

Wherever possible, landing and effort data should be collected in an exhaustive way. A census approach would be ideal. However, in many cases, due to budget and human constraints, and due to the fact that in the region there are a very large number of fishing vessels landing their catches in a large number of small landing places, an appropriate sampling system is required (Sparre, 2000; Stamatopoulos, 2002; ICES, 2008).

For the collection of the requested data, the target population should comprise all the vessels, which in most countries could be derived from the fleet register on a yearly basis. Once the population is identified, it can be split and aggregated into homogeneous sampling strata (e.g. fleet segments), on the basis of fishing activity (e.g. trawlers, polyvalent), and of other similar physical characteristics (e.g. total length), as well as of geographical location (i.e. GSA). Within a country or subregion for example, the combination of industrial (i.e. trawlers) and artisanal fisheries plays an important role in sampling design, each having its own characteristics, its own relative importance and its own potential for the supply of data. A trawler may land once every two/three days, while a purse seiner with a small net may land every day, with a combination of species/individuals that is greater than that of a small vessel operating with artisanal gear (i.e. gillnet, trammel net) in the coastal zone. The sample units (i.e. vessels) are then selected randomly (or under some statistical criteria) within each of the stratum identified.

Furthermore, collecting and reporting fisheries statistics (i.e. landing and effort) from different countries and institutions generate a great variety of formats and contents of reported data (e.g. different units of measurement, the definition of statistical areas, the degree of coverage of the data collection system and other important measures). For example, the effort is routinely measured in units of time and/or amount of gear used, but alternative definitions exist, depending on the nature of the fishing unit (e.g. fishing vessel, gear) and the amount of resources expended by that unit. For this reason information should be collected in the most harmonized way. That is one of the purposes of this document, which recommends that effort data be reported according to the variables and aggregation levels as reported in Appendix F (by fleet segment - Appendix F.1, and by gear – Appendix F.2).

A major shortcoming in using landing data is also the species misidentification. Accurate species identification is one of the most important and difficult aspects of fishery-dependent sampling and is crucial to good fishery management. For many fisheries, however, estimating species-specific landings and the associated uncertainty can be difficult, especially in the case of complex multispecies fisheries: many groups of species (e.g. cephalopods and sharks, but also fish species) are difficult to identify and there are many species still awaiting formal scientific description. In some countries/areas, these difficulties in species identification have led to aggregated data simply being recorded as “sharks” or “mullidae” or “cephalopods”. Every effort should be made to ensure that the total landing of the commercial species is correctly identified and reported at species level. Moreover,

it is important to use the FAO three-alpha code and, where requested, the Latin binomial (i.e. scientific name), genus and species, in order to avoid any confusion between local names.

Chapter 5 - Acquisition of socio-economic data

The aim of a systematic collection of socio-economic data is to calculate appropriate fisheries indicators, so as to assess the economic and social aspects of fisheries and to evaluate the effects of management measures. The list of socio-economic variables (Task VI) considered in the DCRF will allow calculation of the most often used and efficient indicators. In general terms, socio-economic data can be collected through a census or a sample survey (Chapter 3). When considering the methodologies used in the collection and compilation of economic data, it is essential to bear in mind the wide variation in the structure of the fishing "industries" in the region. In particular, in the Mediterranean and Black Sea, there are a large number of fishing vessels operating as individual small enterprises, or small fishery enterprises managed at family level, while the fleets organized as large or medium enterprises represent a smaller share in terms of the number of units. In these cases, collection of accurate socio-economic data can be difficult, because access to primary data is fragmented and not structured in well-organized accounting systems. The typology of fishing enterprises also affects data collection methodologies, because in most cases the primary source of information is represented by *ad hoc* questionnaires and not by official balance sheets.

5.1 Data on revenues, expenditures, employment, prices by species and investments

Due to the structure of the Mediterranean and Black Sea fisheries, an appropriate sampling system has to be preferred to a census approach. The sampling survey (e.g. through questionnaires) may provide representative data that can be extended to the population as a whole.

A range of sampling methods could be employed to improve the likelihood that the sample is representative, although a risk always remains that the sample estimates are biased (e.g. the sample could be different in some way to the target population as a whole). However, as the standard error decreases with sample size, statistical techniques can assist in determining the optimal sampling sizes for a desired level of precision and confidence (Sabatella & Franquesa, 2004).

The use of a stratified random sample approach reduces the potential for sample bias, but requires additional information on the target population prior to sample selection. Where the complete sample for particular fleet segments cannot be achieved due to non-response, bias can be reduced by assigning weights to the individual sample responses, so as to rebalance the data. The potential bias arising directly from non-response can be reduced through the replacement of the non-responding boats by boats with similar characteristics, on the assumption that the similar boat is as representative as the boat that failed to respond (Sabatella & Franquesa, 2004).

Data on expenditures include crew wages (e.g. social security costs), energy costs (e.g. total energy costs of the vessel, obtained by multiplying the average annual costs of fuel per litre by the total amount of litres used), and other variable costs (e.g. production shipping, purchase of ice, purchase of boxes etc.).

Employment data refer to full-time equivalent (FTE – see section 5.3) and total employment (i.e. number of jobs on board, equal to the average number of persons working for and paid by the vessel).

Price by species can be considered as the value of landed products calculated on the basis of the ex-vessel (first sale) price of the products by target species. Investments relate to any improvement made to existing vessel/gear during the reference year.

5.2 Capital value and capital costs

Capital value is the sum of all assets (or liabilities) presented on the annual balance sheet. The capital value of the fishing firms considered for the scope of the DCRF comprises the following components:

- Fixed tangible assets – sea-based = vessel, engine, electronics, other equipment on board.
- Fixed tangible assets – shore based = buildings, cars and other facilities on shore.

The value of intangible assets (licences, quota, permits, etc.) plays an important role in operational decisions of fishing companies. However, this value is often difficult to estimate and it has therefore been excluded from the DCRF.

The estimation of capital value and capital costs should preferably follow the Perpetual Inventory Method (PIM), which is the most important international standard for valuation of tangible capital goods. This method has been exhaustively described by the OECD and is used by national statistical offices and the Farm Accounting Data Network in agriculture (Anonymous, 2011).

PIM proposes to determine the aggregated value of the tangible capital goods used in the current year by aggregating the value of all vintages (year classes). Such aggregation can be based either on historical, current or constant prices. Once the value of the capital goods in a given benchmark year has been determined, the capital value of each subsequent year is calculated by adding investments of that year (gross capital formation), revaluing the existing stock and subtracting the value of capital goods taken out of operation. The capital costs (depreciation and interest) are then calculated using an agreed depreciation schedule and interest rate.

Detailed descriptions of the methodologies to calculate the perpetual inventory method (PIM) are reported in *The Workshop on Calculating Capital Value Using PIM and Definition of DCF variables* (Anonymous, 2011).

The price per capacity unit is the main item for the entire valuation of Gross Capital Stock in fisheries. Its determination requires careful interpretation of the information collected on values of vessels and, if necessary, its adaptation. First, it is important to determine which value indicators can be reliably observed and collected. In principle, three or four types of observable value indicators exist:

- Historic prices, i.e. prices currently paid for newly constructed vessels.
- Second hand prices, i.e. prices currently paid for used vessels.
- Insurance premiums, which are based on insurance values, so insurance values can be derived from them.
- Insurance values, collected, for example, from company administrations or insurance companies.
- Book value as presented on the balance sheets (IREPA, 2006).

5.3 Full-time equivalent

Full-time equivalent (FTE) or “Full-time equivalent employment”, which equals the number of full-time equivalent jobs, is defined as total hours worked divided by the average annual number of hours worked in full-time jobs.

Assuming a full-time fishing year of 2000 hours (as in agriculture), labour input below this level should be considered as part-time. However, standard working time may vary by country and by economic activity or even by region. This means that different standard working times (thresholds) could be applied to different fisheries (country and fleet segments) in order to calculate FTE.

Chapter 6 - Acquisition of biological data

In order to obtain a complete overview of the fishery it is also necessary to monitor some biological variables of living resources (e.g. length distribution, age, weight, sex and maturity). Biological features of the individuals provide demographic information that is crucial for the assessment of stocks, which form the cornerstones of fishery management. For example, information on maturity affords an important understanding of biology and reproduction for initial management purposes and enables the separation of estimates of abundance into values representing the immature and mature populations; age provides a basis for estimating growth and mortality year-class strength variation. Therefore, it is crucial that this information is collected in a standardized and homogenous way.

Since sampling all fleet segments and all commercially important species could be difficult, biological data should only be reported for the major fleet segments and for the major group of species identified at the subregional level (Appendix A and section 6.3). The most important fleet segments can be identified and defined according to the procedure described in section 6.2.2.

6.1 Sampling from different data sources

As mentioned previously, the methods for collecting useful information on biological variables could be subdivided into fishery-dependent and fishery-independent data sources. Fishery-independent data collection from scientific surveys is not always possible: in some countries for example, due to their high costs, annual surveys are not carried out on a regular basis. On the other hand, fishery-dependent sources are more common. Each of these options has positive and negative aspects and the decision on whether to use any of these usually depends on different factors – such as the number of vessels in the fishery, the length of fishing trips, the type of required data and funding available to support data collection. A combination of two or more methods (e.g. sampling on board + at landing) is usually required for an adequate data collection.

In the case of biological variables, the sampling strata are still represented by the fleet segments, but the sampling unit will be the fishing trip, which in the Mediterranean and Black Sea, is equivalent in most cases to a fishing day. The fishing trip duration is the time used from the moment when the vessel leaves the port and when it returns to the port. It is important here that, in most cases, it is possible to allocate landing and biological sampling to a fishing trip in an unambiguous manner (although some trips could be more complex).

Biological data sources

(a) Sampling at landing/market places (fishery-dependent data)

(b) Sampling on commercial vessel (fishery-dependent data)

(c) Self-sampling (fishery-dependent data)

(d) Sampling on research vessel for experimental or/and scientific survey (fishery-independent data)

(a) Sampling at landing/market places

The collection of information through fisheries observer programmes at market/landing places is one of the most common methods used worldwide to collect biological data, species composition, etc. This is the preferred means of gaining accurate and in-depth data, although in most cases this may be restricted by a requirement to purchase fish. During sampling, it may be possible to collect a variety

of information, including fishing location and depth, type and amount of gear used, species identification and biological samples (i.e. length and weight). As reported in section 6.1, for the collection of biological data, the sampling unit is often linked to a fishing day/trip.

At the landing place, fish may be found in several different ways, as a bulk of mixed species, or separated by species (in boxes), or even by size categories. In all cases, when the total landing of a given species, or a fraction of a given species (e.g. juveniles or small size fish), is too abundant, it seems reasonable to make a sufficiently representative subsample. Statistical techniques, beyond the scope of this document, must be applied to obtain the optimum sample size (Gulland, 1966; Cochran, 1977; Baird, 1983; Pauly, 1983; Galluci et al., 1996).

For instance, to get data on the length composition of individuals in the landing, a subsample (e.g. a box) should be selected randomly from each fishing day per target species, also recording the total weight of the catch of that particular species. All the size categories of a given species should be represented in the sample (note: it is important not to collect biological parameters for only small or large individuals). These measurements can either be taken directly at the landing place (when feasible), or the sample can be purchased in order to collect additional biological parameters, such as age, individual weight, sex and maturity stages, and assess them later in the laboratory.

- Sampling mixed species – When faced with a mix of species for sampling, the first basic task is to estimate the proportions of each one in the bulk load. In this case, it will probably be necessary to take larger subsamples of fish from each location in the bulk. Each subsample should be of approximately similar size. There is no guarantee that a large load of fish will be homogeneously mixed. Ideally, sampling would give each fish in the load an equal chance of inclusion in the sample, but this is seldom achievable in practice, given restricted physical access, time and other difficulties. Therefore, to maximize the accuracy of the mean of the sample, the sample should be made up of subsamples of the species taken, for example, from several boxes. If this is impractical, collection of data should try to devise other practical ways to minimize the influence over the choice of individual species, so that all possible classes are present in the sample in roughly the same proportions as they are in the bulk. To improve accuracy further, the number of species collected in a sample should be large, but only if the species are selected independently.

- Sampling single species – For species divided into size categories, following market demand, a sample should be collected from each size category. To maximize accuracy in this case, the sample should be a composite from subsamples of individuals taken from several size categories. It is essential to record the total weight of landing for that species and, if present, for each size category.

(b) Sampling on board commercial vessel

At sea, ideally fishery observations should make a more precise record of the weight and/or number of individuals by species and per fishing hauls. Sampling on a boat poses many difficulties, apart from those associated with working on an unstable platform. On board commercial vessels, the data collectors must work in a way that will cause the least possible interference with the normal work of the crew and often, they will have a very limited time in which to obtain their samples. If it is not feasible to sample the entire fishing trip, some hauls should be taken randomly. There is no predefined list of hauls upon which one can base a random sample. The idea could be to make a kind of systematic sampling, spreading the samples equally during fishing day(s). On board, catches are often split into categories and subcategories depending on commercial values. For each main commercial species, the total weight should be collected.

(c) Self-sampling

Self-sampling occurs when fishers themselves collect, and sometimes process, biological samples and report on these. It is a tool that has been developed recently to obtain data in an affordable manner, often producing a higher rate of coverage (in time and space). At-sea sampling of commercial fishery

catches by observers could result in a relatively expensive exercise, in terms of cost and human resources. From this perspective, sampling by fishers (self-sampling) may offer an alternative, since a larger number of trips can be sampled at a lower cost. However, a major problem with the self-sampling approach is that some scientists and/or managers consider that the data provided by fishers may not have been collected in a sufficiently rigorous manner, and they may be biased as a result (Hoare et al., 2011). To avoid these problems, regular and accountable training sessions for fishers can be conducted to guarantee the accuracy and reliability of data collection. Communication, feedback, incentives and shared motivation are essential for good cooperation.

In the event of self-sampling activities, countries should ensure that:

- fishers are trained;
- protocols are well developed;
- results are scrutinized for flaws, and controlled for bias.

(d) Sampling on research vessel for experimental or/and scientific survey

Besides commercial fisheries' statistics, another source of information for biological data is fishery-independent data collected by scientific experimental survey at sea, carried out on commercial or scientific vessels. Surveys provide accurate indices of species/stock abundance and distribution, though the major problem is cost. Surveys require fishing with a standard vessel using standard fishing gear at predetermined fishing stations, selected according to a fixed-grid, fixed-site or stratified random sampling design. Such surveys provide an estimate of average fish density (e.g. per area swept by a trawl net; as fish encounters with longlines or gillnets; number of nautical miles for acoustic survey etc.) over the entire spatial range where the species might be found. It also provides mapping of the spatial distribution of density over the entire range.

In the Mediterranean and Black Sea, a number of countries already undertake regular fishery-independent surveys. Survey data for most species are regularly analysed. Hence, opportunities already exist for some countries to provide biological information for a number of species by analysing available data from these existing surveys. Scientific survey methods and procedures carried out in the Mediterranean and Black Sea are developed and available in different manuals (e.g. MedSudMed, 2006; SoleMon, 2011; Medias Handbook, 2012; Medits Handbook, 2013).

Information to be collected during each sampling day

at landing/market places or on board commercial vessels

- *fleet segment sampled;*
- *area (GSA) and time period;*
- *gear used;*
- *name of selected target species (Appendix A);*
- *length of all individuals contained in at least one sample (e.g. a single box) of the total commercial landing of that species;*
- *sample weight;*
- *total landed quantity (by weight) of the species selected for sampling;*
- *discarded fraction of the target species;*
- *total weight of all landed species.*
- *Incidental catch of vulnerable species*

6.2 Merging and selection of fleet segments

6.2.1 Merging procedures

In order to optimise the sampling, and according to the inputs received by the Subcommittee on Stock Assessment and the Subcommittee on Economic and Social Sciences (GFCM, 2015a, 2015b), fleet segments could be merged (i.e. aggregating length classes) if they:

- have similar exploitation patterns (targeting the same species);
- exploit the same portion of the population (i.e. juveniles or adults).

When a country proposes to aggregate fleet segments, the rationale and corresponding references (e.g. existing scientific studies) should be brought to the attention of the relevant subsidiary bodies, which in turn should confirm the similarity/homogeneity of the combined cells[19]. In the case of merged segments, the code to identify the newly defined fleet segment will be provided by the GFCM Secretariat.

At the beginning of each sampling year (starting from 2016), each country should submit a list of all fleet segments (based on Appendix B and/or fleet segments resulting from merging process, if any) operating in each GSA (see as an example template 1 below), using a standard template (Appendix N).

Template 1) Fleet segments operating in the GSA

GFCM subregion	*XX*
GSA	*XX*
Country	*XX*
Reference year	*XX*
1) List of all fleet segments operating in the GSA	**Notes**
Small-scale vessels with engine using passive gears < 6 m	
Small-scale vessels with engine using passive gears 6-12 m	
Beam trawlers 6-24 m	length classes have been merged because the exploitation pattern is the same
Pelagic trawlers 12-24 m	
Trawlers 6-24 m	vessels, independently from the length classes, exploit the same portion of the population
Longliners < 6 m	
Longliners 6-24 m	length classes have been merged because the exploitation pattern is the same
Polyvalent vessels 6-12 m	
Polyvalent vessels 12-24 m	
…….	…….

[19]Fleet segments aggregation described in Recommendation GFCM/33/2009/3 could be used as guidance.

6.2.2 Selection procedures

The collection of biological parameters for all fleet segments, identified by the country in each GSA (template 1), may be difficult to achieve for obvious and practical reasons (i.e. technical cost, human resources), and a selection of fleet segments to be sampled can help. Due to the fact that the main aim of a sampling plan is to estimate parameters that are representative of the population of interest, it is important to find the best compromise between quality and cost.

Following this rationale, only for biological data, a weighting procedure based on landing (tons), effort (fishing days) and economic values (total landing value) can be applied to identify the fleet segment to be sampled. To carry out this exercise, the mean values for the two years preceding the reference year (i.e. the year to which the collected data refer) should be used (e.g. for reference year 2013 this means values of 2011 and 2012 – Table 3).

The weighting procedure implies these three steps:

1) **Step one**
   Distribute yearly data on landings (tons), effort (fishing days) and value (economic value in national currency) as shown in Tables 3a, 3b and 3c in the examples below. These data, by year, should cover all country fleet segments operating in each GSA. It is important that *all* fleet segments, for which fishing activity has been recorded during the two years preceding the reference year are included in the initial weighting exercise.

Table 3a - Effort values (in fishing days) reported for each cell of the identified fleet segments (based on Appendix B and/or on fleet segments resulting from a merging process, if any). Data should be reported by GSA and by year (for each of the two years preceding the reference year).

		Fleet segments				
		Vessel groups	*Length classes (LOA)*			
			< 6 m	6 - 12 m	12-24 m	> 24 m
Polyvalent	P	Small-scale vessels without engine using passive gears	0	0	115	2
		Small-scale vessels with engine using passive gears	0	30	160	0
		Polyvalent vessels	1	4	20	2
Seiners	S	Purse seiners	0	3	0	0
		Tuna seiners	0	1	3	0
……..		……..	…..	…..	…..	…..

In each cell the total *number of fishing days* by fleet segment and per GSA is reported

Table 3b - Landing values (in tons) reported for each cell of the identified fleet segments (based on Appendix B and/or fleet segments resulting from a merging process, if any). Data should be reported by GSA and by year (for each of the two years preceding the reference year).

		Fleet segments				
		Vessel groups	*Length classes (LOA)*			
			< 6 m	6 - 12 m	12-24 m	> 24 m
Polyvalent	P	Small-scale vessels without engine using passive gears	0	0	250	12
		Small-scale vessels with engine using passive gears	0	65	325	09
		Polyvalent vessels	6	24	185	0
Seiners	S	Purse seiners	0	80	0	0
		Tuna seiners	0	150	2800	0
……..		……..	…..	…..	…..	…..

In each cell the total *landing* by fleet segment and per GSA is reported

Table 3c - Economic values of landing (in local currency), reported for each cell of the identified fleet segments (based on Appendix B and/or fleet segments resulting from a merging process, if any). Data should be reported by GSA and by year (for each of the two years preceding the reference year).

		Fleet segments				
		Vessel groups	*Length classes (LOA)*			
			< 6 m	6 - 12 m	12-24 m	> 24 m
Polyvalent	P	Small-scale vessels without engine using passive gears	0	0	27500	2300
		Small-scale vessels with engine using passive gears	0	3330	45000	0
		Polyvalent vessels	650	4400	9600	2850
Seiners	S	Purse seiners	0	5000	0	0
		Tuna seiners	0	1250	2300	0
……..		……..	…..	…..	…..	…..

In each cell the *total value of the landing* (in local currency) by fleet segment and per GSA is reported

2) Step two

Once all the cells of the fleet segments potentially active in each GSA have been filled in, the following steps should be taken:

- List all identified fleet segments (by GSA) following the procedure reported in Table 4.
- Calculate the *mean values* of the selected variable (e.g. effort) based on the two years preceding the reference year.
- Rank the fleet segment cells according to their share of the total effort, in different columns. The shares *(percentage contribution*) should then be added up starting with the largest figure. All fleet segments belonging to the top 90 percent share (*cumulative %*) will be selected for sampling.
- Repeat the same cumulative process for the other two variables (landings and economic value). The fleet segments in the top 90 percent, whether or not they coincide with the previous top 90 percent (e.g. by effort), will be added to the selection.

Table 4 – Example of a weighting exercise for the selection of fleet segments according to the number of fishing days (i.e. effort values):

- in the first column all the fleet segments identified in each GSA are reported;
- in the second column the total number of fishing days carried out in 2011 are reported;
- in the third column the total number of fishing days carried out in 2012 are reported;
- in the fourth column the mean value of fishing days for each fleet segment is reported for the two years preceding the reference year;
- the last two columns report the percentage (%) contribution of each fleet segment and the cumulative values (%) reached. Highlighted in grey are the fleet segments that have been selected, representing 90 percent in terms of fishing effort. These segments represent the basis for the collection of biological data.
- The same exercise should be repeated for each GSA and for landings and economic values contributions.

Fleet segments (GSA)	***total n fishing days 2011***	***total n fishing days 2012***	***Mean values***	***Percentage contribution %***	***Cumulative %***
Small-scale vessels with engine using passive gears 6-12	76 281.29	57 675.66	66 978.48	37.96	37.96
Longliners 12 - 24 m	37 215.3	49 594.56	43 404.93	24.60	62.56
Trawlers 12 - 24 m	38 726.13	31 651.7	35 188.92	19.94	82.50
Trawlers > 24 m	6 558.75	10 080.54	8 319.645	4.71	87.21
Pelagic trawlers 6 - 12 m	7 991.17	2 471.04	5 231.105	2.96	90.17
Trawlers 6 - 12 m	6 014.55	3 754.39	4 884.47	2.77	92.94
Small-scale vessels with engine using passive gears 12 - 24 m	4 689.74	3 310.71	4 000.225	2.27	95.21
Purse seiners 12 - 24 m	4 463.06	1 794.07	3 128.565	1.77	96.98
Longliners 6 - 12 m	2 693.12	1 795.27	2 244.195	1.27	98.25
Beam trawlers 6-12 m	1 518	1 403	1 460.5	0.83	99.08
Tuna seiners > 24 m	1 510.8	272.47	891.635	0.51	99.59
Small-scale vessels with engine using passive gears < 6 m	101.34	1 024.3	562.82	0.32	99.92
Beam trawlers < 6 m	336	0	168	0.10	100.00
Purse seiners 6 - 12 m	0	0	0	0.00	100.00
Beam trawlers > 24 m	0	0	0	0.00	100.00
(report all other fleet segments)	0	0	0	0.00	100.00
			176 463.5	100%	100%

3) Step three

In each GSA the sampling strata, for the estimation of the biological parameters (e.g. length, sex and maturity), will be constituted by all fleet segments above the 90 percent mark, even if they have been identified according to one of the cited criteria only (landings, values and effort).

In addition, a country may also add to the selection any fleet segment not picked up by the exercise but that may be of special importance for any other criteria (i.e.: conservation, ecological or social relevance).

At the beginning of each sampling year (starting from 2016), and based on the results of the weighting procedure, each country should submit a list of those fleet segments operating in each GSA that have been identified for the collection of biological variables, as well as those for which discard

information will be collected[20]. To provide these lists by GSA, countries should use a standard template (Appendix N – see example provided in template 2 below).

Template 2) Fleet segments selected for the collection of biological variables

GFCM subregion	*XX*	
GSA	*XX*	
Country	*XX*	
Reference year	*XX*	
2) List of fleet segments selected, through the weighting procedure, for the collection of biological variables	**Discards (Y/N)**	**Notes**
Trawlers 6-24 m	Yes	
Small-scale vessels with engine using passive gears 6-12 m	No	discard represent less than 10% of total catch
Polyvalent vessels 12-24 m	No	no discard
Longliners 6-24 m	No	discard represent less than 10% of total catch
……..	….	……

Once the fleet segments (strata) have been identified through the procedure described above, a certain number of fishing trips to be sampled (e.g. on board, at market, at landing place etc.) should be assigned to the selection. The number of fishing trips to be sampled should ensure good coverage for each of the fleet segments selected. Due to variations in the consistency and composition of fishery fleets, as well as in the corresponding extension and availability of fishing grounds, not only in the region, but also between subregions and countries, trips should be assigned within a country and in each GSA taking into account parameters such as gear, fishing ground and temporal stratification (e.g. month, season).

For the design of a proper stratified sampling exercise, the numbers of trips assigned to each fleet segment must be proportional to the effort and adjusted to the variability in the catches of that fleet segment. Statistical methods must be applied to calculate the right number of samples that takes into account this variability.

Where trips occur across two or more GSAs, sharing the same resources, the landing, effort and value data should be distributed proportionally among the different GSAs. When planning a sampling programme, the number of trips to sample per fleet segment becomes an expectation based on the fishing activities of the previous years, not a target, and may vary if the fleet's activities change over time.

6.3 Selection of species

Usually, due to restricted funds and personnel, it is not possible to collect data (e.g. biological data, effort data etc.) from all species of commercial interest. A limited number of species (namely priority species) should be selected as representative of the entire living resources. The concept of priority species represents a key factor for the management of fisheries resources (Barone et al., 2006; AdriaMed, 2007; Ungaro *et al*., 2008). In the context of data collection, priority species are those for which the most complete set of data are required. Their identification has to be based on criteria relevant to the objectives of the GFCM: development, conservation and management. In this regard, not only abundance, but also price and/or market demand and ecological importance should be taken

[20]Discards information should be collected only when the discard rate exceeds 10 percent of the total volume of catches for a given fleet segment in a given GSA.

into account as selection criteria. The use of different parameters to identify the priority species is helpful in assigning the correct importance to some species, which may not be very abundant, but which, for example, fetch a high market price.

According to these criteria, three different groups have been established, whereby species are listed at subregional level (GFCM subregions – Appendix L): the first group concerns the **frequency of assessments** (i.e. species that are regularly assessed); the second one concerns the **fishery's importance** (i.e. landing, catch and/or economic value); the third group is based on **conservation criteria** (i.e. endangered species) or impact of their presence on the ecosystem (i.e. non-indigenous species).

Criteria used to identify the main groups of species

Group 1: *Species for which assessment is regularly carried out.*

Group 2: *Species that are important in terms of landing and/or economic values at regional and subregional level, and for which assessment is not regularly carried out.*

Group 3: *Species within international/ national management plans and recovery and/or conservation action plans as well as non-indigenous species with the greatest potential impact.*

The lists of species identified for each group and GFCM subregion are presented in Appendix A. These lists should be considered as a dynamic tool; any change (i.e. deletion or insertion of species) should be brought to the attention of the relevant subsidiary bodies for approval. Future changes could therefore occur on the basis of the information gathered.

Countries are requested to collect biological information for all the species identified in all GFCM subregions (Appendix L) where their fisheries take place. For all the selected species in Group 1, Group 2 and Group 3, length data per fleet segment should be collected (Subtask VII.2 Length data – Chapter 2). Individual information on sex and length at maturity is mandatory for species belonging to G1 (Appendix A.1). Countries are also kindly invited to provide this information for species belonging to G2 and G3, if available (Appendixes A.2 and A.3).

Exceptions can be applied for the collection of biological data related to certain species, according to the following criteria:

1st the species is/are not present in the country;
2nd the species is present in the country, but its weight accounts for less than 2% of total landings of the country.

Both exemption rules are applicable to all countries within each group of identified species. However, the transmission of length data (Table VII.2 – Chapter 2) is strongly encouraged, at least for elasmobranches species (G3), even if the volume of catches does not reach the 2% of the total national landing. This aims to improve knowledge, especially for some rare elasmobranches species that have a sporadic and unconfirmed presence in the Mediterranean.

At the beginning of each sampling year (starting from 2016), each country should submit a list of the species (Appendix N), based on the identified regional species groups (Appendix A), for which data collection (i.e. length, sex and maturity) will be carried out.

This exercise, at country level, should be repeated for all of the three groups of species. Moreover if a species, which is not present in one of the three groups of species, is important at the national level for any reason, it can be added in the country's sampling scheme, specifying the reason. To provide this

list, countries should use a standard template (Appendix N – see example provided in template 3 below).

Template 3) Species for which data collection will be carried out

GFCM subregion	*XX*	
Country	*XX*	
Reference year	*XX*	
Group 1 species	**Data to be collected (Y/N)**	**Notes**
Merluccius merluccius	Yes	
Mullus barbatus	Yes	
Mullus surmuletus	Yes	
Parapenaeus longirostris	No	Species accounts for 1.2% of total national landings (below the 2% threshold)
Sardina pilchardus	No	Species is not present in the country
Nephrops norvegicus	Yes	
……	…..	
Group 2 species	**Data to be collected (Y/N)**	**Notes**
Eledone cirrhosa	Yes	
Diplodus annularis	No	Species accounts for 1.2% of total national landings (below the 2% threshold)
……	…..	

6.3.1 Length

Length frequency distribution provides information on the demographic structure of the sampled population. Length measures are easy to make, but require many observations in a well-defined and standardized way, in order to allow for comparison of results. The length measurements to be taken depend on the group of species under study. The length of fish and cephalopods is generally measured with graduated fish measuring instruments, called "ichthyometers", while calipers are used for crustaceans.

Bony fish and *Elasmobranchs* – For bony fish, sharks, skates and rays, the length should be considered as the total length (TL). The fish is measured to the lower half centimetre, from the tip of the snout to the end of the caudal fin (Figures 3a and 3b). In elasmobranchs, fork length (FL) could be recorded when the caudal fin is damaged and the total length cannot be taken. Country could also report length data using the standard length (SL). SL is defined as the measurement taken from the tip of the lower jaw to the posterior end of the hypural bone.

The length classes should be reported in centimetres (as a whole number, or half cm, e.g. 0.5, 1.0, 1.5 etc.).

a)

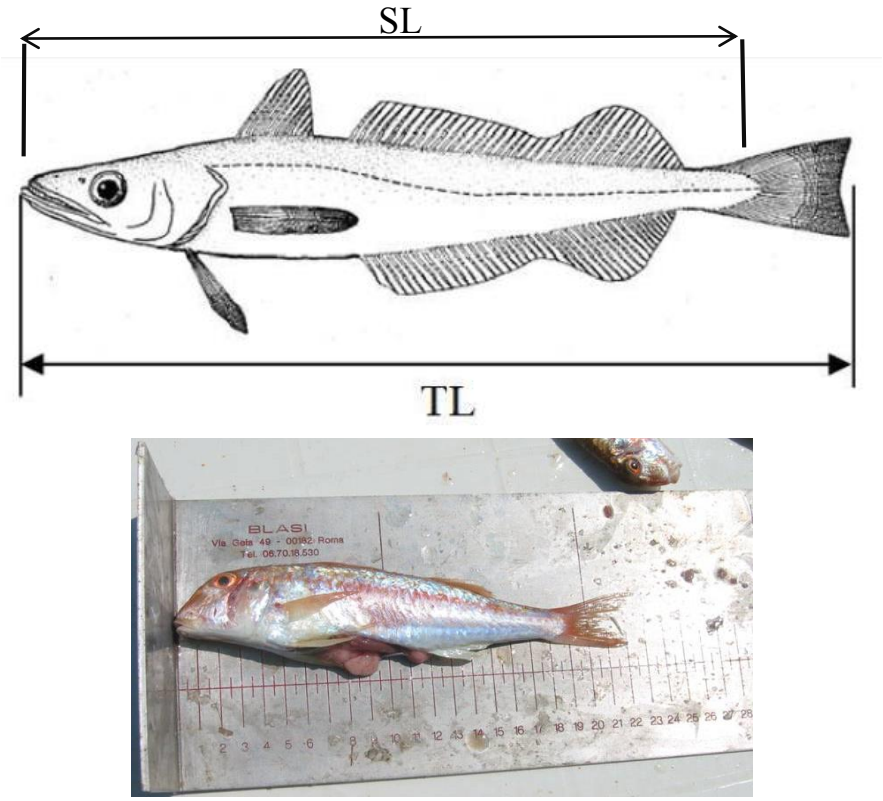


Figure 3a. Illustration showing the measurement of total length (TL) and standard length (SL) in bony fish. TL = Total Length (photo by Carpentieri P.).

b)

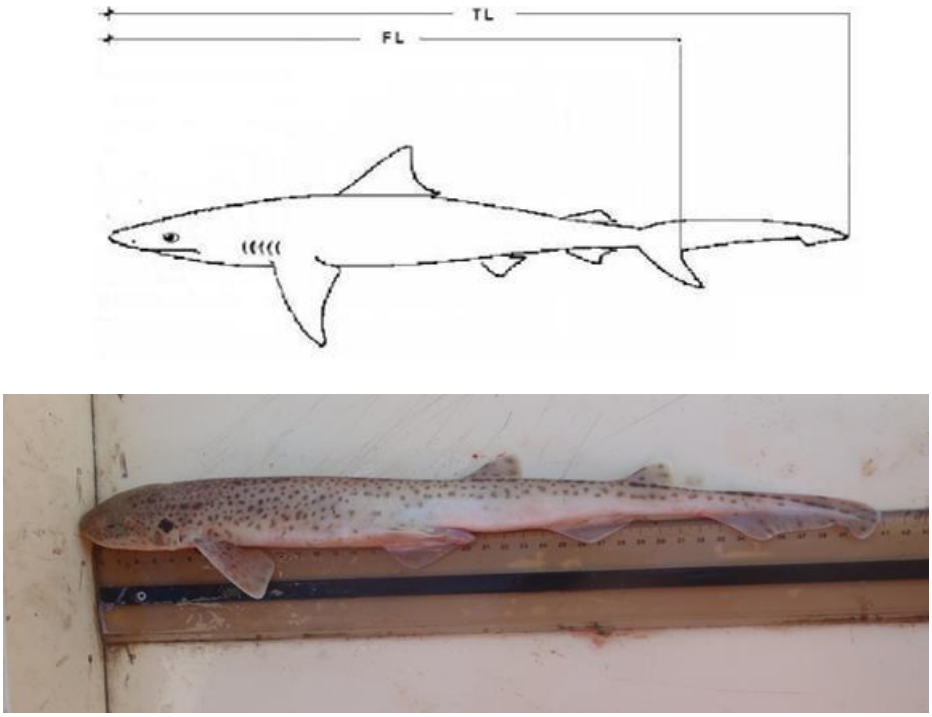


Figure 3b. Illustration showing the measurement of total length in elasmobranchs. TL = Total Length; FL = Fork Length (photo by Carpentieri P.).

Crustaceans – For crustaceans (lobsters, crawfish, shrimps, prawns, stomatopods), the standard measurement is the minimum length of the carapace length (CL). The length classes should be reported in millimetres (as a whole number, e.g. 1, 2, 3, 4 etc.). The crustacean is measured, to the lower millimetre (mm), from the back border of the eye orbit (inside of the eye socket) to the posterior margin of the carapace (Figure 4). All measurements are taken with calipers.

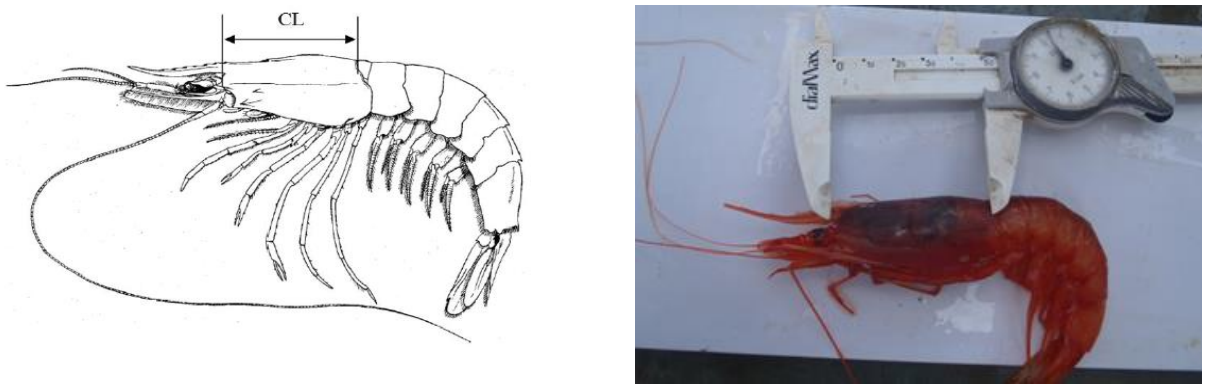


Figure 4. Illustrations showing the measurement of carapace length (CL) for crustacean's decapoda (photo by Carpentieri P.).

Cephalopods – For cephalopods, the length is the dorsal mantle length (ML). The length classes should be reported in centimetres (cm). The cephalopod is measured to the nearest lower half centimetre. The size should be reported in centimetres (as a whole number, or half cm, e.g. 0.5, 1.0, 1.5 etc.). For the Octopoda, measurement is taken along the median line, passing through the eyes, to the apex of the mantle, as shown in Figure 5a. For Decapoda, measurement is made along the dorsal midline from the mantle margin to the posterior tip of the body, excluding long tails (Figure 5b).

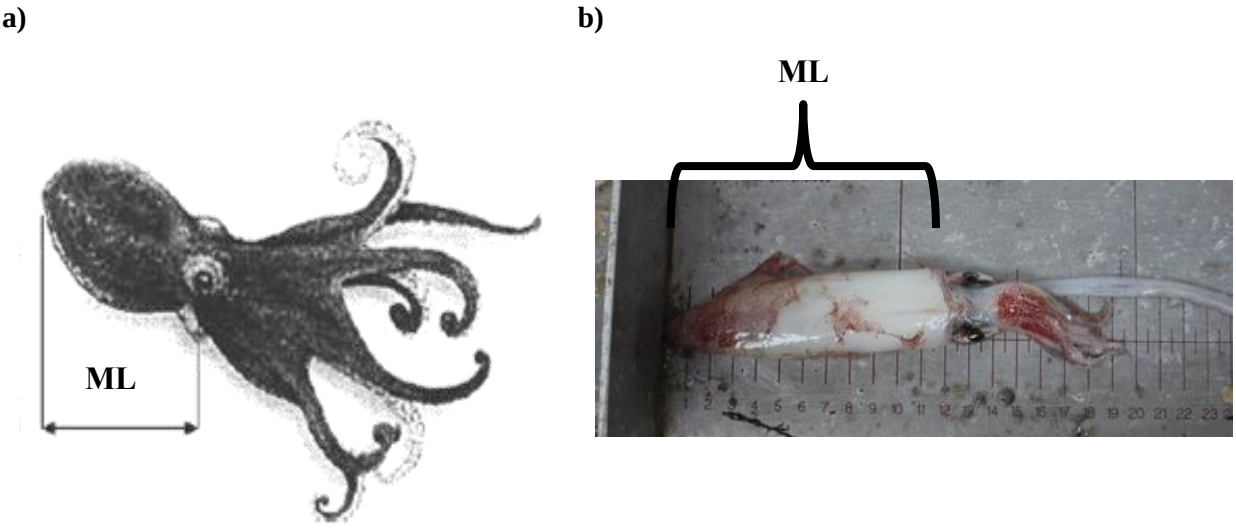


Figure 5. Illustrations showing the measurement of dorsal mantle length (ML) on cephalopods a) Octopoda and b) Decapoda (source: Dimech et al., 2012; MEDITS Handbook, 2013; photo by Carpentieri P.).

6.3.2 Weight

Individual weight is important biological information, although the weighing of individuals may prove to be more complex depending on prevailing conditions in the workplace. It is essential to establish length-weight relationships for all target species, because at some stage in stock assessments, lengths of fish have to be converted to weights of fish.

The choice of weighing device (e.g. hanging balance, electronic balance) depends on the size of the sampling and working conditions. For fish, elasmobranch and cephalopod species, the total weight of each individual could be reported to the nearest 1 g, using an electronic balance. In the case of crustaceans, the weight should be recorded to the nearest 0.1 g.

The length-weight relationship for single species requires a large set of data in order to obtain good representation of the entire "size ranges" of a species: from the smaller individuals to the larger ones. This will help to increase the accuracy of estimates. It is also important to stress that the length-weight relationship may vary seasonally, and between each sex.

6.3.3 Sex and maturity

Knowledge of the length of the species at maturity and of the spawning periods could improve best practices in the sustainable management of fisheries, particularly with respect to regulations on gear selectivity and fishing seasons.

Macroscopic observations can distinguish sex categories: Male (M), Female (F), Undetermined (U – when, after dissection, it was not possible to determine the species' sex with the naked eye) and Not Determined (ND – individual that has not been examined). It is also important to be aware that some

species are hermaphrodites. This means that fish can change sex during their lifespan, either from male to female (protandrous), or from female to male (protogynous). The change may occur more than once in a lifetime. Some hermaphrodite species have both sexes at the same time. In this latter case, the sex is determined on the basis of the most developed gonad and should be reported accordingly. Those definitions could be applied to all groups of fish, crustaceans, elasmobranchs and cephalopods.

Concerning maturity, the macroscopic determination of the maturation stage of a marine organism is a powerful tool for routinely monitoring "maturation schedules", whatever the scale chosen. It is important to remember that the maturation stage assigned to a given individual is relative to its adulthood condition. An "adult" fish caught and analysed macroscopically in a period that is different from its reproductive season can, in fact, have a resting (or spent) gonad that is similar in appearance to that of a juvenile fish. Ovary and testes change their aspect and their relative weight during maturation, according to the species' physiology, growth and/or external factors (environment and season).

A large number of macroscopic maturation scales is available in literature, varying from over-simplified scales comprising three to four stages, to highly specific and relatively complicated scales (up to nine stages). The need to adopt a common acceptable maturity scale, as well as to establish objective criteria for the definition of each maturity stage, is considered a crucial issue in order to give a common tool for exchanging data and scientific information. The macroscopic maturity stages presented in this document (Appendix G) are mostly based on the general aspect, shape, dimension, position and colour of the gonads. These scales derive from knowledge and experience gained during different surveys and ongoing working groups, carried out in the Mediterranean and Black Sea area (Ungaro, 2008; ICES, 2010a, 2010b; SoleMon, 2011; Dimech et al., 2012; Medias Handbook, 2012; Medits Handbook, 2013; Follesa *et al.*, 2015).

It is important that, whatever the maturity scales used by each country in their sampling process, the information gathered (Subtask VII.3 Other biological data – Chapter 2) should be submitted with reference to the maturity scales herein proposed (Appendix G).

Bony fish – The determination of sex for fish is only possible by dissecting individuals. Very few species have clear external sexual dimorphism, and it is therefore necessary to dissect the fish, since the internal body cavity must be exposed, and the shape and appearance of the gonads examined. In adult females, the eggs are readily seen in the ovaries; in adult males, the testes are typically smooth, whitish and non-granular (Figures 6 and 7).

For fish, a 4 stage scale (Appendix G.1) could be used to report the maturity stage (Medits Handbook, 2013). The stages (from 0 to 4) are based mainly on the relative volume, the consistency and the colour of the gonads, the presence of sperm in males and the presence and the degree of hydration of the eggs in females.

Figure 6. Sexual macroscopic determination of male (left) and female (right) of *Merluccius merluccius* (photos by Carpentieri P.)

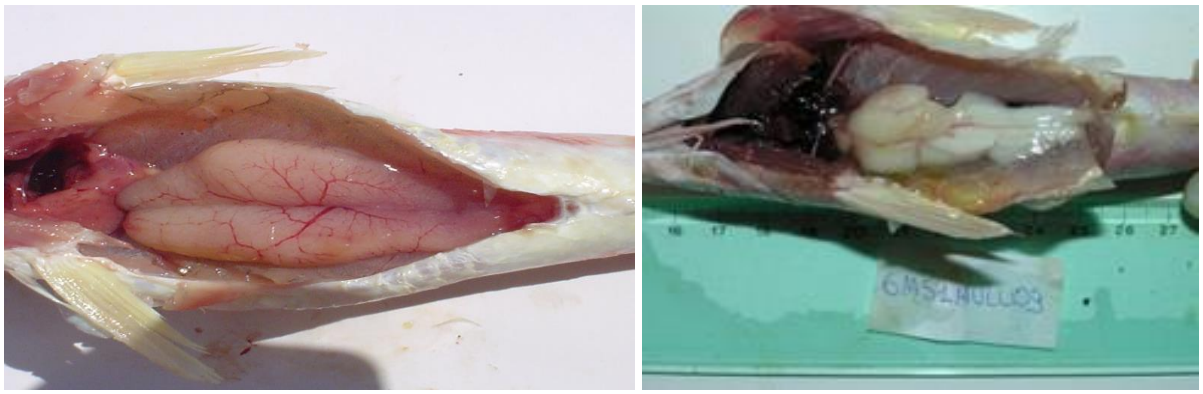


Figure 7. Sexual macroscopic determination of female (left) and male (right) of *Mullus surmuletus* (photos by University of Cagliari/Follesa C.).

Crustaceans – Sex for crustacean's decapods can be determined by the naked eye: the petasma (visible on the 2nd pleopods) and thelycum (present on 4th sternite) will indicate males and females, respectively (Figures 8a and 8b).

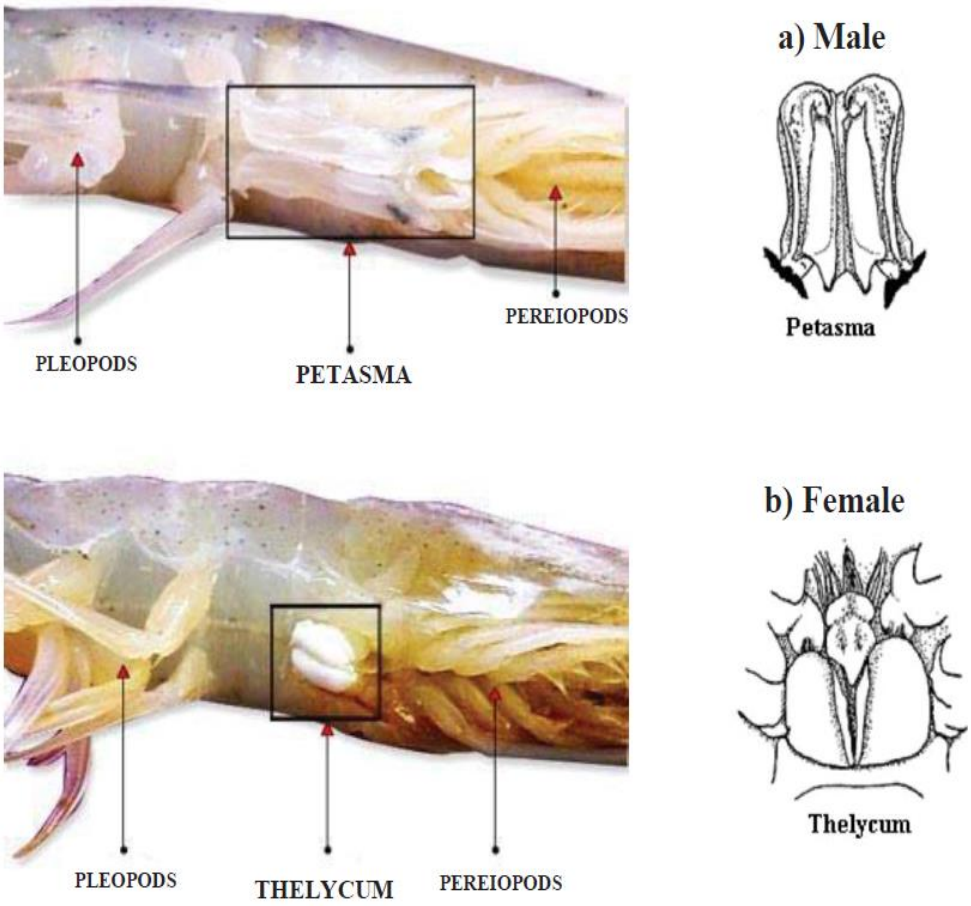


Figure 8. Illustrations showing the sexual macroscopic determination of sex in crustacean's decapods (source: Dimech et al., 2012).

For decapods, a five-stage scale (ICES, 2010a) has been chosen to report the maturity stage of the most common species (Appendix G.3). The maturity stage can be determined by examining the colouring and appearance of ovary lobes (females) and the fusion degree of the petasma, presence/absence of the spermatic masses on seminal ampullae and the dimension of the rostrum (males). However, in most cases, it is extremely difficult to determine the maturity stage of crustaceans macroscopically, and considerable experience is required.

The maturity scale proposed by Froglia (1996) was chosen to report maturity stages for stomatopods (i.e. *Squilla mantis*, Appendix G.5 and Figure 9).

Taking into account the difficulties in detailing the maturity condition of gonads in males at macroscopic level, no maturity scales for males were presented in this document.

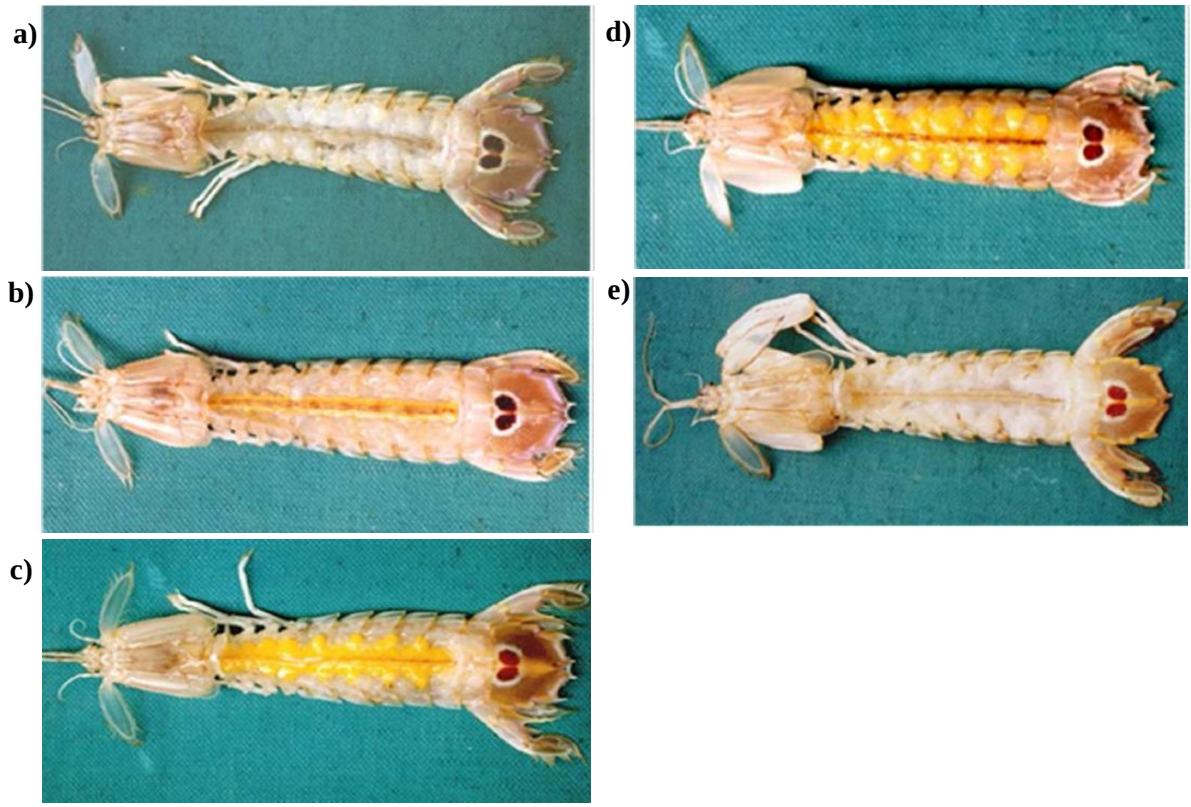
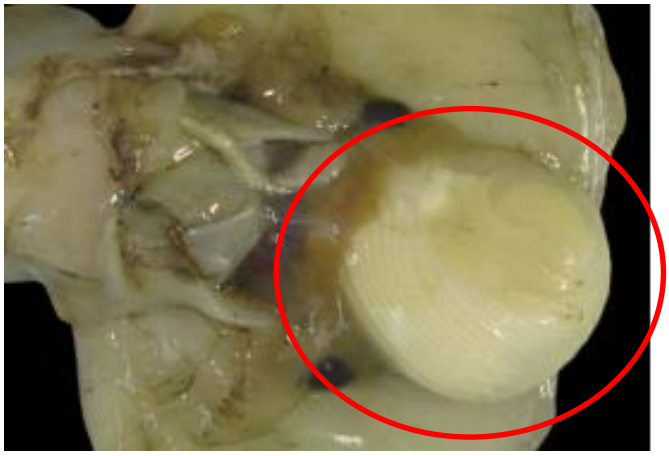


Figure 9. Illustrations showing the sexual macroscopic determination of sex in *Squilla mantis* females, ovaries (dorsal cuticle removed): a) immature b) early maturation c) advanced maturation d) ripe e) spent (source: SoleMon, 2011).

Cephalopods – In the case of cephalopods, sex can be determined by dissecting individuals and checking the presence of a) male and b) female gonads in the mantle cavity (Figures 10a and 10b).

a)



b)

Figure 10. Illustrations showing the sexual macroscopic determination of sex in cephalopods a) *Eledone cirrhosa* spawning male b) *Illex coindetti* spawning female (photos by University of Cagliari/Cuccu D.).

A three-stage scale of maturity (Medits Handbook, 2013) could be used to report the maturity in cephalopods (Appendix G.2). This scale is based on the development (or size, colouring and appearance) of ovary and nidamental glands in females and the development of testis and spermatophoric complex, including the Needham's sac in males.

Elasmobranchs – For sharks, rays and skates, sex can be determined by the naked eye: pterygopods are organs found on male elasmobranchs (Figure 11). Each male has two pterygopods (or claspers), located along the inner side of the shark or ray's pelvic fin and are used in reproduction. All elasmobranchs have internal fertilization.

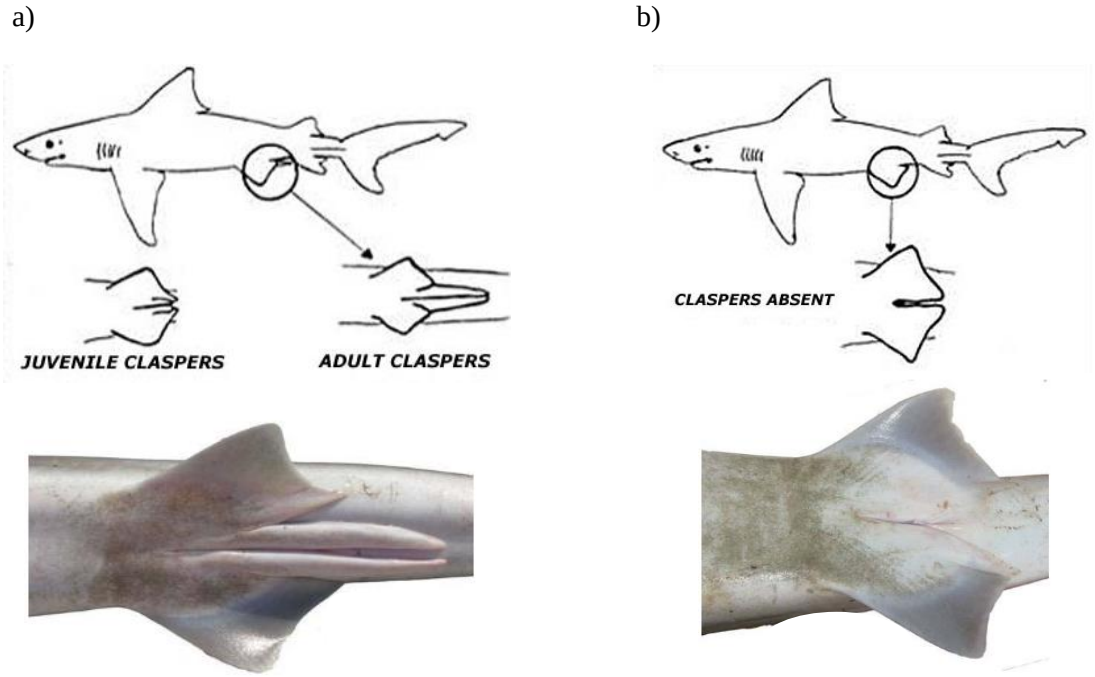


Figure 11. Illustrations showing the sexual macroscopic determination of sex in elasmobranchs a) Male b) Female (source: NOAA – Northeast Fisheries Science Centre).

Based on the degree of development of the pterygopods, it is possible to determine the maturity stages of males. Maturity of females must be determined by internal examination, identifying the development of gonads, ducts and shell glands and/or the presence of embryos and the egg dimensions. Generally, the reproductive system of females consists of ovaries (usually two, but in some species only one is present), shell glands and oviducts. In immature fish, the ovary is barely discernible and contains no eggs, whereas in maturing fish, white eggs are visible in the ovary. In mature fish, the ovaries contain yellow eggs, except immediately after ovulation, in viviparous species, and at the end of the spawning season in oviparous species. In viviparous species, maturity is also associated with changes in the size of the cloaca.

Until 2012, there was no international agreement on the maturity scales to be applied to elasmobranchs. In December 2012, a Workshop on Sexual Maturity Staging of Elasmobranchs – WKMSEL (ICES, 2013) was held, with the main objective of reaching agreement on a common maturity scale for elasmobranchs (sharks, skates and rays), oviparous and viviparous species, across laboratories and countries. The WKMSEL reviewed the maturity scales (Stehmann, 2002; Ungaro, 2008) in use, including in the Mediterranean areas, and proposed two new maturity scales, one for oviparous and other for viviparous species. These scales, based on the development (or size, colouring and appearance) of ovary and nidamental glands in females, and the development of testis and spermatophoric complex, including the Needham's sac in males, could be used to report maturity in elasmobranchs (Appendix G.4).

6.3.4 Age

Having comprehensive and accurate growth information is a key factor in the successful management of fishery resources: knowledge of the age of fish greatly improves population analyses of temporal variation in structure and abundance.

The aged sample also shows the age classes that the population is composed of, or, if the sample is from a particular fishery, the group of age classes exploited by that fishery. Fisheries exert strong selection for certain sizes and therefore ages: most fishing gear are designed to be size/age selective. Fisheries affect population mean size through size selective mortality. For this reason, in addition to the total increase in mortality rate caused by fishing, it is imperative to determine how increased mortality is distributed between age groups in the population.

The strength of each year class is used to forecast stock sizes in the future and show how successful spawning was in each year. The more estimates that can be obtained for the strength of a particular year class (e.g. from consistent sampling in consecutive years), the greater the confidence in the estimate for that year class. These estimates of year class strength can explain variations in total stock abundance and be used to predict future recruitment to the fishery. Moreover, differences in growth rates or population age structures between areas could indicate that multiple stocks occur.

Bony fish – There are several parts of a fish body that can be used for ageing. Currently, the preferred method of ageing fish is examination of otoliths, found within the fish's inner ear. Each year, calcium is deposited in these bony structures in a systematic manner, allowing for the counting of annuli. Scales, vertebrae and various bones can also be used, but otoliths are widely accepted as the best structure for many marine species.

Otoliths, commonly known as "earbones", are paired small and hard structures, located in the semi-circular canals directly behind the brain of bony fish. They are formed by the daily accretion of a layer of calcium carbonate structures, bound within a protein matrix (Figure 12). As the fish grows, a series of concentric opaque and hyaline (translucent) zones are formed. Since the opaque zones are formed in summer and the hyaline zones in winter, the age of the fish may be determined by counting the number of zones. Different species have otoliths of different shapes and sizes. Cartilaginous fish, such as sharks, skates, and rays, have none.

There are various techniques for the removal of otoliths from fish, the choice of which depends on the plane of the cranium section. For teleost, the most commonly used method is from the ventral side, behind the head after removal of the gills.

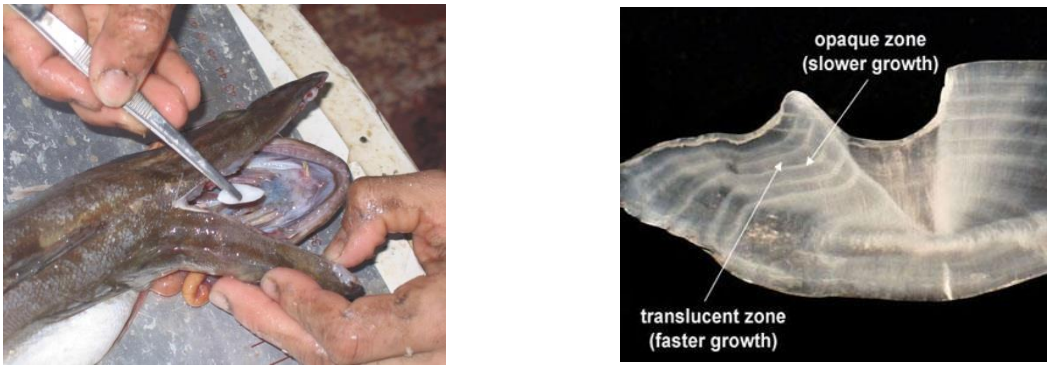


Figure 12. On the left, dissection of fish and extraction of the otolith (photo by Carpentieri P.). On the right, shape of otolith with the alternance of opaque and translucent zones.

The increased standardization in otolith readings between laboratories allows common guidelines, provided by *ad hoc* working groups or experts, to be followed (GFCM, 1982; Campana & Jones, 1992; MedSudMed, 2005; ICES, 2010c, 2010d; Campana, 2014; Carbonara *et al.*, 2015). At the same time, it is important to use different methods, such as the analysis of length frequency distributions, the temporal evolution of the annulus formation on the otolith margin and counts of daily rings, to validate the growth pattern derived from reading (macrostructure interpretation) of hard structures, such as otoliths.

Elasmobranchs – Elasmobranchs have cartilaginous skeletons and therefore lack bony structures with systematic calcium depositing; otoliths are absent and scales do not form discernible growth bands. Some elasmobranch species have hard spines that contain rings suitable for ageing. Most species of elasmobranchs, however, do not have spines, so vertebrae have been used as the ageing structure. Therefore, it is usually the vertebrae (or the fin spine, when present) that should be prepared for age determination. Vertebrae contain concentric pairs of opaque and translucent bands. Several methods have been developed to enhance the concentric pairs of opaque and translucent vertebral bands. Band pairs are counted like rings on a tree, before an age is assigned to the fish based on the count.

Vertebrae (Figure 13) for age determination are usually removed from the cervical or thoracic regions, although the optimal location depends on the species.

a) b)

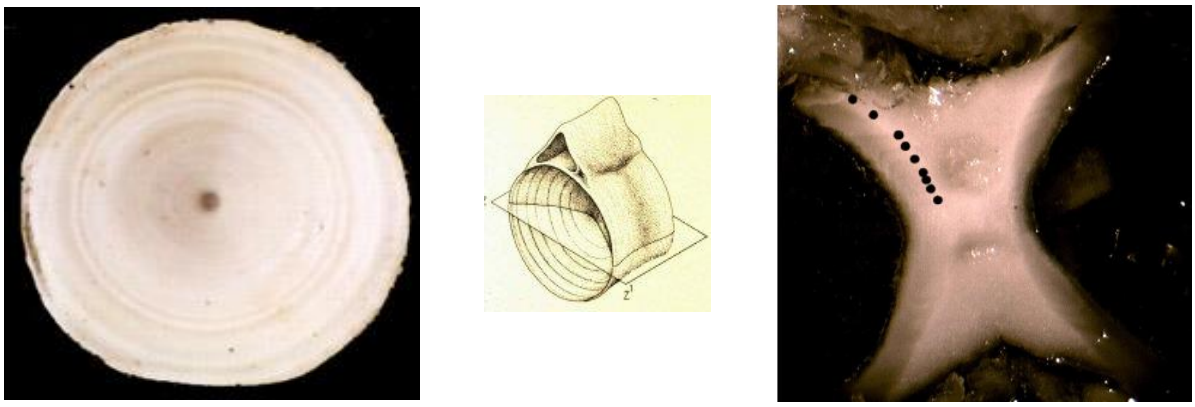


Figure 13. a) Individual vertebrae of an elasmobranch and example of a sagittal cut b) Enhanced vertebral images of *Raja asterias*, annotated to show annual growth bands (source: Campana, 2014).

For many species, the area over the posterior gill slit is often best. A comprehensive summary of more modern ageing methods for elasmobranchs is reported in an *ad hoc* manual (Campana, 2014).
In general, for many species – both elasmobranchs and bony fish – controversies over ageing methodology arise and may last for many years. This is often because several techniques have been used for the same species, and none has been validated to everyone's satisfaction. Indeed, for many species, no reliable or accepted ageing technique has been developed. The aim of age determination studies is to increase precision and accuracy: accuracy refers to the closeness of an age estimate to the true age, whereas precision is a measure of variability between individual readings, either within or between readers. Accuracy can only be assessed through validation experiments, either direct or indirect, while precision can be assessed through intercalibration exercises at different levels (i.e. precision among different readers and/or countries). Indices of precision, among different readers/institutes/countries, may also be a useful tool for conducting comparisons between readers and between methodologies (e.g. otoliths and vertebrae). They can also indicate samples that are "difficult", and that could produce unreliable estimates of age. In order to standardize age reading for target species in the region, the outputs of international workshops on otolith reading should be used as guidelines for interpretation.

Methods for age reading preparation, conservation, validation and programmes are beyond the scope of this document. However, some general principles of best practice on sample design for catch-at-age are summarized below:

- the number of otoliths/scales/vertebrae should be directly related to the number of age classes in the catch/population;

- age distribution in each reference collection should include all the fish length groups in the catch/landing, and should also ensure that older fish are adequately represented (i.e. from juveniles to very large individuals);

- reference collections should take into account any additional strata, such as sex or spatial units where necessary;

- quantifying precision and bias are important components of ageing studies. Regarding this issue, growth derived from otolith reading needs to be validated using different approaches (e.g. LFDs, seasonal pattern in annual formation, back-calculation, daily rings) before being adopted for any purposes (e.g. stock assessment);

- follow common guidelines, provided by *ad hoc* working groups.

Chapter 7 – Shared stocks

In the Mediterranean, the importance of shared fishery resources is widely recognized, and a list of shared stocks has already been proposed by SAC (GFCM, 2006) (Appendix I).

The term "shared fish stocks" is understood by FAO-GFCM as *"a group of exploitable organisms, distributed over, or migrating across, the maritime boundary between two or more national jurisdictions, or the maritime boundary of a national jurisdiction and the adjacent high seas, whose exploitation is carried out by more than one country and which can only be managed effectively through cooperation between all concerned States."*

In different Mediterranean and Black Sea GSAs, fleets of different countries exploit the same stocks/species, which are either pelagic (e.g. anchovy, sardine) or demersal (e.g. hake, red shrimps *Aristeus antennatus* and *Aristaeomorpha foliacea*), and which could be frequently found in international waters (i.e. outside the 6 or 12 nautical mile border, delimiting national waters). Since the activity of one fleet has a direct effect on the fishing opportunities of others exploiting the same fish stocks, and on the associated ecosystems, management measures applied only by a part of the operating fleets would have a very limited effect on these stocks.

To address this issue, it will be important that all the available information, for the most important commercial stocks in the different areas, be used in the best way possible to gather evidence on the occurrence of shared stocks. This information should be related to:

- fishery activities (catches, target species, landing sites and distribution of fleets and effort);
- existence of physical barriers to the species' lifecycle (e.g. continental shelf interrupted by deep waters);
- differences in biological parameters (e.g. growth, maturity, etc.);
- population genetic, morphological differences (e.g. otolith, meristics, etc.);
- larval dispersal, water circulation and distribution of nurseries and spawning grounds (e.g. fishery independent data source).

The term "shared stocks" can include the following definitions:

(a) Trans-boundary stocks – fish resources crossing the Exclusive Economic Zone (EEZ) boundary or national waters of one coastal State into the EEZ(s), or national waters, of one or more other coastal States.

(b) Highly migratory fish stocks – stocks that can be found both within the coastal State's EEZ/national waters and the adjacent high seas.

(c) Straddling stocks – fish stocks (with the exception of anadromous/catadromous stocks) that are found both within the coastal State's EEZ/national waters and the adjacent high seas.

(d) High seas fish stocks – stocks that can be found exclusively in the high seas.

On the basis of the above criteria, and of the outputs of the work carried out by the FAO regional projects (AdriaMed, 2007) and by GFCM SAC (GFCM, 2008), the list of shared stocks (Appendix I) can be regularly updated and thereafter brought to the attention of the relevant subsidiary bodies for approval.

Chapter 8 - Data quality

The quality of fisheries data is related to the precision and accuracy of measurements made on fisheries variables. It is subject to many factors, including data type, nature of fisheries and economic, social or ecological values of fisheries (Cochran 1977; FAO, 1999; Kolding & Ubal Giordano, 2002; Pennington et al., 2002; Vigneau & Mahevas, 2004; ICES, 2008, 2010e). All collected data contain some level of bias and random variation. Improvements needed in precision and accuracy often require greater relative expenditures on sampling and analysis.

Data quality must be ensured in all data collection phases: survey design, field and laboratory methods, data processing and transmission.

Errors deriving from different sources have different statistical characteristics: errors linked to direct measurement of fishery variables (e.g. length, weight), or to well-designed sampling programmes, are likely to be random and small. In some cases, errors associated with fisheries data can be non-random and biased, a characteristic of low-quality data.

Quality indicators such as statistical dispersion parameters are needed to perform quality controls. In the region, the definition of such indicators is in progress and needs to be agreed upon by all members in order to establish control routines.

Generally, a routine quality validation/control should be performed at both internal (e.g. country) and external level (e.g. GFCM Secretariat) to quantify the accuracy and precision level and, if problems are identified, they must be solved before datasets are assembled.

Internal validation

The design and implementation of statistical sampling schemes is placed under the responsibility of the each country.

In order to meet new data requirements established by the GFCM-DCRF, it may be necessary to improve, standardize and possibly modify current national data collection systems. A more efficient use of sampling resources may require the definition of best practices for sampling design and data analysis, with the aim to obtain accurate variable estimates with minimum bias and uncertainty levels.

It is fundamental that field collection, laboratory techniques and data processing be applied consistently and correctly. The integrity of the data should be also maintained and documented, from sample collection to entry in the data record.

Countries are expected to produce standard documents as reported below:

- *A standard operating procedure* which should include:
  - the quantitative goals of the monitoring programme;
  - the methodological details of all steps performed (e.g. fields and laboratory aspects);
  - details of the procedure related to the analysis and archiving of data.

- *A quality manual* which should describe:
  - the quality assurance system in place;
  - the frequency at which different aspects of quality assurance should be reviewed;
  - the standards that should be met;
  - the actions needed if the standards are not met.

Precision, accuracy, representativeness, completeness, and comparability are all components of the quality that should be taken into account.

Precision	Measure of the proportion of agreement among replicate measurements.
Accuracy	The degree to which a recorded measurement varies from a true or expected value.
Representativeness	The extent to which measurements represents the true value in the population.
Completeness	The proportion of valid data collected with regards the total expected.
Comparability	The extent to which data from different sources can be comparable.

External validation

This validation is performed by the GFCM Secretariat to assess the quality of data transmitted by countries. The Secretariat will:

- check the completeness of data collected;
- identify deficiencies in the data submissions;
- check differences between countries;
- check problems connected with the quality of existing time series, their completeness and the level of compatibility;
- check consistency with other sources of information/reference;
- identify significant discontinuities in time series of collected variables;
- identify significant outcomes.

Results of the external evaluation will be transmitted to the countries, so as to obtain their feedback and overcome any problems identified.

Chapter 9 - Data confidentiality and access policy

One of the key issues considered within the GFCM-DCRF is data confidentiality. In the context of regional data collection, there is a need for a series of common principles for data sharing and dissemination, to ensure confidentiality protection. These principles recall the concept of privacy viewed as a basic human right by the United Nations:[21]

Article 12 of the Universal Declaration of Human Rights
(General Assembly of the United Nations, 1948)
"No one shall be subjected to arbitrary interference with his privacy, family, home or correspondence, nor to attacks upon his honor and reputation. Everyone has the right to the protection of the law against such interference or attacks."

In this sense, the GFCM will, through its Secretariat, define and maintain high levels of protection for the data transmitted by countries complying with the GFCM data submission requirements, as endorsed by the Commission. To this extent, the Secretariat has recently established dedicated IT platforms, in line with recent trends at UN-level in terms of secure, flexible and cost-effective IT solutions supporting online cooperative activities and information management.

Countries will be responsible for the quality and completeness of the data sent to the GFCM. Data and information transmitted by countries will be treated by the GFCM Secretariat in accordance with all necessary measures to comply with GFCM security and confidentiality provisions. Once collected, data shall be made publicly available, in accordance with the following criteria:

Data confidentiality status (DCS)

Status		Definition	Access policy
P	**Public**	Not sensitive information	Users without online authentication
S	**Semi-private**	Partially sensitive information	Users with online authentication (e.g.: experts attending GFCM meetings)
R	**Private**	Sensitive information	Users with online authentication (e.g.: DCRF focal points, SAC, WGBS and GFCM bureau, GFCM Secretariat)

These criteria may be applied to both raw and aggregated data as defined in the related GFCM decisions. Raw data, classified as fully private, will be accessed by the head of delegation and DCRF focal point of the owner country only according to the security provision defined by the Commission. Particular attention will be given to crucial requirements such as the flexibility to address emerging needs in data submission, cost-efficiency, service levels, data security, and privacy provisions in compliance with relevant standards.

[21] Matthews, G. J. & Harel, O. Data confidentiality: A review of methods for statistical disclosure limitation and methods for assessing privacy. Statistics Surveys 5 (2011), 1--29. doi:10.1214/11-SS074. http://projecteuclid.org/euclid.ssu/1296828958

Chapter 10 - Data submission

The data submission to the GFCM Secretariat is meant to be performed by countries through the dedicated IT Online Platform, available within the GFCM extranet. This online system will allow countries to manage the data submission procedures and facilitate the communication with the GFCM Secretariat.

The overall online system will be equipped with an automated reminder to better assist countries in complying with GFCM data submission requirements, within deadlines endorsed at Commission level. Moreover, data validation mechanisms will be progressively put in place to ensure compliance with GFCM codifications, standards and data submission requirements (such as compulsory fields). The aim is to provide countries with a familiar and secure environment where the following services are delivered to national eligible users, for the sake of data transmission, through a single access credential system:

- Secure data submission tools leveraging a flexible and cost-effective infrastructure;
- Online wikis, training material and FAQ repositories allowing national eligible users to easily obtain any relevant training material and update regarding data requirements pertaining to the DCRF;
- At-a-glance compliance reporting system, providing countries with an immediate and exhaustive report of their overall compliance level;
- Historical records of data transmission by countries.

The design of the dedicated IT Online Platform considers several potential scenarios of data transmission workflows at the national level. If several persons in charge of various data topics, the access policies for such users could be adjusted in order to deliver relevant features only.

Through the dedicated IT Online Platform, several data transmission procedures will be made available in accordance to business needs and validation mechanisms entailed (online forms, upload of predefined Excel/Word templates).

APPENDICES

Appendix A - Priority species

A.1 - Group 1 species. Species that drive the fishery and for which assessment is regularly carried out.

	GFCM subregions	**Western Mediterranean Sea**	**Ionian Sea**	**Adriatic Sea**	**Eastern Mediterranean Sea**	**Black Sea**
	GSAs	*1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11*	*12, 13, 14, 15, 16, 19, 20, 21*	*17, 18*	*22, 23, 24, 25, 26, 27*	*28, 29, 30*
	Countries	*Algeria, France, Italy, Monaco, Morocco, Spain*	*Italy, Greece, Libya, Malta, Tunisia*	*Albania, Croatia, Italy, Montenegro, Slovenia*	*Cyprus, Egypt, Greece, Israel, Lebanon, Syrian Arab Republic, Turkey*	*Bulgaria, Romania, Turkey, (Georgia, Russian Federation, Ukraine)***
Scientific name	***FAO 3-alpha code***					
Engraulis encrasicolus	ANE	X	X	X	X	X
Merluccius merluccius	HKE	X	X	X	X	
Mullus barbatus	MUT	X	X	X	X	
Mullus surmuletus	MUR	X	X		X	
Nephrops norvegicus	NEP	X	X	X		
Parapenaeus longirostris	DPS	X	X	X	X	
Psetta maxima	TUR					X
Sardina pilchardus	PIL	X	X	X	X	
Sprattus sprattus	SPR					X
*Squalus acanthias**	DGS					X
Trachurus mediterraneus	HMM					X

** Species included in Appendix III (species whose exploitation is regulated) of the Barcelona Convention (protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean).*

*** All States, including non-members of the GFCM which are known to fish in its competence area, are encouraged to cooperate in joint actions undertaken in accordance with applicable international obligations (i.e. Article 63 UNCLOS).*

A.2 - Group 2 species. Species which are important in terms of landing and/or economic values at regional and subregional level, and for which assessment is not regularly carried out.

	GFCM subregions	**Western Mediterranean Sea**	**Ionian Sea**	**Adriatic Sea**	**Eastern Mediterranean Sea**	**Black Sea**
	GSAs	*1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11*	*12, 13, 14, 15, 16, 19, 20, 21*	*17, 18*	*22, 23, 24, 25, 26, 27*	*28, 29, 30*
	Countries	*Algeria, France, Italy, Monaco, Morocco, Spain*	*Italy, Greece, Libya, Malta, Tunisia*	*Albania, Croatia, Italy, Montenegro, Slovenia*	*Cyprus, Egypt, Greece, Israel, Lebanon, Syrian Arab Republic, Turkey*	*Bulgaria, Romania, Turkey, (Georgia, Russian Federation, Ukraine)**
Scientific name	***FAO 3-alpha code***					
Alosa pontica	SHC					X
Aristaeomorpha foliacea	ARS		X			
Aristeus antennatus	ARA	X				
Boops boops	BOG	X	X	X	X	
Chamelea gallina	SVE			X		
Coryphaena hippurus	DOL		X			
Diplodus annularis	ANN		X			
Eledone cirrhosa	EOI	X		X		
Eledone moschata	EDT			X		
Galeus melastomus	SHO	X				
Lophius budegassa	ANK	X	X			
Merlangius merlangius	WHG					X
Micromesistius poutassou	WHB	X				
Octopus vulgaris	OCC	X	X	X	X	
Pagellus bogaraveo	SBR	X				
Pagellus erythrinus	PAC	X	X	X	X	
Raja asterias	JRS	X				
Raja clavata	RJC	X	X			
Rapana venosa	RPW					X
Sardinella aurita	SAA	X	X		X	
Saurida undosquamis	LIB				X	
Scomber japonicus	MAS	X			X	
Scomber scombrus	MAC	X	X			
Sepia officinalis	CTC	X	X	X		
Siganus luridus	IGU				X	
Siganus rivulatus	SRI				X	
Solea vulgaris	SOL			X	X	
Sphyraena sphyraena	YRS		X			
Spicara smaris	SPC			X	X	
Squilla mantis	MTS			X		
Trachurus mediterraneus	HMM	X				
Trachurus picturatus	JAA	X				
Trachurus trachurus	HOM	X	X		X	

** All States, including non-members of the GFCM which are known to fish in its competence area, are encouraged to cooperate in joint actions undertaken in accordance with applicable international obligations (i.e. Article 63 UNCLOS).*

A.3 - Group 3 species. Species within international/ national management plans and recovery and/or conservation action plans; non-indigenous species with the greatest potential impact.

	GFCM subregions	**Western Mediterranean Sea**	**Ionian Sea**	**Adriatic Sea**	**Eastern Mediterranean Sea**	**Black Sea**
	GSAs	*1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11*	*12, 13, 14, 15, 16, 19, 20, 21*	*17, 18*	*22, 23, 24, 25, 26, 27*	*28, 29, 30*
	Countries	*Algeria, France, Italy, Monaco, Morocco, Spain*	*Italy, Greece, Libya, Malta, Tunisia*	*Albania, Croatia, Italy, Montenegro, Slovenia*	*Cyprus, Egypt, Greece, Israel, Lebanon, Syrian Arab Republic, Turkey*	*Bulgaria, Romania, Turkey, (Georgia, Russian Federation, Ukraine)***
Scientific name	***FAO 3-alpha code***					
Dalatias licha	SCK	X	X	X	X	
Dipturus oxyrinchus	RJO	X	X	X	X	
Etmopterus spinax	ETX	X	X	X	X	
Galeus melastomus	SHO		X	X	X	
Hexanchus griseus	SBL	X	X	X	X	
*Mustelus asterias**	SDS	X	X	X	X	
*Mustelus mustelus**	SMD	X	X	X	X	
*Mustelus punctulatus**	MPT	X	X	X	X	
Myliobatis aquila	MYL	X	X	X	X	
*Prionace glauca**	BSH	X	X	X	X	
Pteroplatytrygon violacea	PLS	X	X	X	X	
Raja asterias	JRS		X	X	X	
Raja clavata	RJC			X	X	X
Raja miraletus	JAI	X	X	X	X	
Scyliorhinus canicula	SYC	X	X	X	X	X
Scyliorhinus stellaris	SYT	X	X	X	X	
*Squalus acanthias**	DGS	X	X	X	X	
Squalus blainvillei	QUB	X	X	X	X	
Torpedo marmorata	TTR	X	X	X	X	
Torpedo torpedo	TTV	X	X	X	X	
Fistularia commersonii	FIO				X	
Lagocephalus sceleratus	LFZ				X	
Marsupenaeus japonicus	KUP				X	
Metapenaeus stebbingi	MNG				X	
Scomberomorus commerson	COM				X	
Corallium rubrum	COL	X	X	X	X	
Anguilla anguilla	ELE	X	X	X	X	

** Species included in Appendix III (species whose exploitation is regulated) of the Barcelona Convention (protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean).*

***All States, including non-members of the GFCM which are known to fish in its competence area, are encouraged to cooperate in joint actions undertaken in accordance with applicable international obligations (i.e. Article 63 UNCLOS).*

Appendix B - Fleet segments
(Combination of vessel groups and length classes)

Vessel groups			Length classes (LOA)			
			< 6 m	**6 - 12 m**	**12-24 m**	**> 24 m**
Polyvalent	**P**	Small-scale vessels without engine using passive gears	**P-01**	**P-02**	**P-03**	**P-04**
			P-13			
		Small-scale vessels with engine using passive gears	**P-05**	**P-06**	**P-07**	**P-08**
		Polyvalent vessels	**P-09**	**P-10**	**P-11**	**P-12**
					P-14	
Seiners	**S**	Purse seiners	**S-01**	**S-02**	**S-03**	**S-04**
					S-09	
		Tuna seiners	**S-05**	**S-06**	**S-07**	**S-08**
					S-10	
Dredgers	**D**	Dredgers	**D-01**	**D-02**	**D-03**	**D-04**
				D-05		
Trawlers	**T**	Beam trawlers	**T-01**	**T-02**	**T-03**	**T-04**
		Pelagic trawlers	**T-05**	**T-06**	**T-07**	**T-08**
				T-13		
		Trawlers	**T-09**	**T-10**	**T-11**	**T-12**
Longliners	**L**	Longliners	**L-01**	**L-02**	**L-03**	**L-04**
				L-05		

Notes:

- *A vessel is assigned to a group on the basis of the dominant gear used in terms of percentage of time: more than 50 percent of the time at sea using the same fishing gear during the year.*
- *"Polyvalent vessels" are defined as all the vessels using more than one gear, with a combination of passive and active gears, none of which exceeding more than 50 percent of the time at sea during the year.*
- *A vessel is considered "active" when it executes at least one fishing operation during the reference year in the GFCM area of application.*
- *The yellow cells contain the codes of reported fleet segments which should be included in the GFCM data submission. If necessary, fleet segments as identified in the orange cells can be used: P-13 (P-01 + P-02), P-14 (P-11 + P-12), S-09 (S-03 + S-04), S-10 (S-07 + S-08), D-05 (D-02 + D-03), T-13 (T-06 + T-07 + T-08) and L-05 (L-02 + L-03 + L-04). Any proposal for a different aggregation of fleet segments should be brought to the attention of the relevant GFCM subsidiary bodies, mentioning the rationale and corresponding references (e.g. existing scientific studies), which in turn should confirm the similarity/homogeneity of the combined cells.*

Appendix C - Fisheries Restricted Areas (FRAs)

Name of FRA	Country	GSA	km^2
Lophelia reef off Capo Santa Maria di Leuca	Italy	GSA 19	1 672.6
The Nile delta area cold hydrocarbon seeps	Egypt	GSA 26	6 042.6
The Eratosthemes Seamount	Cyprus	GSA 25	14 791.6
Gulf of Lion	France	GSA 7	3 741.6

As per Recommendation GFCM/30/2006/3, fishing with towed dredges and bottom trawl nets shall be prohibited in the areas bounded by lines joining the following coordinates:

a) Deep sea fisheries restricted area "Lophelia reef off Capo Santa Maria di Leuca"

39º 27.72' N, 18º 10.74' E
39º 27.80' N, 18º 26.68' E
39º 11.16' N, 18º 04.28' E
39º 11.16' N, 18º 32.58' E

b) Deep sea fisheries restricted area "Nile delta area cold hydrocarbon seeps"

31° 30.00' N, 33° 10.00' E
31° 30.00' N, 34° 00.00' E
32° 00.00' N, 34° 00.00' E
32° 00.00' N, 33° 10.00' E

c) Deep sea fisheries restricted area "Eratosthemes Seamount"

33° 00.00' N, 32° 00.00' E
33° 00.00' N, 33° 00.00' E
34° 00.00' N, 33° 00.00' E
34° 00.00' N, 32° 00.00' E

For demersal stocks, fishing effort of vessels using towed nets, bottom and midwater longlines and/or bottom-set nets shall not exceed the level of the fishing effort applied in 2008 in the fisheries restricted area of the eastern Gulf of Lions, as bounded by lines joining the following geographic coordinates (Recommendation GFCM/33/2009/1):

d) "Gulf of Lion"

42°40'N, 4°20' E;
42°40'N, 5°00' E;
43°00'N, 4°20' E;
43°00'N, 5°00' E;

Appendix D - Fishing gears[22]

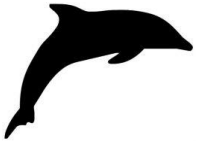
Gear name	Code
Purse seine without purse lines (lampara)	LA
Purse seine with purse lines (purse seines)	PS
One boat-operated purse seines	PS1
Two boat-operated purse seines	PS2
Beach seines	SB
Danish seines	SDN
Pair seines	SPR
Scottish seines	SSC
Boat or vessel seines	SV
Seine nets (not specified)	SX
Otter trawls (not specified)	OT
Bottom otter trawls	OTB
Midwater otter trawls	OTM
Otter twin trawls	OTT
Pair trawls (not specified)	PT
Bottom pair trawls	PTB
Midwater pair trawls	PTM
Bottom trawls	TB
Bottom beam trawls	TBB
Bottom nephrops trawls	TBN
Bottom shrimp trawls	TBS
Midwater trawls	TM
Midwater shrimp trawls	TMS
Other trawls (not specified)	TX
Boat dredges	DRB
Hand dredges	DRH
Lift nets (not specified)	LN
Boat-operated lift nets	LNB
Portable lift nets	LNP
Shore-operated stationary lift nets	LNS
Cast nets	FCN

Gear name	Code
Falling gear (not specified)	FG
Gillnets and entangling nets (not specified)	GEN
Gillnets (not specified)	GN
Encircling gillnets	GNC
Driftnets	GND
Fixed gillnets (on stakes)	GNF
Set gillnets (anchored)	GNS
Combined gillnets-trammel nets	GTN
Trammel nets	GTR
Aerial traps	FAR
Traps (not specified)	FIX
Stationary uncovered pound nets	FPN
Pots	FPO
Stow nets	FSN
Barrier, fences, weirs, etc.	FWR
Fyke nets	FYK
Handlines and pole-lines (mechanized)	LHM
Handlines and pole-lines (hand operated)	LHP
Longlines (not specified)	LL
Drifting longlines	LLD
Set longlines	LLS
Trolling lines	LTL
Hooks and lines (not specified)	LX
Harpoons	HAR
Pumps	HMP
Mechanized dredges	HMD
Harvesting machines (not specified)	HMX
Miscellaneous gear	MIS
Recreational fishing gear	RG
Gear not known or not specified	NK

[22] International Standard Statistical Classification of Fishing Gear (ISSCFG)

Appendix E - Vulnerable species

E.1 – Vulnerable species. List of vulnerable species included in Appendix II (endangered or threatened species) and Appendix III (species whose exploitation is regulated) of the Barcelona Convention (*Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean*). The list also contains the Amendments of Annexes II and III of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (2012/510/EU: *Council Decision of 10 July 2012, establishing the position to be adopted on behalf of the European Union with regard to the amendments to Annexes II and III to the Protocol concerning Specially Protected Areas and Biological Diversity SPA/BD in the Mediterranean of the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, adopted by the seventeenth meeting of the Contracting Parties, Paris, France, 8 - 10 February 2012*).

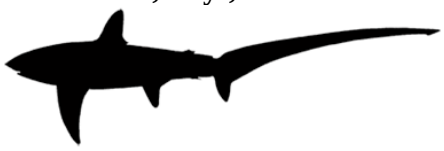
Group of vulnerable species	Family	Species	Common name
Cetaceans 	Balaenopteridae	*Balaenoptera acutorostrata*	Common minke whale
		Balaenoptera borealis	Sei whale
		Balaenoptera physalus	Fin whale
		Megaptera novaeangliae	Humpback whale
	Balenidae	*Eubalaena glacialis*	North Atlantic right whale
	Physeteridae	*Physeter macrocephalus*	Sperm whale
		Kogia simus	Dwarf sperm whale
	Phocoenidae	*Phocoena phocoena*	Harbour porpoise
	Delphinidae	*Steno bredanensis*	Rough-toothed dolphin
		Grampus griseus	Risso's dolphin
		Tursiops truncatus	Common bottlenose dolphin
		Stenella coeruleoalba	Striped dolphin
		Delphinus delphis	Common dolphin
		Pseudorca crassidens	False killer whale
		Globicephala melas	Long-finned pilot whale
		Orcinus orca	Killer whale
	Ziphiidae	*Ziphius cavirostris*	Cuvier's beaked whale
		Mesoplodon densirostris	Blainville's beaked whale
Seals	Phocidae	*Monachus monachus*	Mediterranean monk seal

Group of vulnerable species	Family	Species	Common name
Sharks, Rays, Chimaeras	Alopiidae	*Alopias vulpinus*	Common thresher
	Carcharhinidae	*Carcharias taurus*	Sand tiger
		Carcharhinus plumbeus	Sandbar shark
		Carcharodon carcharias	Great white shark
		Prionace glauca	Blue shark
	Centrophoridae	*Centrophorus granulosus*	Gulper shark
	Cetorhinidae	*Cetorhinus maximus*	Basking shark
	Gymnuridae	*Gymnura altavela*	Spiny butterfly ray
	Hexanchidae	*Heptranchias perlo*	Sharpnose sevengill shark
	Lamnidae	*Isurus oxyrinchus*	Shortfin mako
		Lamna nasus	Porbeagle
	Myliobatidae	*Mobula mobular*	Devil fish
	Odontaspididae	*Odontaspis ferox*	Small-tooth sand tiger shark
	Oxynotidae	*Oxynotus centrina*	Angular rough shark
	Pristidae	*Pristis pectinata*	Smalltooth sawfish
		Pristis pristis	Common sawfish
	Rajidae	*Dipturus batis*	Common skate
		Leucoraja circularis	Sandy ray
		Leucoraja melitensis	Maltese skate
		Rostroraja alba	Bottlenose skate
	Rhinobatidae	*Rhinobatos cemiculus*	Blackchin guitarfish
		Rhinobatos rhinobatos	Common guitarfish
	Sphyrnidae	*Sphyrna lewini*	Scalloped hammerhead
		Sphyrna mokarran	Great hammerhead
		Sphyrna zygaena	Smooth hammerhead
	Squatinidae	*Squatina aculeata*	Sawback angel shark
		Squatina oculata	Smoothback angel shark
		Squatina squatina	Angel shark
	Triakidae	*Galeorhinus galeus*	School/Tope shark

Group of vulnerable species	Family	Species	Common name
Sea birds	Falconidae	*Falco eleonorae*	Eleonora's falcon
	Cerylidae	*Ceryle rudis*	Pied kingfisher
	Charadriidae	*Charadrius alexandrinus*	Kentish plover
		Charadrius leschenaultii columbinus	Greater sand plover
	Halcyonidae	*Halcyon smyrnensis*	White-throated kingfisher
	Hydrobatidae	*Hydrobates pelagicus*	European storm petrel
		Hydrobates pelagicus melitensis	European storm petrel
		Hydrobates pelagicus pelagicus	European storm petrel
	Laridae	*Larus audouinii*	Audouin's gull
		Larus armenicus	Armenian gull
		Larus genei	Slender-billed gull
		Larus melanocephalus	Mediterranean gull
	Pandionidae	*Pandion haliaetus*	Osprey
	Pelecanidae	*Pelecanus crispus*	Dalmatian pelican
		Pelecanus onocrotalus	Great white pelican
	Phalacrocoracidae	*Phalacrocorax aristotelis*	European shag
		Phalacrocorax pygmaeus	Pygmy cormorant
	Phoenicopteridae	*Phoenicopterus ruber*	American flamingo
	Procellariidae	*Calonectris diomedea*	Cory's shearwater
		Puffinus puffinus yelkouan	Yelkouan shearwater
		Puffinus yelkouan	Mediterranean shearwater
		Puffinus muretanicus	Balearic shearwater
	Scolopacidae	*Numenius tenuirostris*	Slender-billed curlew
	Sternidae	*Sterna albifrons*	Little tern
		Sterna bengalensis	Lesser crested tern
		Sterna sandvicensis	Sandwich tern
		Sterna caspia	Caspian tern
		Sterna nilotica	Gull-billed tern

Group of vulnerable species	Family	Species	Common name
Sea turtles	Cheloniidae	*Caretta caretta*	Loggerhead turtle
		Chelonia mydas	Green turtle
		Eretmochelys imbricata	Hawksbill Turtle
		Lepidochelys kempii	Kemp's ridley sea turtle
	Dermochelyidae	*Dermochelys coriacea*	Leatherback sea turtle
	Trionychidae	*Trionyx triunguis*	African softshell turtle

E.2 – Rare elasmobranchs species. This list reports elasmobranchs species that are considered rare but are present in the Mediterranean and the Black Sea (Bradai et al., 2012).

Group of rare species	Family	Species	Common name
Sharks, Rays, Chimaeras 	Alopiidae	*Alopias superciliosus*	Bigeye thresher
	Hexanchidae	*Hexanchus nakamurai*	Bigeye sixgill shark
	Echinorhinidae	*Echinorhinus brucus*	Bramble shark
	Squalidae	*Squalus megalops*	Shortnose spurdog
	Centrophoridae	*Centrophorus uyato*	Little gulper shark
	Somniosidae	*Centroscymnus coelolepis*	Portugese dogfish
		Somniosus rostratus	Little sleeper shark
	Lamnidae	*Isurus paucus*	Longfin mako
	Scyliorhinidae	*Galeus atlanticus*	Atlantic catshark
	Carcharhinidae	*Carcharhinus altimus*	Bignose shark
		Carcharhinus brachyurus	Bronze whaler shark
		Carcharhinus brevipinna	Spinner shark
		Carcharhinus falciformis	Silky shark
		Carcharhinus limbatus	Blacktip shark
		Carcharhinus melanopterus	Blacktip reef shark
		Carcharhinus obscurus	Dusky shark
		Galeocerdo cuvier	Tiger shark
		Rhizoprionodon acutus	Milk shark
	Torpedinidae	*Torpedo nobiliana*	Great torpedo
		Torpedo sinuspersici	Variable torpedo ray
	Rajidae	*Dipturus nidarosiensis*	Norwegian skate
		Leucoraja fullonica	Shagreen skate
		Leucoraja naevus	Cuckoo skate
		Raja africana	African skate
		Raja brachyura	Blonde skate
		Raja montagui	Spotted skate
		Raja polystigma	Speckled skate
		Raja radula	Rough skate
		Raja undulata	Undulate skate
	Dasyatidae	*Dasyatis centroura*	Roughtail stingray
		Dasyatis marmorata	Marbled stingray
		Dasyatis pastinaca	Common stingray
		Dasyatis tortonesei	Tortonese's stingray
		Himantura uarnak	Honeycomb whipray
		Taeniura grabata	Round fantail stingray
	Myliobatidae	*Pteromylaeus bovinus*	Bullray
	Rhinopteridae	*Rhinoptera marginata*	Lusitanian cownose ray
	Sphyrnidae	*Sphyrna tudes*	Smalleye hammerhead

Appendix F - Fishing effort measurement

Mandatory

F.1 – Effort measurement by fleet segment

Fleet segments			Effort measurements		
Vessel groups		Length classes (LOA)	Unit of capacity	Unit of activity	Nominal effort
P	Small-scale vessels without engine using passive gears Small-scale vessels with engine using passive gears Polyvalent vessels	All	Net length [23] [24]	Fishing days	Net length * Fishing days
			Number of traps/pots [23]	Fishing days	Number of traps/pots * Fishing days
			Number of lines [23]	Fishing days	Number of lines * Fishing days
S	Purse seiners Tuna seiners	All	GT	Number of fishing sets [25] [26]	GT * number of Fishing sets
D	Dredgers	All	GT	Fishing days	GT * Fishing days
T	Beam trawlers Pelagic trawlers Trawlers	All	GT	Fishing days	GT * Fishing days
L	Long liners	All	Number of hooks	Fishing days	Number of hooks * Fishing days

[23] Length of net expressed in 100-metre units (FAO).
[24] Should this information not be available, "GT" may be used as capacity unit upon approval by relevant GFCM subsidiary bodies on a case-by-case basis.
[25] Number of times the gear has been set or shot, whether or not a catch was made (FAO).
[26] Should this information not be available, "fishing days" may be used as activity unit upon approval by relevant GFCM subsidiary bodies on a case-by-case basis.

F.2 – Effort measurement by fishing gear

Fishing gear		Gear code	Unit of capacity	Unit of activity	Nominal effort
Surrounding nets	With purse lines (purse seines)	PS	GT	Number of fishing sets [27] [28]	GT * Number of fishing sets
	One boat operated purse seines	PS1			
	Two boats operated purse seines	PS2			
	Without purse lines (lampara)	LA			
Seine nets	Beach seines	SB	Net length [29] [30]	Fishing days	Net length * Fishing days
	Boat or vessel seines	SV			
	Danish seines	SDN			
	Scottish seines	SSC			
	Pair seines	SPR			
	Seine nets (not specified)	SX			
Trawls	Bottom trawls	TB	GT	Fishing days	GT * Fishing days
	Bottom beam trawls	TBB			
	Bottom otter trawls	OTB			
	Bottom pair trawls	PTB			
	Bottom nephrops trawls	TBN			
	Bottom shrimp trawls	TBS			
	Midwater trawls	TM			
	Midwater otter trawls	OTM			
	Midwater pair trawls	PTM			
	Midwater shrimp trawls	TMS			
	Otter twin trawls	OTT			
	Otter trawls (not specified)	OT			
	Pair trawls (not specified)	PT			
	Other trawls (not specified)	TX			

[27] Number of times the gear has been set or shot, whether or not a catch was made (FAO).
[28] Should this information not be available, "fishing days" may be used as activity capacity upon approval by relevant GFCM subsidiary bodies on a case-by-case basis.
[29] Length of net expressed in 100-metre units (FAO).
[30] Should this information not be available, "GT" may be used as capacity unit upon approval by relevant GFCM subsidiary bodies on a case-by-case basis.

Fishing gear		Gear code	Unit of capacity	Unit of activity	Nominal effort
Dredges	Boat dredges	DRB	GT	Fishing days	GT * Fishing days
	Mechanised dredges	HMD			
	Hand dredges	DRH			
Gillnets and Entangling Nets	Set gillnets (anchored)	GNS	Net length [28] [29]	Fishing days	Net length* Fishing days
	Driftnets	GND			
	Encircling gillnets	GNC			
	Fixed gillnets (on stakes)	GNF			
	Trammel nets	GTR			
	Combined gillnets-trammel nets	GTN			
	Gillnets and entantling nets (not specified)	GEN			
	Gillnets (not specified)	GN			
Traps	Stationary uncovered pound nets	FPN	Number of traps/pots [29]	Fishing days	Number of traps/pots* Fishing days
	Pots	FPO			
	Fyke nets	FYK			
	Stow nets	FSN			
	Barrier, fences, weirs, etc	FWR			
	Aerial traps	FAR			
	Traps (not specified)	FIX			
Hooks and Lines	Handlines and pole-lines (hand operated)	LHP	Number of lines [29]	Fishing days	Number of lines * Fishing days
	Handlines and pole-lines (mechanised)	LHM			
	Trolling lines	LTL			
	Set longlines	LLS	Number of hooks	Fishing days	Number of hooks* Fishing days
	Drifting longlines	LLD			
	Longlines (not specified)	LL			
	Hooks and lines (not specified)	LX			

Appendix G - Scales of maturity stages

G.1 - *Bony fish*

Stages	Maturation state	Reproductive apparatus aspect	
0	UNDETERMINED	Sex not distinguished by naked eye. Gonads very small and translucent, almost transparent. Sex undetermined.	
		Females	*Males*
1	IMMATURE-VIRGIN	Small pinkish and translucent ovary shorter than 1/3 of body cavity. Eggs not visible to naked eye.	Thin and whitish testis shorter than 1/3 of body cavity.
2a	VIRGIN-DEVELOPING	Small pinkish/reddish ovary shorter than 1/2 of body cavity. Eggs not visible to naked eye.	Thin whitish testis shorter than 1/2 of body cavity.
2b	RECOVERING	Pinkish-reddish/reddish-orange and translucent ovary; length about 1/2 of body cavity. Blood vessels visible. Eggs not visible to naked eye.	Whitish/pinkish testis, more or less symmetrical; length about 1/2 of body cavity.
2c	MATURING	Ovary pinkish-yellow in colour with granular appearance; length about 2/3 of body cavity. Eggs are visible to naked eye through the *ovaric tunica*, which is not yet translucent. Under light pressure, eggs are not expelled.	Whitish to creamy testis; length about 2/3 of body cavity. Under light pressure, sperm is not expelled.
3	MATURE/SPAWNER	Ovary orange-pink in colour, with conspicuous superficial blood vessels; length from 2/3 to full length of body cavity. Large transparent, ripe eggs are clearly visible and could be expelled under light pressure. In more advanced conditions, eggs escape freely.	Whitish-creamy soft testis; length from 2/3 to full length of body cavity. Under light pressure, sperm could be expelled. In more advanced conditions, sperm escapes freely.
4a	SPENT	Reddish ovary shrunk to about 1/2 length of body cavity. Flaccid ovaric walls; ovary may contain remnants of disintegrating opaque and/or translucent eggs.	Bloodshot and flabby testis shrunk to about 1/2 length of body cavity.
4b	RESTING	Pinkish and translucent ovary; length about 1/3 of body cavity. Eggs not visible to naked eye.	Whitish/pinkish testis, more or less symmetrical; length about 1/3 of body cavity.

G.2 - *Cephalopods*

Stages	Maturation state	Reproductive apparatus aspect	Sex
0	Undetermined	Sex not distinguished by naked eye. Sex undetermined.	U
1	Immature-Virgin	Small and translucent Nidamental glands (NG)/Oviducal glands (OG). Ovary is semi-transparent, stringy and lacking granular structure. Small semi-transparent NG/OG. Oviduct meander not visible. Total absence of spermatophores.	F
		Testis small. Spermatophoric complex (SC) semi-transparent; Vas deferens not visible. Penis appears as a small prominence of SC.	M
2a	Developing	NG/OVG enlarged. NG covering some internal organs. Whitish ovary with granular structure clearly visible, not reaching the posterior half of the mantle cavity. Oviduct meander clearly visible. Eggs very small. Absence of spermatophores.	F
		Enlarged testis with structure not clearly visible. Vas deferens is whitish or white and the spermatophoric organ has white streak.	M
2b	Maturing	Large NG covering the viscera below. Ovary occupies the whole posterior half of mantle cavity, containing reticulated oocytes of all sizes tightly packed and probably a few ripe ova at its proximal part. Oviducts fully developed but empty. Maturing eggs visible to naked eye. Few spermatophores.	F
		Vas deferens is white, meandering, enlarged. Needham's sac (SS) with structure less whitish particles inside. Normally the Needham's sac is without functional spermatophores, but sometimes some immature/abortive ones could occur. Testis tight, crispy, with visible structure.	M
3a	Mature	Large NG as previously. Ovary containing higher percentage of large reticulated eggs and some large ripe ova with smooth surface. In Teuthoidea ripe ova in oviducts. Eggs medium and big, and visible both in oviducts and in the ovary. Well-developed spermatophores.	F
		Testis as before. Spermatophores packed in the Needham's sac.	M
3b	Spent	NG/OG large but soft and running. Ovary shrunk and flaccid, with only immature oocytes attached to the central tissue and a few loose large ova in the coelom. In Teuthoidea, oviduct may contain some mature ova but are no longer packed.	F
		Disintegrating spermatophores in the Needham's sac and the penis.	M

G.3 - *Crustaceans*

Stages	Maturation state	Reproductive apparatus aspect				
		Colouring of fresh ovary	*Parapenaeus longirostris*	*Aristaeomorpha foliacea*	*Aristeus antennatus*	*Nephrops norvegicus*
1	Immature	whitish or translucid	Ovaries not visible without dissection. The ovaries are thin and translucent with a tubular appearance adherent to the dorsal portion of the stomach, not extending to the abdomen.	Ovaries not visible without dissection. The ovaries are thin and translucent with a tubular appearance adherent to the laterals of the stomach, not extending to the abdomen.	Ovaries not visible without dissection. The ovaries are thin and translucent with a tubular appearance adherent to the laterals of the stomach, not extending to the abdomen.	Ovaries not visible without dissection. The ovaries are translucent, thin and threadlike.
2	Developing/Resting /Recovering	*A. foliacea*: flesh coloured; *A. antennatus:* ivory coloured with orange pink-violet dotting; *N. norvegicus*: cream; *P. longirostris*: cream orange;	Ovaries are barely visible without dissection. The cephalic lobes start to cover the sides while the abdominal extensions occupy all somites.	Ovaries barely visible without dissection. Cephalic lobes small but distinguishable. The gonad generally extends up to 3rd abdominal somite.	Ovaries barely visible without dissection. Cephalic lobes small but distinguishable. The gonad extends to the full length of the abdomen.	Ovaries barely visible without dissection. The gonads extends up to the 1st somite of the abdomen and have a granular appearance.
3	Maturing	*A. foliacea*: light and dark grey; *A. antennatus:* lilla; *N. norvegicus*: light green; *P. longirostris*: light green or grey green;	Ovaries are clearly visible through integument. Ovaries developed and turgid, with cephalic lobes and abdominal extensions occupying the entirely the dorsal portion. The gonads appear granular.	Ovaries are clearly visible through integument. Ovaries developed and turgid, with evident cephalic lobes. The gonad generally extends to the 4th abdominal somite	Ovaries are clearly visible through integument. Cephalic and abdominal extensions are well developed and turgid.	Ovaries are clearly visible through integument. The gonad occupies one third of the cephalotoracic space. The gonads extend up to the 1st somite of the abdomen.
4	Mature	*A. foliacea*: black; *A. antennatus:* violet; *N. norvegicus*: dark grey; *P. longirostris*: brightgreen or olive green;	Turgid ovaries extending to the whole dorsal area. Lobes and extensions well developed. Eggs well visible.	Turgid ovaries extending to the whole dorsal area. Lobes well developed and abdominal extensions may reach the 5th somite. Eggs well visible.	Turgid ovaries occupying the whole dorsal area. Lobes and abdominal extensions well developed. Eggs well visible.	Turgid ovaries occupying the whole dorsal cephalotoracic space and extending up to the 2nd somite. Eggs visible.
5	Spent	uncoloured	Ovaries after spawning are fully extended but loose turgidity becoming flaccid.	Ovaries large but flaccid with blackish spots.	Ovaries large but flaccid with purple spots.	Ovaries flaccid with green spots. Re-absorption of ovarian material. Most likely with green eggs on pleopods.

G.4 - *Elasmobranchs oviparous*

Oviparous elasmobranchs		**Females**		**Males**	
MATURATION STATE	STAGES	MATURATION STATE	REPRODUCTIVE APPARATUS ASPECT	MATURATION STATE	REPRODUCTIVE APPARATUS ASPECT
IMMATURE	**1**	IMMATURE	Ovaries: small and whitish. Undistinguishable ovarian follicles. Oviducal gland often not visible. In some species a thickening of the uteri where the gland will develop may be visible. Uteri: thread-like and narrow.	IMMATURE	Claspers: flexible, non-calcified and shorter than pelvic fins. Testes: small and undeveloped (in skates, sometimes with visible lobules). Ducts: straight and thread-like.
	2	DEVELOPING	Ovaries: follicles of different stages of development. Some small and medium-sized yolked follicles may be present. Oviducal gland: distinguishable and developing. Uteri: enlarging.	DEVELOPING	Claspers: flexible, partially calcified and usually as long as or longer than pelvic fins. Testes: developing (in skates, lobules clearly visible but not fully developed). Ducts: developing and beginning to coil.
MATURE	**3a**	CAPABLE OF REPRODUCTION	Ovaries: presence of large yolked follicles ready to be ovulated. Oviducal glands: fully developed. Uteri: fully developed.	CAPABLE OF REPRODUCTION	Claspers: rigid, fully calcified, and longer than pelvic fins (in some sharks they may only be as long as the pelvic fins). Testes: fully developed (in skates, with fully formed lobules). Ducts: tightly coiled and filled with sperm.
	3b	EGG LAYING	Uteri: presence of egg capsules.	ACTIVE	Claspers: similar to stage 3a, however with clasper glands dilated, sometimes swollen and reddish. Sperm may be present in clasper groove or glands. Testes: similar to stage 3a. Ducts: sperm observed inside (after a cut) or flowing out of the cloaca on pressure.
	4a	POST-LAYING	Ovaries: flaccid with few follicles of different sizes. Few large vitellogenic follicles entering atresia. POFs and atretic follicles may be visible. Oviducal glands: fully developed but may be reduced in size. Uteri: enlarged and flaccid.	REGRESSING	Claspers: fully formed, similar to stage 3. Testes shrunken and flaccid, (in skates, with few visible lobules). On pressure sperm does not flow. Sperm ducts: empty and flaccid.
	4b	REGENERATING	Ovaries: large with small and medium-sized yolked follicles. Pre-ovulatory follicles absent. Oviducal glands: fully developed but may be reduced in size. Uteri: enlarged.	-	-

G.4 - *Elasmobranchs viviparous*

Viviparous elasmobranchs		**Females**			**Males**	
MATURATION STATE	STAGES	MATURATION STATE	REPRODUCTIVE APPARATUS ASPECT	STAGES	MATURATION STATE	REPRODUCTIVE APPARATUS ASPECT
IMMATURE	**1**	IMMATURE	Ovaries: small and whitish; undistinguishable ovarian follicles. Oviducal gland: often not visible. In some species a thickening of the uteri where the gland will develop may be visible. Uteri: thread-like and narrow.	**1**	IMMATURE	Claspers: flexible, non-calcified and usually shorter than pelvic fins. Testes: small and undeveloped. Ducts: straight and thread-like.
	2	DEVELOPING	Ovaries: follicles of different stages of development. Some small and medium-sized yolked follicles may be present. Oviducal gland: distinguishable and developing. Uteri: enlarging.	**2**	DEVELOPING	Claspers: flexible, partially calcified and as long as or longer than pelvic fins. Testes: developing and may start to segment in sharks; in rays lobules clearly visible but do not occupy the whole surface. Ducts: developing and beginning to coil.
MATURE	**3**	CAPABLE OF REPRODUCTION	Ovaries: presence of large yolked follicles ready to be ovulated. Oviducal glands: fully developed Uteri: fully developed.	**3a**	CAPABLE OF REPRODUCTION	Claspers: rigid, fully calcified, and longer than pelvic fins. Testes: fully developed; for some shark species testes are fully segmented. Ducts: tightly coiled and filled with sperm.
				3b	ACTIVE	Claspers: similar to stage 3a, however with clasper glands dilated, sometimes swollen. Sperm may be present in clasper groove or glands. Testes: similar to stage 3a. Ducts: sperm observed inside after a cut or flowing out of the cloaca on pressure.
				4	REGRESSING	Claspers: fully formed, similar to stage 3. Testes shrunken and flaccid, (in skates, with few visible lobules). On pressure, sperm does not flow. Sperm ducts: empty and flaccid. Seminal vesicle developed but empty.

G.4 - *Elasmobranchs viviparous*

Viviparous elasmobranchs		**Females**			**Males**	
MATURATION STATE	STAGES	MATURATION STATE	REPRODUCTIVE APPARATUS ASPECT	STAGES	MATURATION STATE	REPRODUCTIVE APPARATUS ASPECT
MATERNAL	**4a**	EARLY PREGNANCY	Uteri: well filled and rounded with yolk content (usually candle shaped). Embryos cannot be observed.	-	-	-
	4b	MID PREGNANCY	Uteri: well filled and rounded. Embryos are always visible, small and with a relatively large yolk sac.	-	-	-
	4c	LATE PREGNANCY	Uteri: embryos fully formed, yolk sacs reduced or absent.	-	-	-
	5	POST-PARTUM	Ovaries: shrunken without follicle development and with atretic (degenerating) follicles. Uteri: enlarged and flaccid.	-	-	-
MATURE	**6**	REGENERATING	Ovaries: large with small and medium-sized yolked follicles. Pre-ovulatory follicles absent. Atretic follicles may be present. Oviducal glands: fully developed but may be reduced in size. Uteri: enlarged.	-	-	-

G.5 – *Stomatopods*

Maturation state	Stages	Reproductive apparatus aspect
IMMATURE	0	ovaries filamentous and hyaline; 6th-8th sternites hyaline
QUIESCENT	1	filamentous ovaries with evident brown dots (chromatophores), 6th-8th sternites hyaline
EARLY MATURATION	2	narrow yellow ovaries, 6th-8th sternites whitish
MATURATION	3	yellow ovaries extending up to half of abdomen width, not visible through cutile on the ventral side of telson, 6th-8th sternites white.
RIPE	4	yellow ovaries extending over half abdominal width, visible through cutile on the ventral side of telson, 6th-8th sternites milky white.
SPENT	5	similar to quiescent ovaries, sometime with fewyellow dots, but 6th-8th sternites still white.

Appendix H - European eel's fishery

H.1 - Eel's habitats

Habitat	Code
Lagoon	LGN
Lake	LAK
Managed lagoon*	MLG
River	RIV

* Coastal lagoons which displays also fixed barriers at the sea channel

H.2 - Eel's gear types

Gear types	Code	Gear units
Barrier	BAR	Meters*
Eel longlines	ELL	Number of hooks
Fishing rod	FRD	Number of rods
Glass eel net	GEN	Number of nets
Gillnets	GLN	Meters
Shore lift net	SLN	Number*
Spear fishing	SPF	Number*
Traps fyke nets	FYK	Number of fyke nets
Umbrella	UMB	Number of umbrellas

*if other units are used please indicate

Appendix I - Shared stocks

English common name	Scientific name	Area	Countries
Dolphin fish	*Coryphaena hippurus*	Western Mediterranean.	Italy, Malta, Spain and Tunisia
Horned octopus	*Eledone cirrhosa*	Adriatic Sea	Albania, Croatia, Italy and Serbia-Montenegro
Musky octopus	*Eledone moschata*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Anchovy	*Engraulis encrasicolus*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Anchovy	*Engraulis encrasicolus*	Aegean Sea	Greece and Turkey
Anchovy	*Engraulis encrasicolus*	Gulf of Lion	France and Spain
Shortfin mako	*Isurus oxyrhinchus*	All Mediterranean	All countries
Porbeagle	*Lamna nassus*	All Mediterranean	All countries
European squid	*Loligo vulgaris*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Blackbellied angler	*Lophius budegassa*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Monkfish or angler	*Lophius piscatorius*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Hake	*Merluccius merluccius*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Hake	*Merluccius merluccius*	Gulf of Lion	France and Spain
Hake	*Merluccius merluccius*	North Tyrrhenian and Corsica	France and Italy
Hake	*Merluccius merluccius*	Sicily Channel	Italy, Libya, Malta and Tunisia
Blue whiting	*Micromesistius poutassou*	Adriatic Sea	Albania, Croatia, Italy and Serbia-Montenegro
Blue whiting	*Micromesistius poutassou*	North Tyrrhenian and Corsica	France and Italy
Red mullet	*Mullus barbatus*	Western Mediterranean	Corsica and Sardinia
Red mullet	*Mullus barbatus*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Striped red mullet	*Mullus surmuletus*	Western Mediterranean	Corsica and Sardinia
Norway lobster	*Nephrops norvegicus*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Norway lobster	*Nephrops norvegicus*	North Tyrrhenian and Corsica	France and Italy

English common name	Scientific name	Area	Countries
Black spot seabream	*Pagellus bogaraveo*	Alboran Sea and the Straits of Gibraltar	Morocco and Spain
Common pandora	*Pagellus erythrinus*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Common spiny lobster	*Palinurus elephas*	Western Mediterranean	Corsica and Sardinia
Common spiny lobster	*Palinurus elephas*	Sicily channel	Italy and Tunisia
Pink spiny lobster	*Palinurus mauritanicus*	Sicily channel	Italy and Tunisia
Deepwater rose shrimp	*Parapenaeus longirostris*	Adriatic Sea	Albania, Croatia, Italy and Serbia-Montenegro
Blue shark	*Prionace glauca*	All Mediterranean	All countries
Sardine	*Sardina pilchardus*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Sardine	*Sardina pilchardus*	Aegean Sea	Greece and Turkey
Atlantic mackerel	*Scomber scomber*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Common cuttlefish	*Sepia officinalis*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Common sole	*Solea vulgaris*	Adriatic Sea	Albania, Croatia, Italy, Slovenia and Serbia-Montenegro
Sprat	*Sprattus sprattus*	Adriatic Sea	Croatia, Italy, Slovenia
Albacore	*Thunnus alalunga*	All Mediterranean	All countries
Bluefin tuna	*Thunnus thynnus*	All Mediterranean	All countries
Swordfish	*Xiphias gladius*	All Mediterranean	All countries

SAC provisional shared stocks list/Liste provisoire des stocks partagés du CSC (GFCM, 2006) (Annex H - Report of the ninth session of the Scientific Advisory Committee of the GFCM, Rome, Italy, 24–27 October 2006).

Appendix L - Geographical subareas (GSA) and GFCM subregions

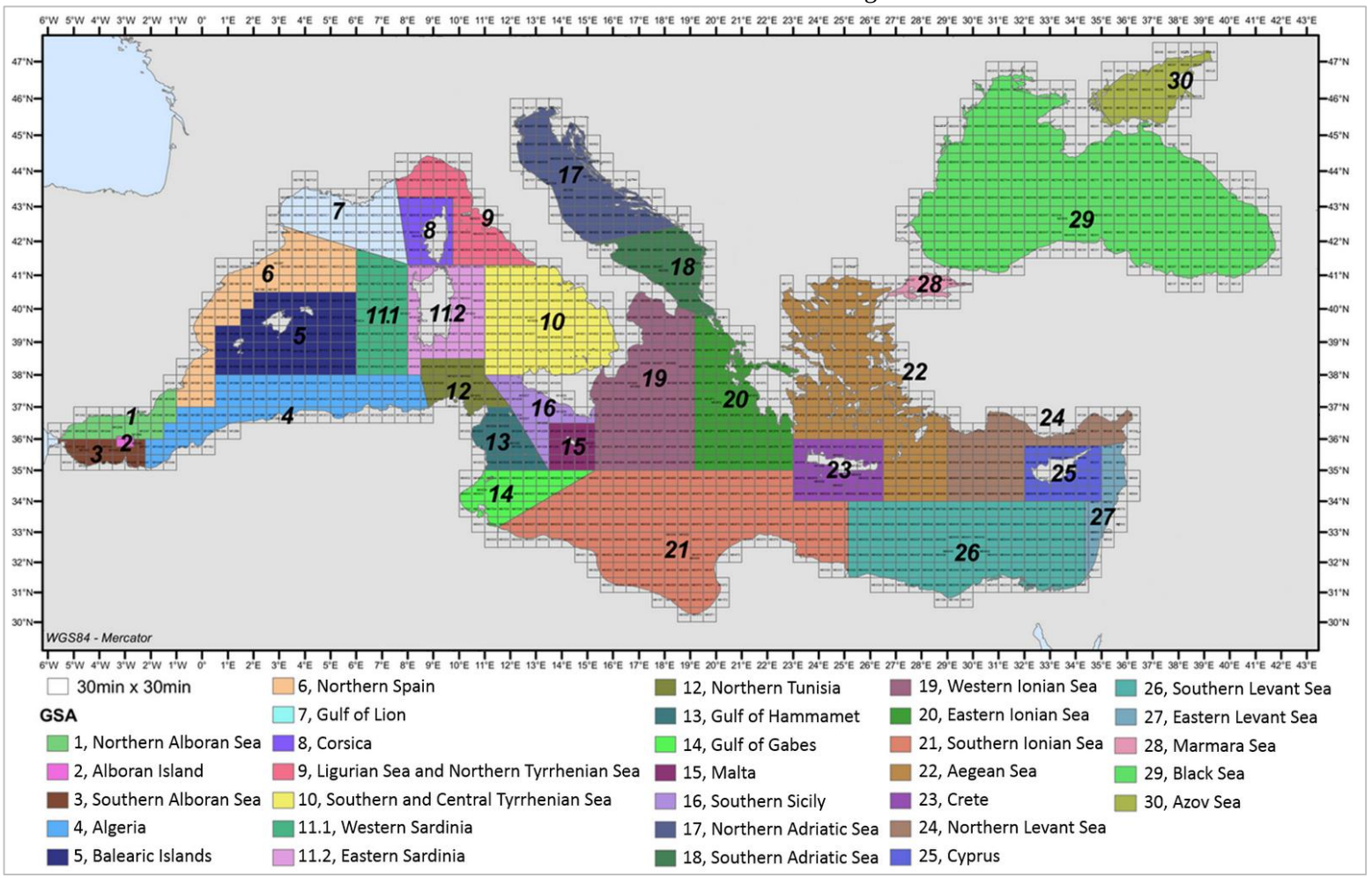
GSA	Name
1	Northern Alboran Sea
2	Alboran Island
3	Southern Alboran Sea
4	Algeria
5	Balearic Islands
6	Northern Spain
7	Gulf of Lion
8	Corsica
9	Ligurian Sea and Northern Tyrrhenian Sea
10	Southern and Central Tyrrhenian Sea
11.1	Western Sardinia
11.2	Eastern Sardinia
12	Northern Tunisia
13	Gulf of Hammamet
14	Gulf of Gabes
15	Malta
16	Southern Sicily
17	Northern Adriatic Sea
18	Southern Adriatic Sea
19	Western Ionian Sea
20	Eastern Ionian Sea
21	Southern Ionian Sea
22	Aegean Sea
23	Crete
24	Northern Levant Sea
25	Cyprus
26	Southern Levant Sea
27	Eastern Levant Sea
28	Marmara Sea
29	Black Sea
30	Azov Sea

GFCM subregions	GSAs	Countries
Western Mediterranean Sea	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	Algeria, France, Italy, Morocco, Spain
Ionian Sea	12, 13, 14, 15, 16, 19, 20, 21	Greece, Italy, Libya, Malta, Tunisia
Adriatic Sea	17, 18	Albania, Croatia, Italy, Montenegro, Slovenia
Eastern Mediterranean Sea	22, 23, 24, 25, 26, 27	Cyprus, Egypt, Greece, Israel, Lebanon, Syria, Turkey
Black Sea	28, 29, 30	Bulgaria, Romania, Turkey, (Georgia, Russia, Ukraine)*

**All States, including non-members of the GFCM which are known to fish in its competence area, are encouraged to cooperate in joint actions undertaken in accordance with applicable international obligations (i.e. Article 63 UNCLOS).*

Appendix M - Geographic statistical grid for red coral

Mediterranean and Black Sea statistical grid[31]



[31] *www.fao.org/gfcm/data/map-statistical-grid*

Appendix N - Templates for the selection of fleet segments and species

Template 1) Fleet segments operating in the GSA

GFCM subregion	*XX*
GSA	*XX*
Country	*XX*
Reference year	*XX*
1) List of all fleet segments operating in the GSA	**Notes**

Template 2) Fleet segments selected for the collection of biological variables

GFCM subregion		
GSA		
Country		
Reference year		
2) List of fleet segments selected, through the weighting procedure, for the collection of biological variables	**Discards* (Y/N)**	**Notes**

* discards information should be collected only when the discard rate exceeds 10 percent of the total volume of catches for a given fleet segment in a given GSA.

Template 3) Species for which data collection will be carried out

GFCM subregion		
Country		
Reference year		
Group 1 species	**Data to be collected (Y/N)**	**Notes**
Group 2 species	**Data to be collected (Y/N)**	**Notes**
Group 3 species	**Data to be collected (Y/N)**	**Notes**

Appendix O - Data submission calendar

DCRF Tasks and Subtasks			Reference year	Frequency (Annual or Biennial)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
T1	***Global figures of national fisheries***		n-1	A					X							
T2	***Catch***	Landing data	n-1	A						X						
		Catch data per species	n-1	A						X						
T3	***Incidental catch of vulnerable species***		n-1	A							X					
T4	***Fleet***		n-1	A					X							
T5	***Effort***	Fleet segment	n-1	A						X						
		Fishing gear	n-1	A						X						
		CPUE	n-1	A						X						
T6	***Socio-economics***	Economic and social data	n-1	A											X	
		Operating costs	n-2	A / B*					X							
		Species value	n-2	A / B*					X							
		Other economic aspects	n-2	A / B*					X							
T7	***Biological information***	Stock assessment form**	n-1	A									X			
		Length data	n-1	A							X					
		Other biological data	n-1	A							X					
		Dolphin fish	n-1	A							X					
		Red coral	n-1	A						X						
		European eel	n-1	A									X			

*Data reference year is "n-2", on an annual or biennial basis.
Biennial submission should only take place for those countries that do not have annual economic surveys in place. Countries collecting these data on a yearly basis are requested to submit them annually (keeping reference year – 2).
**The date of data submission will be linked to the scheduling of the GFCM stock assessment working groups and therefore may differ from year to year.

Notes - *At the beginning of each sampling year (starting from 2016), each country should submit three templates containing: all the fleet segments (based on Appendix B and/or the fleet segments resulting from merging process, if any) operating in each GSA with indication of those fleet segments that, based on the weighting procedure, have been identified for the collection of biological variables, as well as all the species (G1, G2 and G3) for which the biological data collection will be carried out (sections 6.2 and 6.3 - Appendix N).*

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