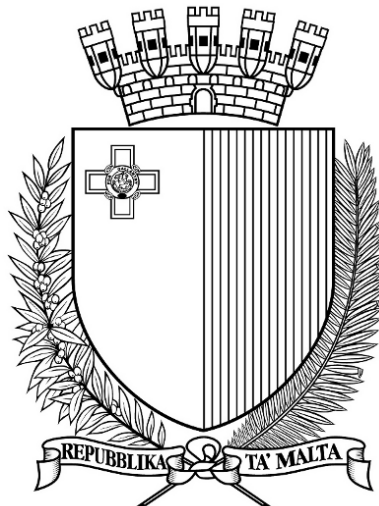


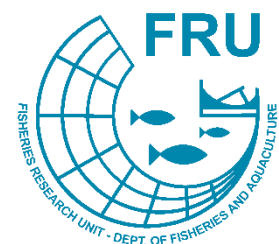
Department of Fisheries and Aquaculture
Ministry for Agriculture, Fisheries, Food and
Animal Rights



**Sampling Methodology and Quality Assurance:
Biological Variables**

Malta, May 2021

Version 1



General Introduction

The Data Collection Multi-Annual Programme (DC-MAP) for the period 2020 to 2021 was set by the Commission Delegated Decision (EU) 2019/910 and Commission Implementing Decision (EU) 2019/909, as required by (EU) Regulation 2017/1004 and (EC) Commission Regulation 665/2008.

The DC-MAP requirements are in line with Regional Fisheries Management Organisations' (RFMOs) requirements and end-user needs. Malta is actively involved in two RFMOs, being the General Fisheries Commission for the Mediterranean (GFCM) and International Commission for the Conservation of Atlantic Tunas (ICCAT). The GFCM aims to ensure the conservation and sustainable use of living marine resources in the Mediterranean and Black Sea, whilst the ICCAT is responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and its adjacent seas.

Fisheries-dependent biological data

The DC-MAP incorporates the collection, management and use of fisheries and aquaculture data and one of the obligations set by this framework is related to fisheries-dependent biological data.

Spatial Unit

All fisheries-dependent biological sampling conducted by Malta is carried out within Geographical Sub-Area (GSA) 15, as delineated in Figure 1.

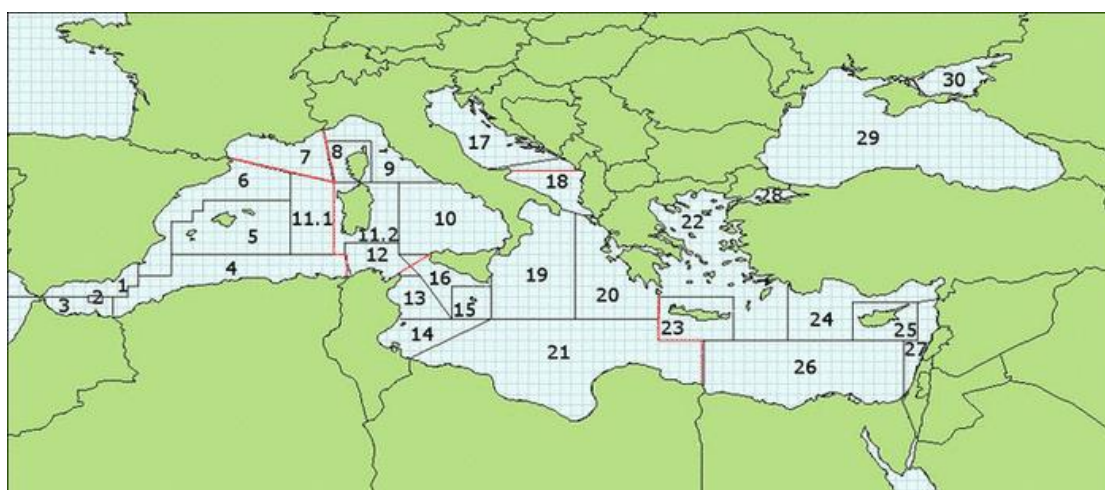


Figure 1: Geographical Sub-Areas (GSA) in the GFCM area. Source: GFCM (2009).

The DC-MAP defines a métier as a group of fishing operations targeting a similar assemblage of species, using a similar gear, during the same period of the year and/or within the same area and which are characterised by a similar exploitation pattern.

Sampling procedure

For most métiers, biological sampling is carried out via a random stratified sampling scheme. The population for sampling refers to the Maltese professional fishing fleet, which is divided by the adopted gears to form the strata. The primary sampling unit is the trip; data is collected from random fishing trips from each stratum selected for sampling.

Assigning métiers

Métiers are identified according to the scheme in Table 1, as required by the DC-MAP (the table can also be viewed in the Maltese language via <https://eur-lex.europa.eu/legal-content/MT/TXT/PDF/?uri=CELEX:32019D0910&from=EN>).

Table 1 The identified métiers in the Mediterranean region.

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	LOA classes (m) (d)						
Activity	Gear classes	Gear groups	Gear type	Target assemblage (a)	Mesh size and other selective devices	< 10	10-<12	12-<18	18-<24	24-<40	40 &+	
Fishing activity	Dredges	Dredges	Boat dredge [DRB]	Anadromous species (ANA) Catadromous species (CAT) Cephalopods (CEP) Crustaceans (CRU)	(b)							
			Mechanised / Suction dredge [HMD]		(b)							
	Trawls	Bottom trawls	Bottom otter trawl [OTB]	Demersal species (DEF) Deep-Water species (DWS) Finfish (FIF)	(b)							
			Multi-rig otter trawl [OTT]		(b)							
			Bottom pair trawl [PTB]		(b)							
			Beam trawl [TBB]		(b)							
			Pelagic trawls		Midwater otter trawl [OTM]	Freshwater species (no code)	(b)					
					Midwater pair trawl [PTM]	Miscellaneous (MIS)	(b)					
	Hooks and Lines	Rods and Lines	Hand and Pole lines [LHP] [LHM]	Mixed Cephalopod and Demersal (MCF)	(b)							
			Trolling lines [LTL]	Mixed Crustaceans and Demersal (MCD)	(b)							
		Longlines	Drifting longlines [LLD]	Mixed Deep-water species and Demersal (MDD)	(b)							
			Set longlines [LLS]	Mixed Pelagic and Demersal (MPD)	(b)							
	Traps	Traps	Pots and Traps [FPO]	Molluscs (MOL)	(b)							
			Fyke nets [FYK]	Large Pelagic fish (LPF)	(b)							

		Stationary uncovered pound nets [FPN]	Small Pelagic fish (SPF)	(b)							
		Fixed installations for fences and weirs (code needed)	Large Pelagic fish (LPF) and Small Pelagic fish (SPF)	(b)							
	Nets	Trammel net [GTR]		(b)							
		Set gillnet [GNS]		(b)							
		Driftnet [GND]		(b)							
	Seines	Surrounding nets	Purse seine [PS]	(b)							
			Lampara nets [LA]	(b)							
		Seines (c)	Fly shooting seine [SSC]	(b)							
			Anchored seine [SDN]	(b)							
	Pair seine [SPR]		(b)								
		Beach and boat seine [SB] [SV]		(b)							
	Other gear	Other gear	Glass eel fishing (no code)	Glass eel	(b)						
	Misc. (Specify)	Misc. (Specify)			(b)						
Other activity than fishing			Other activity than fishing								
Inactive			Inactive								
Footnotes: (a) according to existing coding in relevant Regulations (b) according to existing coding in relevant Regulations (c) with Fish Aggregating Devices (FADs)/in free schools (d) in the Mediterranean <6m and 6-12m											

Trips conducted by Maltese vessels are assigned to métiers based on Table 1. Levels 1 to 4 are assigned according to the gear used by vessels during the sampled trips. For example, if during a trip the fisher is working with set longlines, the assigned levels 2 to 4 will be hooks and lines, longlines and set longlines, respectively. In most cases, Level 4 corresponds to only one target assemblage however, in cases when the gear corresponds to different target assemblages, the landings data needs to be analysed. From the catch composition, by weight, the target assemblage can be assigned.

Table 2 shows the current accepted list of métiers for the Mediterranean and Black Sea Region.

Table 2 Métiers at level 6 and level 7 for the Mediterranean and Black Sea Region as agreed upon during at the PGMed 2009 meeting. Source: PGMed, 2009.

Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Activity	Gear classes	Gear groups	Gear type	Target assemblage	Mesh size and other selective devices	
Fishing activity	Dredges	Dredges	Boat dredge [DRB]	Molluscs		
	Trawls	Bottom trawls	Bottom otter trawl [OTB]	Demersal species	≥40	shelf slope mixed shelf and slope
				Deep water species*	≥40	
				Mixed demersal species and deep water species*	≥40	
			Multi-rig otter trawl [OTT]	Demersal species	≥40	
			Bottom pair trawl [PTB]	Demersal species	≥40	
		Beam trawl [TBB]	Demersal species	≥40		
		Pelagic trawls	Midwater otter trawl [OTM]	Mixed demersal and pelagic species	≥20	
			Midwater otter trawl [OTM]	Mixed demersal and pelagic species	13-20**	
			Pelagic pair trawl [PTM]	Small pelagic fish	≥20	
			Hooks and Lines	Rods and Lines	Hand and Pole lines [LHP] [LHM]	
	Cephalopods					(a)
	Trolling lines [LTL]	Large pelagic fish			(a)	
	Longlines	Drifting longlines [LLD]	Large pelagic fish	(a)	LLD_LPF_0_0_0 (BFT) LLD_LPF_0_0_0 (ALB) LLD_LPF_0_0_0 (SWO)	
			Set longlines [LLS]	Demersal fish	(a)	shelf slope
			Pots and Traps [FPO]	Demersal species	(a)	
	Traps	Traps	Fyke nets [FYK]	Catadromous species	(a)	
				Demersal species	(a)	
			Stationary uncovered pound nets [FPN]	Large pelagic fish	(a)	
				Trammel net [GTR]	Demersal species	≥16
	Nets	Nets	Set gillnet [GNS]	Small and large pelagic fish	≥16	
				Demersal species	360-400**	
				Demersal species	≥16	
			Driftnet [GND]	Small pelagic fish	(a)	
				Demersal fish	(a)	
	Seines	Surrounding nets	Purse seine [PS]	Small pelagic fish	≥14	
				Large pelagic fish	≥14	
			Lampara nets [LA]	Small and large pelagic fish	≥14	
		Seines	Fly shooting seine [SSC]	Demersal species	(a)	
			Anchored seine [SDN]	Demersal species	(a)	
			Pair seine [SPR]	Demersal species	(a)	
			Beach and boat seine [SB] [SV]	Demersal species	(a)	
	Other gear	Other gear	Glass eel fishing	Glass eel	(a)	
Misc. (Specify)	Misc. (Specify)			(a)		
Other activity than fishing				Other activity than fishing		
Inactive				Inactive		
(a) Not spelled out in DCR but defined with reference to relevant EU Regulation(s)						
(*) referring only to red shrimps <i>Aristaeomorpho foliaceus</i> and <i>Aristeus antennatus</i> , species not included in the definition of deep sea species given by Council Regulation (EC) 2347/2002.						
(**) for black sea						

Selecting métiers

The selection of métiers for sampling is based on commercial landings, mainly on the total landed value and effort in fishing days. The latter analysis is based on data from the two years preceding the reference year and the procedure applied is as follows:

- Following the classification of trips carried out by professional fishers to métiers, the complete list of métiers used over the previous two years is compiled.
- The average effort in fishing days by métier is calculated, and the métiers are ranked according to their share of the total effort.
- The shares (being the percentage contributions) are then summed up and listed in descending order, and all métiers accounting for 90% of the total fleet effort are selected for sampling.
- These steps are repeated for landings and economic value to obtain a final list of métiers selected for sampling based on all three parameters

Métiers for which discards are estimated to exceed 10% of the total volume of catches, are also selected for sampling.

Sampling schemes

The different schemes adopted for the Maltese sampling plan are the following:

- onboard observations;
- market sampling;
- a combination of market sampling and onboard observations; and
- observation during bluefin tuna harvesting.

For all métiers, except for purse seiners targeting large pelagic species, the selection of the sampling scheme is based on the proportion of discards in the catches. A regional list of métiers with their respective discard status was prepared in the PGMed 2010 report. Métiers known to have significant proportions of discards are sampled via onboard observations, whereas other métiers are sampled from market samples.

For some métiers, the PGMed report does not assign a discard status, for example for GTR_DEF_>=16_0_0 further information at a national level was required. In these cases, the overall proportion of discards for these métiers is calculated. If the weight of discarded species (listed in the DC-MAP regulation for the region) accounts for less than 10% of the total weight of the catch, trips are sampled from landings; otherwise trips are sampled via onboard observations.

Selection of trips

The number of trips to be sampled is based mainly on the seasonality of the fishery and on regional sampling plans. In general, a minimum of two trips per quarter are set to be sampled per métier.

For most gears, in order to be able to carry out onboard observations, a number of fishers are selected at random from a list of contacts for vessels employing the particular gear to be sampled in the Maltese professional fishing fleet. The fishers are contacted at the beginning of each month to inform the Fisheries Research Unit the first time they would be using the gear to be sampled. This is done monthly to ensure that samples are collected throughout the year. The trip conducted by the first fisher that contacts the Department is selected for sampling and non-responses and refusals are documented. Drifting longlines targeting swordfish and blue-fin tuna are sampled by onboard observers on vessels with an overall length exceeding 15m, as per ICCAT Recommendation 2016-05 and ICCAT Recommendation 2018-02 respectively.

To sample catches from market, a representative of the Fisheries Research Unit purchases the first available catch (using the particular gear) at the fish market, which will then be sampled at the Fisheries Research Unit laboratory.

Selection of species

Stock-based sampling is carried out for common dolphinfish (*Coryphaena hippurus*), blue-fin tuna (*Thunnus thynnus*) and swordfish (*Xiphias gladius*). Data for other species shown in Table 1 is collected concurrently from onboard observations and market sampling following national protocols and from surveys at sea following the International Bottom Trawl Survey in the Mediterranean (MEDITS, 2017) protocol.

The list of species is compiled from lists of priority species identified in the DC-MAP and GFCM Data Collection Reference Framework (DCRF). From the DC-MAP, species are selected for sampling by region unless any of the following criteria are fulfilled:

- The related total allowable catch is less than 10% of the total of the Union;
- No total allowable catch (TAC) is fixed and the total landings of a Member State of a stock or species are less than 10% of the average total EU landings in the previous three years; or
- The total annual landings of the species by a Member State are less than 200 tonnes.

The GFCM-DCRF divides species into three groups as follows:

- Group 1 includes species that drive the fishery and for which assessment is regularly carried out;
- Group 2 includes species that are important in terms of landings and/or economic value at regional and sub-regional level, and for which assessment is not regularly carried out; and
- Group 3 includes species within international/national management plans and recovery and/or conservation action plans and non-indigenous species with the greatest potential impact.



Species from these three groups are selected for sampling by region unless their landings account for less than 2% of the total Maltese landings. As per legislation, no thresholds apply to large pelagic species, therefore all species landed in Malta in the previous three years are selected for sampling.

The biological parameters being sampled are selected in line with the GFCM-DCRF requirements and regional requirements:

- Length, weight, sex, maturity and in some cases age of Group 1 species will be reported yearly.
- Length, weight, sex, maturity and in some cases age of Group 2 species will be reported every three years.
- Length, weight, sex and maturity of Group 3 species will be reported yearly.



The planned minimum number of samples depends on the species as follows:

- The planned minimum number of demersal and small pelagic species is based on previously collected data.
- The planned minimum number of large pelagic species is based on the PGMed 2014 report.
- There is no planned minimum number of samples or specific sampling strategy for sharks. Sampling will be carried out concurrently during onboard and market sampling and through the MEDITS survey.



Data quality and accuracy

Biological parameters, including maturities, are collected using standardised schemes as described in the MEDITS and GFCM-DCRF manuals. As data is being inputted, inbuilt checks are in place to ensure data quality. These include:

- Locked headers to ensure that the format is correct;
- Compulsory fields to ensure that all the required fields have been inputted; and
- Limited list of values for registration number, gear, and species to ensure that codes are correct.

At this stage, data is verified, or further comments are provided by inputter. Consequently, the data from all sources is compiled into one file and pending comments made by observers and data inputters are addressed. The following information is then inputted/calculated and further checks are carried out:

- Compilation of the date in the DD/MM/YYYY format and the corresponding quarter.

- Inputting of the DC-MAP métier code, the GFCM fleet segment and the DC-MAP and GFCM-DCRF length segment according to the different manuals.
- Assigning of a unique number to every trip, based on vessel registration number, date, gear sampled and type of sampling (onboard or market).
- Identification of outliers for length and weight data. A user can inspect the data visually on scatter plots for obvious outliers and through statistical comparisons. When necessary data is verified with raw data.
- Estimation of the individual weights using growth equations based on past Maltese MEDITS and market data, or by using Length-Weight parameters based on past data or on literature values.
- Reviewing of the number of sampled trips achieved against the number of trips conducted. This analysis is presented in Text box and Table 4A of the DC-MAP Annual Report. (The latest Annual Report is available via <https://datacollection.jrc.ec.europa.eu/ars/2019>).

Editing and imputation

The final compiled data is stored in an MS Excel file in an organised shared folder with restricted 'read and write' access, serving the same purpose as an internal website. There are currently discussions at the regional level to set up a regional database; progress on this database can be followed via <https://medbsrdb.eu/>.

Data calls/requests

Biological data is aggregated as requested by different data requests and data checks include:

- Checks that all the codes are correct (as per data request).
- Checks that the raised number and weight of species is correct by calculating and checking the average weight per individual.

GFCM Data Collection Reference Framework

Biological data (on length, maturities and other biological parameters) are submitted to the GFCM, following the requirements set in the GFCM-DCRF manual available online on: <http://www.fao.org/gfcm/data/dcrf/en/>. The DCRF governs the collection and transmission of fisheries-related data in line with GFCM Recommendations and as required by the relevant subsidiary bodies within the organisation.

Following the collection, validation and processing of data following the protocols detailed in this documentation, external validations and controls are applied at the GFCM level before data can be transmitted. For instance, this process includes:

- Checks that all mandatory information is provided;
- Checks that the correct codifications are used; and
- Checks consistency with other data tables. For example, the fleet segments reported in biological data should match the list of fleet segments selected for sampling.

Once all these checks/controls are met, data is transmitted to the GFCM through the dedicated DCRF platform, which offers a secure data transmission tool with an immediate compliance reporting system comprising the above-mentioned controls.

Following transmission, further checks are carried out at the GFCM level and the results are sent to Malta for feedback and to address any problems encountered (if required). The checks carried out at this stage include the following:

- Checks on any deficiencies in data transmission.
- Checks on the quality of existing data, its completeness and the level of comparability.
- Checks on the stability of data provided. This is done by checking that values submitted are within acceptable ranges when compared to the same variables provided in recent past.
- Checks on the accuracy of the data provided to ensure that the data provided is close to realistic of expected values (in terms of sampling coverage, precision and bias checks). This is done by checking the number of strata with low sampling effort, the number of strata with high dispersion indices and the number of outliers.

EU Data Collection Multi-Annual Programme

Biological data (on landings and discards by length and age) are uploaded to databases managed by the Joint Research Centre (JRC), in line with requirements set in the DC-MAP regulation. In this regard, currently, two data calls are issued by DG MARE: the Fisheries Dependent Information (FDI) data call and the Mediterranean and Black Sea data call.

Following the collection and validation of data following the protocols detailed in this documentation, the data is processed as per specifications provided for these two data calls. The data provided must comply with the format set out in the data call and it should be validated with the Data Validation Tool available on the JRC website. The checks carried out include:

- Checks that all the required information is provided;
- Checks that data is not duplicated;
- Checks that the correct codifications are used; and
- Checks consistency with other data tables.

Following upload, further checks are carried out by the JRC and by the Scientific, Technical and Economic Committee for Fisheries (STECF). Data issues identified by the STECF-EWGs and the JRC Data Collection Teams are sent to Malta in form of a Coverage Report, and they are also reported in STECF Reports. The report addresses gaps and inconsistency in the data.

Relevance

Notably, the main users of the data are: The Department of Fisheries and Aquaculture in the MAFA (Ministry for Agriculture, Fisheries, Food and Animal Rights) that uses the information collected for its management function of the fisheries sector, European Commission Bodies such as DG-MARE, Eurostat and JRC (Joint Research Centre) as data is required for the scientific and economic assessment of the fishing sector in Malta as a member country of the EU and the academic and scientific fora such as the University of Malta and MCAST (The Malta College of Arts, Science and Technology).

Each of these end-users has different needs depending on the ultimate aim of the information they require; in any case, measures are in place to protect the data confidentiality, whilst

allowing the end-users to apply their statistical operations in order to expand the knowledge on the activity of the Maltese fishing fleet.

Confidentiality Policy

The necessary administrative, logical and physical measures are adopted in order to effectively protect the confidentiality of data from the data collection and until its publication, as well as its storage.

Where the DFA is required to process personal data (as defined in Regulation (EU) 2016/679, the 'GDPR') for the performance, implementation and execution of its deliverables, it will be carried out in accordance with all applicable data protection legislation, including the GDPR and the Data Protection Act (Chapter 586, Laws of Malta).

Confidentiality with external users

Data collection for research purposed by the Department of Fisheries and Aquaculture and which is not personal data as provided by the Data Protection Act, Chapter 586 of the Laws of Malta and any other applicable laws in relation to personal data as in force from time to time in Malta.

In terms of data requested by end-users, all data processed and exchanged is considered as confidential amongst themselves and may only be disclosed subject to common written agreement between the parties.

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