



# EastMed

Report of the EastMed Working Group on  
Fisheries Data Analysis and Joint EastMed/GFCM  
data preparatory meeting on round sardinella  
in the eastern Mediterranean Sea

FAO HQs, Rome Italy, 10-14 September 2018

The conclusions and recommendations given in this and in other documents in the *Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean* series are those considered appropriate at the time of preparation. They may be modified in the light of further knowledge gained in subsequent stages of the Project. The designations employed and the presentation of material in this publication do not imply the expression of any opinion on the part of FAO or donors concerning the legal status of any country, territory, city or area, or concerning the determination of its frontiers or boundaries.

## **Preface**

The Project “Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean- EastMed is executed by the Food and Agriculture Organization of the United Nations (FAO) and funded by Italy and the EC DG MARE.

The Eastern Mediterranean countries have for long lacked a cooperation framework as created for other areas of the Mediterranean, namely the FAO sub-regional projects AdriaMed, MedSudMed and CopeMed II. This made it more difficult for some countries in the region to participate fully in international and regional initiatives for cooperation on fishery research and management. Following the very encouraging experience of technical and institutional assistance provided to countries by the other FAO sub-regional Projects,

## **EastMed**

The project was born to support the development of regional cooperation and the further development of multidisciplinary expertise necessary to formulate appropriate management measures under the FAO Code of Conduct for Responsible Fisheries and the principles of the Ecosystem Approach to Fisheries (EAF) to ensure rational, responsible and participative fisheries management

The project’s **longer-term objective** is to contribute to the sustainable management of marine fisheries in the Eastern Mediterranean, and thereby to contribute to supporting national economies and protecting the livelihoods of those involved in the fisheries sector.

The project’s **immediate objective** is to support and improve the capacity of national fishery departments in the sub-region to increase their scientific and technical information base for fisheries management and to develop coordinated and participative fisheries management plans in the Eastern Mediterranean sub-region.

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## **Publications**

EastMed publications are issued as series of Technical Documents (GCP/INT/318/EC – 041/ITA/TD-00) and Occasional Papers (GCP/INT/318/EC –041ITA/OP-00) related to meetings, missions and research organized by or conducted within the framework of the Project.

Occasionally, relevant documents may be translated into national languages as EastMed Translations (GCP/INT/318/EC– 041/ITA/ET-00)

Comments on this document would be welcomed and should be sent to the Project Headquarters:

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## **Preparation of this document**

This document is the final version of the Report of the EastMed Working Group on Fisheries Data Analysis and Joint EastMed/GFCM Data preparatory meeting on round sardinella in the eastern Mediterranean Sea, held in FAO HQs, Rome (Italy), 10–14 September 2018.

Report of the EastMed Working Group on Fisheries Data Analysis and Joint EastMed/GFCM Data preparatory meeting on round sardinella in the eastern Mediterranean Sea. GCP/INT/318/EC–041/ITA/TD-27. Rome 2018: 20 pp.

### **ABSTRACT**

The FAO-EastMed project organised the Working Group on Fisheries Data Analysis that was attended by experts from Egypt, Lebanon, Turkey and Cyprus. The objectives of the working group were to facilitate and support the analysis of fisheries biological and socioeconomic data collected in the Eastern Mediterranean countries, with a view to assess the status of priority stocks in the subregion and estimate socioeconomic indicators about the status of the main fishing fleets. The WG was organized in two sub-groups that run in parallel: the Sub-Group on Stock Assessment and the Sub-Group on Socioeconomics.

A joint session was also organized with the GFCM for a Data Preparatory Meeting on round sardinella (*Sardinella aurita*). Round sardinella is commercially exploited in Egypt, Gaza Strip, Lebanon, Israel, Syria and Turkey whereas catches are negligible in Cyprus. The areas with highest catches are located close to runoff of major rivers in Egypt and Turkey. Data on age obtained from otolith reading is not yet available in the sub-region. However, with the support of EastMed, otoliths started to be collected in Egypt, Gaza, Lebanon and Turkey and a first intercalibration exercise is currently ongoing with the objective to provide reliable age readings and, in turn, to obtain a consistent age/length key for the species in the area.

## **Introduction**

The EastMed Working Group on Fisheries Data Analysis was held in FAO headquarters, Rome, Italy, from 10 to 14 September 2018. The WG was attended by experts from Egypt, Lebanon, Turkey and Cyprus. The list of participants and agenda are in Annex 1 and 2.

The objectives of the working group were to facilitate and support the analysis of fisheries biological and socioeconomic data collected in the Eastern Mediterranean countries, with a view to assess the status of priority stocks in the subregion and estimate socioeconomic indicators about the status of the main fishing fleets. The WG was organized in two sub-groups that run in parallel: a Sub-Group on Stock Assessment and a Sub-Group on Socioeconomics.

As agreed during the GFCM Subregional Committee for the Eastern Mediterranean (SRC-EM), a joint session was also organized with the GFCM for a Data Preparatory Meeting on round sardinella. The joint session was run on the 10 and 11 September inside the Sub-Group on Stock Assessment. The detailed agenda of the joint session is in Annex 3.

## **Sub-Group on Stock Assessment**

### ***Joint Session on data preparatory meeting on round sardinella***

Ms Morello, GFCM Secretariat, summarized the background of the data preparatory meeting. She recalled that 1) at the 1st SRC-EM (2017) and at the 19th session of SAC experts and countries agreed to advance on the assessment of data limited stocks (DLS) and to launch a pilot study on the application of these methods in the eastern Mediterranean, and 2) a dedicated session on the provision of advice for DLS was held in the 2<sup>nd</sup> SRC-EM (2018). The SRC summarized the current knowledge on DLS assessments and management and proposed a roadmap to explore the application of these concepts to two existing DLS case studies in the eastern Mediterranean: deep water red shrimps and round sardinella. The meeting also identified the main types of data available for each case study. With regards to sardinella, a data preparatory meeting was recommended as first step in the road map towards the assessment of the stock. As a result of the data preparation meeting, an assessment (based on one or more assessment methods) would be then carried out within the 2018 WGSASP, during a dedicated session, in view of a benchmark in 2019. In preparation for the data preparatory meeting, participating countries were requested to submit available data to the GFCM/EastMed at least one month in advance of the meeting, and to put them at the disposal of the meeting for analysis.

The objectives of the data preparatory meeting were to:

- Analyse, harmonize and aggregate as appropriate data from the main fleets exploiting the stock with the objective of facilitating the provision of advice

- Compare the available data to the Data-Methods table and identify and test-run a range of possible stock assessment methods.

### **Available data**

In the first part of the meeting participants presented the available data on sardinella, reported in the metadata table elaborated during the SRC-EM. Comments provided during the presentation were used to update the metadata (Annex 4 to 6).

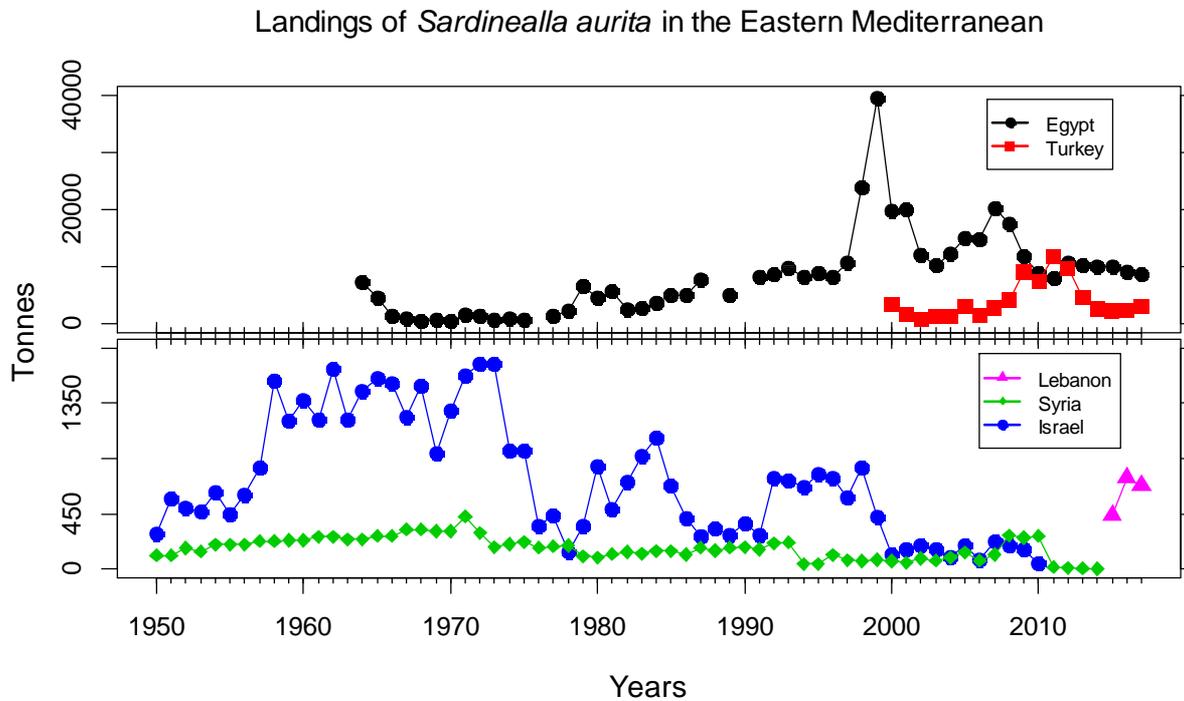
Sardinella is commercially exploited in Egypt, Gaza Strip, Lebanon, Israel, Syria and Turkey. Catches are negligible in Cyprus. No updated information could be obtained from Greece, where the species is not an important target of commercial fisheries. No catches were reported to GFCM until 2015. Catches of 1,010 tonnes were reported by Greece in 2016.

The areas with highest catches are located close to runoff of major rivers in Egypt and Turkey. In Egypt the main fishing ground was historically located in front of the Nile delta. With the damming of the Nile river and consequent decrease in runoff in the last decades, the fishing ground moved toward eastern areas in the Sinai Peninsula. In Turkey the species appears in the catches of purse seine fleets mainly in Mersin Bay and areas facing the mouths of Seyhan and Ceyhan rivers. These areas are also characterised by a wide continental shelf.

In all localities where there are target fisheries, some level of mixing of sardinella occurs in the catch statistics and the availability of time series is limited. Reconstructing the catches of the species requires data from parallel biological sampling programs, which in most localities are available only for the most recent years. Therefore, the historical trends in production (Figure 1) need to be considered with some reservation.

In Egypt the species is recorded together with other clupeids as sardines. According to the available biological sampling data, sardinella represents about 40% of the total sardine catches, with some interannual fluctuations. In Lebanon the proportion of sardinella in the catches of purse seines, estimated from biological sampling program, presents high monthly fluctuations. In the years 2016 -2017, it ranged between 50.5% and 55.77% of the total catches of purse seiners respectively. In official Turkish statistics only two groups of sardines are referred to. One is for small sardines which contains mostly pilchard (*S. pilchardus*) in GSA 22 and also small sized *S. aurita* and some other small clupeids but not anchovy or sprat. In GSA 24, the statistics contains small sized sardinellas in addition to pilchards. *S. aurita* becomes dominant, as we go east along the Turkish Mediterranean coast in GSA 24, and the pilchard catches reduces. Based on the data from different provinces along the coast, for years 2016 and 2017 only 5% of the landings or total catch is made of pilchards. However, while we can assume remaining catch contains *S. aurita*, we cannot be sure about the contribution of the other similar species such as *S. maderensis*.

The group noted a range of possible factors affecting the historical patterns in catches, including changes in river runoffs in the area, changes in fishing technologies and fishing areas, the adoption of closed seasons in some countries (e.g. Lebanon and Egypt) and also possible errors in the estimation of the species composition of the catches of sardines.



**Figure 1.** Estimated landings of sardinella in the eastern Mediterranean. Data from Syria and Israel are the reported landings of sardinella to the GFCM,

In Egypt, Gaza Strip and Lebanon, biological sampling of the species in the catches have been supported by EastMed. The sampling in Egypt covers the period from 2012 to 2017, while in Gaza and Lebanon from 2015 to 2017. The catch composition in length and weight and maturity stage of individuals have been systematically collected in the three areas and the data are used in the assessment of the stock presented in recent EastMed and GFCM stock assessment working groups. A similar biological sampling program was initiated in Turkey in 2018.

Data on age obtained from otolith reading is not yet available in the sub-region. With the support of EastMed, otoliths started to be collected in Egypt, Gaza, Lebanon and Turkey and a first intercalibration exercise is currently ongoing with the objective to provide reliable age readings and, in turn, to obtain a consistent age/length key for the species in the area.

EastMed is planning the launching of a parallel sub-regional research action aimed at investigating the stock boundaries of round sardinella using a multidisciplinary approach similar to the TransBoran project implemented by CopeMed in the western Mediterranean. This action aims at investigating the spatial population structure and identifying the most

plausible stock units based on a multidisciplinary approach. Therefore, the expected outputs will give us the opportunity to reveal whether the current GSA boundaries are the appropriate spatial scale for assessment and management of the species or other boundaries should be set. In terms of methodology, existing information on environmental features of the area (hydrodynamics, hydrology, bathymetry, etc.) and biology of round sardinella will be preliminarily collated. Ad hoc sampling programs will complete set of samples already collected by the Countries. Samples will be then use for the following analyses: i) meristic and morphometric, ii) otolith shape analyses and iii) genetic markers.

### **Determination of assessment/management units**

After reviewing the available fishery and biological information the group made the following considerations regarding stock units in the Eastern Mediterranean:

- There seems to be an association between the location of main fisheries for *Sardinella aurita* and important river runoff areas in the Eastern Mediterranean. Main catches at the moment come from Egypt (Nile river) and Turkey (Seyhan and Ceyhan rivers). These coastal waters could be serving as spawning areas for the stock. However, there are no comprehensive data on eggs and larvae to infer the location of spawning areas. Some data from Cyprus show the presence of larvae of round sardinella in southern Cyprus. In Lebanon the catch of very small sizes (3 cm) in coastal waters also indicates the presence of early life stages in Lebanese waters.
- Even if there are different spawning areas in the eastern Mediterranean and being round sardinella a migratory species, the possibility that adult individuals spawning in these two areas could be mixing cannot be ruled out.
- Preliminary meristic analysis of round sardinella in Lebanon, using data from 2012 and 2013, shows differences between fish sampled in the north and central regions of the country. These results indicate the possibility of the occurrence of mixed stocks in this part of the Eastern Mediterranean.
- Currently there is no detailed biological sampling from the catches in Turkey to estimate catch composition and biological parameters.
- Available length frequency data from survey in Turkey indicate the presence of a higher frequency of juveniles/small individuals during the month of June in some years. Data from Lebanon indicates the presence of smaller individuals in the catch in June/July and in Egypt in July.
- The mean length at first maturity in Egypt in 2015 was 14.22 cm, in Gaza Strip (2015) was 14.61 cm and in Lebanon was 14.81 cm (2017). In Turkey one study (2011) found that the length of first maturity was 11.6 cm females and 12.0 cm males.
- The peak production occurs in the third quarter of the year in Egypt, Gaza and Lebanon.

- Male/Female ratio close to 1:1 in Turkey and 1:1.5 in Egypt.

Given the available information, it is not possible at the moment to refute the hypothesis of a single stock unit in the Eastern Mediterranean. Participants therefore agreed to consider two plausible hypotheses in the assessment of the stock: individual stocks by countries and a single stock covering GSAs 24 to 27.

With the technical and financial support of EastMed project, the collection and analysis of biological data is planned to be carried out in the next two years to better understand round sardinella's stock boundaries in the Levantine Basin (including age, otolith shape, genetics, etc.). Based on this new information, the hypotheses of a single or multiple stocks should be revisited in the near future.

### **Stock assessment**

The first attempts to assess the status of *Sardinella aurita* in the Eastern Mediterranean were presented to the GFCM SA WG in 2015. The assessment was based on length frequency data for one year and used a length based VPA analysis (VIT). The assessment was considered preliminary by the SA Working Groups because of the short time-series of data (one year only). VIT relies on equilibrium assumptions that need to be verified with multiple years of data. In 2016 new assessments for Lebanon and Egypt - using VIT - were submitted to the GFCM WG. The assessments were not validated because of discrepancies between length frequency analysis and available growth parameters. In 2017 a VIT assessment was presented by Lebanon and validated by the GFCM WG.

Miguel Bernal (GFCM Secretariat) noted that sardinella is a priority species for the GFCM and that the Commission requested an advice on the species by 2020. Towards this end he noted that a special session on the species will be held during the GFCM SA WG in 2018 and a benchmark assessment is planned for 2019. He acknowledged the ongoing work carried out with the support of EastMed, including efforts to obtain age data from direct methods. However, based on the experience from other small pelagic fisheries in the Mediterranean, he noted that it will take time before a robust age/length key is available for stock assessment. In the meanwhile, the exploration of length-based methods should continue to be used for the assessment of the status of the stock.

The group did not progress in the identification of alternative assessment methods for the species. There was agreement however that while reliable age information does not become available, the assessment should be based on length frequency data, using length-based VPA or other reliable length-based methods (to be discussed and identified in the SA WG). One such method briefly discussed during the WG was the Length-based Integrated Mixed Effects (LIME) (Rudd and Thorson, 2018; Can. J. Fish. Aquat. Sci. 75: 1019–1035), which if flexible

enough to accommodate the various types of data available for sardinella in the subregion. The use of additional indicators of stock status (e.g. changes in mean length, catches and CPUE) was recommended as a general good practice to support the conclusions of assessment models.

As a first step towards the assessment of the stock, the group agreed to prepare the available length frequency data to assess the stock in Egypt, Gaza and Lebanon, testing scenarios reflecting the hypotheses of single and multiple stocks. Data prepared during the WG and the preliminary analysis conducted will be presented in the GFCM WG on Stock Assessment in November 2018.

### Session on Demersal stocks

The WG covered also the assessment of demersal stocks of Egypt, Gaza (presented by Egypt), Lebanon and Cyprus (Table 1). During the session, experts presented available data and preliminary results of assessment runs, followed by open discussions and suggestions from the group on assumptions, methods and recommendations for further analyses. The group worked particularly on the preparation of catch at length data, using appropriate raising factors, and also on the analysis of length frequency data for the estimation of growth parameters.

**Table 1.** Demersal stocks covered during the WG.

Country	Stocks to assess	GSA	Data series and source	Models
Cyprus	<i>Mullus barbatus</i>	25	1980 – 2017 Catch data by Quarter; 2005 – 2017 Age data by Quarter; 2005 – 2017 Length Data by Quarter; 2005 – 2017 MEDITS Survey data	Stock Synthesis Age Based 4 Season Model
Egypt	<i>Mullus surmuletus</i>	26	2011-2013 2016-2017	LCA (VIT, Y/R models)
	<i>Mullus barbatus</i>	26	2016-2017	LCA (VIT, Y/R models)
	<i>Metapenaeus stebbingi</i>	26	2012-2017	VPA
	<i>Saurida undosquamis</i>	26	2016-2017	LCA (VIT, Y/R models)
Palestine	<i>Saurida undosquamis</i>	27	2013-2017	LCA (VIT, Y/R models)
Lebanon	<i>Pagellus erythrinus</i> and <i>Lithognathus mormyrus</i>	27	2015-2017	LCA (VIT, Y/R models)

### **Subgroup on Socioeconomic Data Analysis**

Experts from three countries (Egypt, Lebanon and Turkey) attended the subgroup on socioeconomic data analysis. The sub-group focused the analysis on three main technical areas that included the fleet structure and output ('technical component'); employment ('social component'); and the economic performance ('economic component') for the main fleet segments in their respective countries. These three areas were selected, with four indicators per area, to:

- provide wide coverage of the socio-economic characteristics
- ensure data availability across the countries
- ensure coherence with the previous analysis to allow for temporal and cross-regional comparisons

The indicators were calculated and analysed for 2016 data and compared to the results from 2015. The following table summarizes the data analyzed:

Country	Year
Egypt	2016/2015
Lebanon	2016/2015
Turkey	2016/2015
EU countries (Italy; Greece; Cyprus)	2016/2015
Palestine	2016/2015

During the working group, the group revised the data inputs and produced preliminary estimates of the socioeconomic indicators. The sub-group also started to prepare individual chapters covering all the main fleet segments per country to produce a publication with a sub-regional analysis of the socio-economic situation of the Eastern Mediterranean fisheries, updating the EastMed Technical Documents TD-22 of 2016.

## **Conclusions and closure of the meeting**

In the final day of the working group, a plenary session was held, where experts from the two sub-groups briefly presented the advances made during the week and the plan of work to complete the assessments and analysis.

In terms of stock assessment, a general discussion was held on the types of scenarios, data and methods to be applied for the assessment of sardinella and demersal stocks. For sardinella the group agreed to run assessments using VIT for the years 2015, 2016 and 2017, separately and for the years combined. A joint assessment will also be attempted for the three years using data from Egypt, Gaza and Lebanon. Work will continue to advance on the preliminary assessments of demersal stocks (as described in Table 1) to be presented to the GFCM SAC Stock Assessment Working Groups in November 2018. In terms of new stock assessment methods, the group briefly discussed the capabilities of LIME using the code and simulated data provided by Dr Merrill Rudd for the meeting. The method can integrate different types of data, including length frequency data and spotted biological and catch data, and is one of the methods recommended by FAO for data limited situations. The group agreed that further guidance on the use of the method would be desirable, if possible through a dedicated hands-on training session during the next GFCM SAC SAWG. The possibility of having the model script adapted to the specific data availability of sardinella in the eastern Mediterranean would also facilitate its use.

The socioeconomic sub-group presented the preliminary results of the comparative analysis of socioeconomic indicators between 2015 and 2016, which was followed by questions and clarifications. The group agreed to continue working on the country analysis and to prepare a joint technical publication on the socioeconomic status of the fleets in the following months.

The dates and venue of the next Working Group are yet to be defined. The possibility of having it again in FAO, Rome, in the fourth quarter of 2019 was proposed as a viable option by the project.

The meeting was closed on Friday 14 September 2018.

## Annex 1. List of participants

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## **Annex 2. Agenda of the FAO EastMed WG on Fisheries Data Analysis, 10 – 14 September 2018, FAO HQ, Rome.**

### **Monday 10 September**

Introduction of the meeting objectives and adoption of the agenda\* (Mexico Room)

**Stock Assessment Sub-Group:** Presentation of available data for the assessment of sardinella and discussion on management/assessment units\* (Mexico Room)

**Socio-Economic Sub-Group:** Socio-economic analysis of main fleet segments in Egypt, Lebanon, Gaza and Turkey (FI-Meeting Room)

*\* Joint session with the EastMed/GFCM Data Preparatory Meeting on Round Sardinella.*

### **Tuesday 11 September**

**Stock Assessment Sub-Group:** Data collation and determination of appropriate assessment methodologies for sardinella\* (Mexico Room)

**Socio-Economic Sub-Group:** Socio-economic analysis of main fleet segments in Egypt, Lebanon, Gaza and Turkey. Continued. (Room TBD)

*\* Joint session with the EastMed/GFCM Data Preparatory Meeting on Round Sardinella.*

### **Wednesday 12 September**

**Stock Assessment Sub-Group:** Presentation of available data and work on assessment of demersal stocks (Morning: Mexico Room; Afternoon: FI meeting room)

**Socio-Economic Sub-Group:** Socio-economic analysis of main fleet segments in Egypt, Lebanon, Gaza and Turkey. Continued. (Room TBD)

### **Thursday 13 September**

**Stock Assessment Sub-Group:** Presentation of available data and work on assessment of demersal stocks; Preparation of GFCM stock assessment forms (All day: Mexico Room)

**Socio-Economic Sub-Group:** Socio-economic analysis of main fleet segments in Egypt, Lebanon, Gaza and Turkey. Continued. (Room TBD)

### **Friday 14 September**

Plenary session (Iran Room):

- Presentation of the preliminary assessments and socio-economic analysis
- Closure of meeting

**Annex 3. Agenda of the EastMed/GFCM Data preparatory meeting on round sardinella, FAO HQ, Rome, Italy 10 – 11 September 2018**

**MONDAY 10 SEPTEMBER**

**1. Opening and arrangements of the meeting (joint session with EastMed Working Group on Data Analysis)**

- Welcome addresses and introduction of participants
- Adoption of the agenda and appointment of the chair

**2. General overview of objectives and expected outcomes (*EastMed/GFCM Secretariat*)**

**3. Overview of available data for the assessment of round sardinella**

Review of available data for the assessment of round sardinella

- Presentation of available data by country (*presentations by participants*)
- Outcomes of the age determination and intercalibration workshop (*EastMed*)

**4. Determination of assessment/management units**

Review of data available for the determination of the most appropriate assessment/management

units:

- Presentation of available data by country (*presentations by participants*)
- Overview of the plan for stock boundary definition exercise (*EastMed*)

**TUESDAY 11 SEPTEMBER**

**4. Determination of assessment/management units (cont'd)**

**5. Data collation**

Collation of data according to the assessment/management units determined above

**6. Determination of appropriate assessment methodologies**

Presentation of stock assessment methods applied in the past

Cross comparison of available data with data-methods table



<b>Lebanon</b>	Length based	Estimated from length data	Available (2012-2013 Jemaa et al., 2016; 2015-2016 on monthly basis)	Available (2012-2013 Jemaa et al., 2016; 2015-2016 on monthly basis)	Available (2012-2013 Jemaa et al., 2016; 2015-2016 on monthly basis)	Available (2012-2013 Jemaa et al., 2016; 2015-2016 on monthly basis)	Available (2012-2013 Jemaa et al., 2016; 2015-2016 on monthly basis)	Estimated		Yes	No				Seasonal migration needs to be assessed		Available
<b>Libya</b>																	
<b>Tunisia</b>																	
<b>Turkey</b>	Length based	NA	Available (2009-2011 Gücü, et al., 2011; 2015-2016)	Available (2009-2011 Gücü, et al., 2011; 2015-2016)	Available (Gücü, et al., 2011)	Available (Gücü, et al., 2011)		Estimated	cyclical	Yes	Yes	NA	Yes				

**Annex 5. Available fisheries dependent data on sardinella in Eastern Mediterranean countries.**

**Part 1**

Fishery-dependent data												
Country	Gear type	Catch compo. in species (>5 yr)	Spatial distr. of catch (>5 yr)	Sex compo. Of catch	Catch (<5 yr)	Catch (>5 yr)	Length/size compo of catch (<5 yr)	Length/size compo of catch (>5 yr)	age compo of catch (<5 yr)	age compo of catch (>5 yr)	Mean length of catch	Mean weight of catch
Cyprus		No catch information										
Egypt	Purse seine experimental fishing around 30 years ago	Landings from at least 50 years but grouped with other clupeid species. It represents about 10% of all species	Only by main landing ports	Yes		Landings from at least 50 years, but grouped with other clupeid species		Yes: from 2013/2014		No direct ageing	Yes from data collection	Yes from data collection
Egypt	Gillnet	Minor component of gillnets				No record						
Greece		FAO/GFCM database?										
Israel	Purse seine	All clupeids are reported together. Not a target species, except when the fish are big in the school				Electronic data from the 1990s; on paper from the 1950s - monthly sampling		No			No	No
Gaza strip	Purse seine - Gillnets - Trawler	Landings from 1996 grouped with other clupeid	By fishing port	Yes		Landings from 1996 grouped with other clupeid		Yes: from 2014		No direct ageing	Yes from data collection	Yes from data collection

		species. % of the single species is then evaluated				species. % of the single species is then evaluated						
<b>Lebanon</b>	Purse seine	Clupeids are target species; the importance of sardinella fluctuates over time and region	Yes	Yes	Census based for 1 year (2017); sample-based for 3 years (2015)		Data length of catch from 2015, 2016 and 2017		No direct ageing		Census based for 1 year (2017); sample-based for 3 years (2015)	Census based for 1 year (2017); sample-based for 3 years (2015)
<b>Lebanon</b>	Gillnets				Sample-based for 3 years (2015)							
<b>Libya</b>												
<b>Tunisia</b>												
<b>Turkey</b>	P-13 (small boats using gillnets), P-06 (small purse seine without PB), S-09 (purse seine with PB)	NA	2011-	NA	Yes	By GSA (1968 - ); By province (2011 - )	NA	NA	NA	NA	NA	NA

**Part 2**

Fishery-dependent data													
Country	Gear type	Number of active vessels	Spatial distr. of effort (> 5yr)	Effort (<5 yr)	Effort (>5 yr)	Effort characteristics (month/season, gear, fleet, etc)	Initial depletion	Final depletion	Total discards	Discards composition	socioeconomic data	Comments	Potential data
Cyprus												No catches, but the species is in the area as it is present in bongo hauls (as 50%); it may comprise food for other species.	
Egypt	Purse seine experimental fishing around 30 years ago. Gillnets as a secondary gear	Yes (registered vessels): from over 50 years	No (no VMS devices are installed on Egyptian fishing vessels)		Estimates of CPUE for some ports	Yes, depending on spot (efforts to carry out research)	Yes	Yes	None		Yes: DCRF data		
Greece												Not a target species, commercial value very low	MEDIAS survey may give information
Israel	Purse seine	Electronic data from the 1990s; on paper from the 1950s - monthly sampling	No		Electronic data from the 1990s; on paper from the 1950s - monthly sampling	Monthly							
Gaza strip	Purse seine - Gillnets - Trawler	Yes (registered vessels) but information is difficult to access	No	Estimates of CPUE from socio-economic study		Monthly			-		Yes: DCRF data		

<b>Lebanon</b>	Purse seine	Yes. Source: Vessel registry at the MoA		Source: Ministry of Agriculture from 2015 (sample-based for 3 years: 2015)			Although data are recent, the fishery goes back for decades.	No	Scarce			The fishery targets the small fish, which have a high value, so catch data may not be representative for the total population	
<b>Lebanon</b>	Gillnets	Yes. Source: Vessel registry at the MoA		From the Ministry of Agriculture from 2015 (sample-based for 3 years: 2015)								This gear catches larger individuals, not as valuable as the small ones.	
<b>Libya</b>													
<b>Tunisia</b>													
<b>Turkey</b>	P-13 (small boats using gillnets), P-06 (small purse seine without PB), S-09 (purse seine with PB)	Available	NA	2017-	NA	No	NA	NA	NA	NA	NA		

**Annex 6. Available fisheries-independent data on sardinella in Eastern Mediterranean countries.**

Fishery-independent data						
Country	Survey type	Timing	Density	Size distribution from surveys	Age distribution from surveys	Potential data
Cyprus						During the MEDITS survey, some bongonets are used to collect data on plankton. Early-life stages of <i>S. aurita</i> are reported to be an important fraction of the zooplankton. Currently, these surveys have no sampling design and therefore neither quantitative nor qualitative estimation were done
Egypt	Purse seine experimental fishing ,30 years ago					Check on these data on the past
Greece						MEDIAS survey may give information
Israel	No					
Gaza strip						
Lebanon	No					Exploratory survey trawling 2018, Full trawl survey 2019 (MEDITS); potential acoustic survey 2020
Libya						
Tunisia						
Turkey	Hydroacoustics and pelagic trawl	2009-2011 and 2015-2016	Yes	Yes	No	