

## EastMed



### Report of the EastMed Working Group Meeting on round sardinella

COISPA, Bari, Italy from 1-5 July 2019

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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For bibliographic purposes this document  
should be cited as follows:

EastMed, 2019. Report of the EastMed Working Group Meeting on round sardinella. GCP/INT/318/EC– 041/ITA/TD-30. Rome 2019: 11 pp.

## **Preparation of this document**

EastMed initiated in 2018 a sub-regional activity aimed at enhancing the knowledge on the population structure and dynamics of the round sardinella, *Sardinella aurita*, in the Eastern Mediterranean. Two Study Groups were established: *the Study Group on transboundary population structure of round sardinella in the Eastern Mediterranean* aims to evaluate the adequacy of current GSA boundaries as appropriate spatial scale for the assessment of the stock using a multidisciplinary approach; the *Study Group on inter-calibration of fish otolith reading*, focused initially on sardinella but to include other species in the future, aims at enhancing the quality of the growth data used in stock assessment, including the preparation of reliable age/length keys for the species. Both study groups met for the first time in July 2018, at the *EastMed Working Group on round sardinella* hosted by the COISPA Tecnologia & Ricerca (Bari, Italy). The study groups met again during a second meeting of *EastMed Working Group on round sardinella*, at COISPA, Bari, Italy, 1–5 July 2019, to take stock of the progress made, to carry out further otolith intercalibration exercises and to plan to work ahead. This document is the final report of the Working Group meeting.

EastMed. 2019. Report of the EastMed Working Group Meeting on round sardinella. GCP/INT/318/EC–041/ITA/TD-27. Rome 2019: 11 pp.

### **ABSTRACT**

The EastMed Working Group on round sardinella met in Bari, Italy, from 1 to 5 July 2019 and was attended by experts from Egypt, Lebanon, Palestine, Syria, Turkey, Cyprus and Italy. The working group main objectives were to take stock and progress with the work being carried to understand the population structure of round sardinella in the Eastern Mediterranean (FISHBONE project) and to define ageing criterion and aging scheme for the species. In view of the upcoming benchmark assessment of the species, the working group also discussed possible sources of bias in the available data for a reliable stock assessment of *S. aurita*. A section of the meeting was also dedicated to the presentation of the EU-funded project MED\_UNITS which aims to contribute to the definition of stock boundaries of priority species across the Mediterranean. The working group discussed the potential collaboration and optimization of protocols between the FISHBONE and MED\_UNITS projects.

## 1. Background

Improved growth estimates from age data has been recognized as a key step for enhancing the quality and reliability of stock assessment for priority species in the Eastern Mediterranean. The FAO EastMed project supported and steered the establishment of a Study Group involving researchers from Eastern Mediterranean countries with the objective to carry out, on a regular basis, calibration exercises for fish age determination by otolith reading. In view of the planned benchmark assessment of the round sardinella, *Sardinella aurita*, scheduled for the beginning of 2020 by the GFCM SAC, and following the requests of the Eastern Mediterranean countries to obtain a sound age-length key for this species, in 2019 the Study Group focused its effort on the round sardinella.

The round sardinella is a commercially exploited marine pelagic species that is widely distributed throughout the tropical and subtropical seas of the world, including the entire Mediterranean and the Black Sea. The species is currently assessed and managed assuming discrete stocks in each individual country and GSAs. Historically, stock delimitation has followed a top-down approach, in which management stewardships decide the stock boundaries attending mainly to political reasons and, consequently, fisheries stock assessment work according to these boundaries. However, there are currently vast research evidences showing that stock delimitation should follow a bottom-up approach in which the stock delimitations should be based in scientific evidences from multiple disciplines. Based on these previous studies, and at the request of GFCM SAC to enhance the understanding of structure of fish populations in the Mediterranean, the FAO Regional Project EastMed initiated a sub-regional activity and Study Group to contribute to the understanding of stock structure and boundaries of round sardinella in the Eastern Mediterranean. This activity was named Round sardinella FISHBONE project (FInding Stock units with BOundaries iN Eastern Mediterranean).

At the moment the assessment of the status of round sardinella in the Eastern Mediterranean relies on length distribution data obtained by the countries with support of EastMed. In view of the planned benchmark assessment of the species in the framework of the GFCM SAC, a data preparatory meeting was recommended as first step in the road map towards the assessment of the stock. A first data preparation meeting was held in September 2018, in a joint session with the GFCM within the EastMed WG on Data Analysis. As a follow up to the meeting it was recommended that further exploration of sources of biases in available data sets be conducted before proceeding with the stock assessment. At the 2018 WGSASP further guidance were provided to countries to explore and analyse potential sources of bias in data sets.

The EastMed Working Group on round sardinella met at COISPA Tecnologia & Ricerca, Bari, Italy, from 1 to 5 July 2019, to take stock of the progress made within the ongoing study groups and activities on sardinella and to plan for next steps and activities. A section of the meeting was also dedicated to the presentation of the EU-funded project MED\_UNITS, which aims to contribute to the definition of stock boundaries of priority species across the Mediterranean. The Working Group was attended by experts from Egypt, Lebanon, Palestine, Syria, Turkey, Cyprus and Italy. The full list of participants is in Annex 1 of this report. The agenda of the meeting is in Annex 2.

## **2. Activities**

The following is a summary of the discussions and activities carried out on the different themes during the meeting.

### **2.1. MED\_UNITS project**

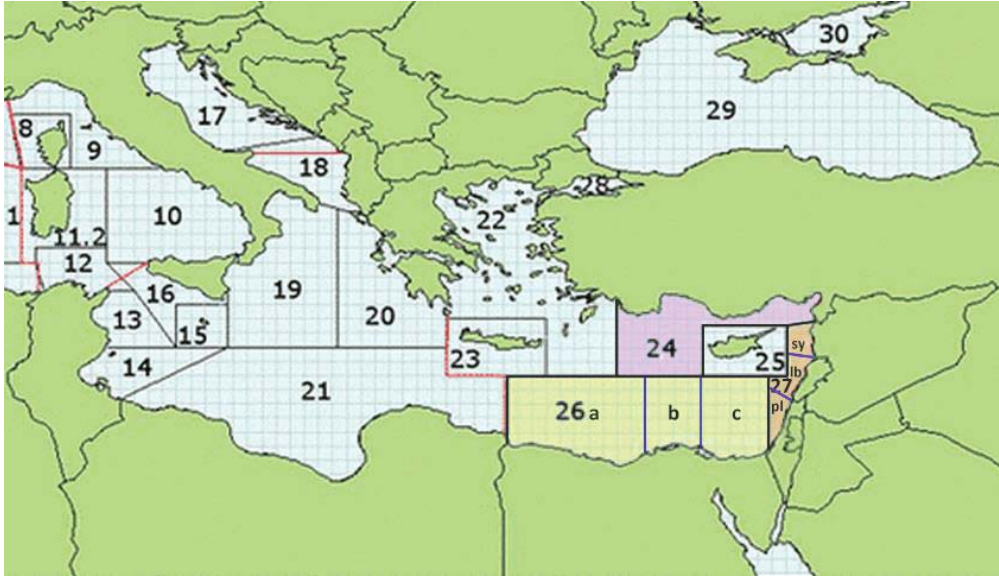
Maria Teresa Spedicato introduced the project MED\_UNITS on advancing fisheries assessment and management advice in the Mediterranean by aligning biological and management units of priority species. The project is implemented by a consortium of European research institutes and universities and has the following specific objectives:

- Identify biogeographical boundaries and population structure of priority species;
- Investigate genetic distribution among and within sub-basins;
- Identify and delineate stocks using the ‘state of the art’ approach i.e. the application of multiple approaches, to the same biological samples, to achieve an interdisciplinary perspective and consensus;
- Identify and delimit the more important fishing grounds with associated main origin of the operating fleet to define spatial units for fisheries management;
- Combine the information on fish stock boundaries and delimitation of spatial units for fisheries management;
- Perform stock assessments based on the updated list of stock units for the examined priority species as emanating from the present study and compare with previous assessments.

To ensure the participation of research institutes from non-EU Countries in the project, the FAO Regional Projects agreed to explore the possibility of supporting the collection of samples in non-EU countries depending on the interest of partners and the availability of funds. During discussions, a specific focus was given to the genetic sampling protocol foreseen in the MED\_UNITS project and to its implementation schedule. Differently from the FISHBONE project, MED\_UNITS protocols require genetic samples to be sent to Italy and the analysis to be centralized in one laboratory.

During discussions participants stressed the importance of involving Eastern Mediterranean countries in the MED\_UNITS project. It was proposed to partially replicate the scheme of sampling stations agreed upon by the FISHBONE project, increasing the number of subregion in Egypt (see Figure 1). The centralization of the analysis of genetic material in Italy could hamper the participation of Turkey due to national laws currently in force. Therefore, the participation of the country was provisionally left on standby to allow further considerations.





**Figure 1.** Agreed subareas for data collection in GSAs 26 and 27 in the framework of the MED\_UNITS project,

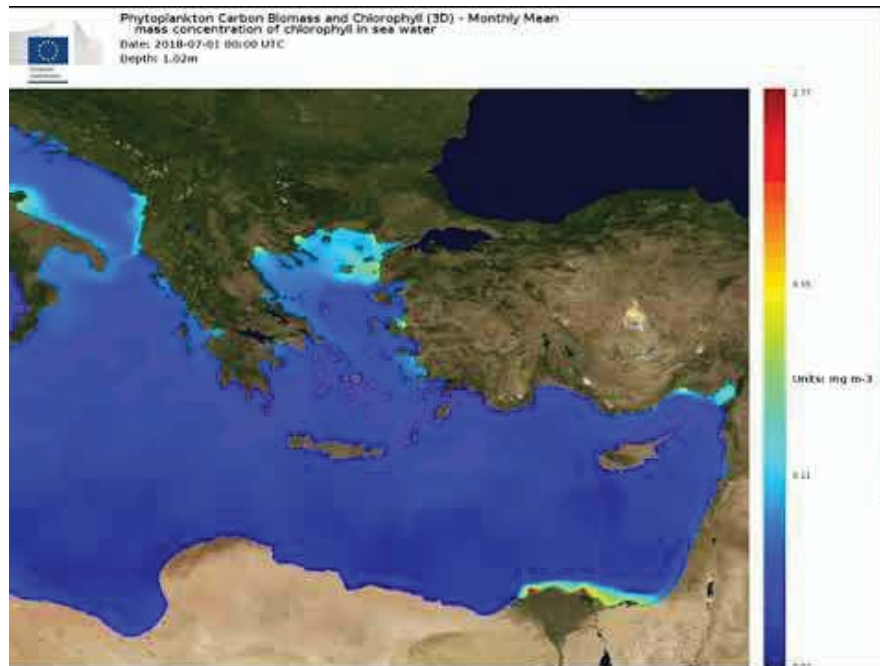
The Countries agreed to test their capabilities to collect samples of the following species by subregion (as defined in figure 2):

- GSA 24 - to be defined
- GSA 26a - *Aristaeomorpha foliacea*; *Aristeus antennatus*; *Parapenaeus longirostris*; *Merluccius merluccius*
- GSA 26b – *Mullus barbatus*
- GSA 26c – *M. barbatus*
- GSA 27 Palestine (a)– *M. barbatus*
- GSA 27 Lebanon (b)– *A. foliacea*; *A. antennatus*; *P. longirostris*; *M. merluccius*; *M. barbatus*
- GSA 28 Syria (c)– *P. longirostris*; *M. merluccius*; *M. barbatus*

## 2.2. Study Group on transboundary population structure of round sardinella in the Eastern Mediterranean (FISHBONE Project)

Sefano Lelli, EastMed fishery expert, introduced the activity on the definition of stock boundaries of *Sardinella aurita*. He noted that sampling protocols were already agreed and that concrete steps for data collection and sample handling needed to be discussed and defined, including the needs in terms of human and financial resources. Therefore, technical aspects and potential issues were discussed for the following disciplines/tasks: i) Morphometry, meristics and life history traits; ii) Otolith Shape Analysis; iii) Genetic markers for stock boundaries analysis; iv) Review of environmental information and fisheries data. With reference to the last task, Mümtaz Tıraşın showed the first results of a review of available data in the Copernicus website ([www.copernicus.eu](http://www.copernicus.eu); see example in Figure 2). Among the others, he highlighted the importance of certain environmental and meteorological parameters and how the seasonal and historical changes in these parameters can affect life history traits of round sardinella.





**Figure 2.** Phytoplankton Carbon Biomass and Chlorophyll in the Eastern Mediterranean, monthly resolution for the year 2018, extracted from [www.copernicus.eu](http://www.copernicus.eu).

With reference to the previous tasks, the following points were made during discussions following the presentations:

- a minimum of 440 samples should be prepared for genetic analyses (40 samples from each sampling site, times 11 sites).
- with regards to the transportation of samples from collection sites to the laboratories, participants from Egypt proposed to investigate the possibility of sending samples to Italy (University of Bologna, UNIBO) through FAO Egypt. Participants from Turkey confirmed that samples for genetic analysis cannot leave the country unless specific administrative procedures are put in place, which can take a long time. To avoid delays, it was suggested that a specialized laboratory in Turkey be in charge of the task of genetic analyses of the Turkish samples, under the guidance and control of the UNIBO.
- a webinar for the correct identification of the species can be organized and shared by Sharif Jemaa (CNRS-L).
- two videos showing how to follow protocols for extraction and storage of genetic materials (prepared by UNIBO) and for extraction and storage of otoliths for shape analysis (prepared by CNRS-L) were appreciated by the Group.
- participants agreed on the idea of organizing, on a later stage, a workshop on round sardinella's maturity stage identification.
- a unique code for each sample shall be assigned, as follows:

GSA-subarea-COUNTRY-SPECIES-NUMBER-replica (lower case, only when appropriate)

<b>26aEGYSA07b</b>
<b>27LEBSA12</b>

Example 1

Example 2

Participants highlighted the importance of defining a comprehensive workflow for laboratory activities for the optimization of time and reduction of the risk of contamination of the samples. To this end a simple infographic was prepared (Figure 3) and shared among participants.

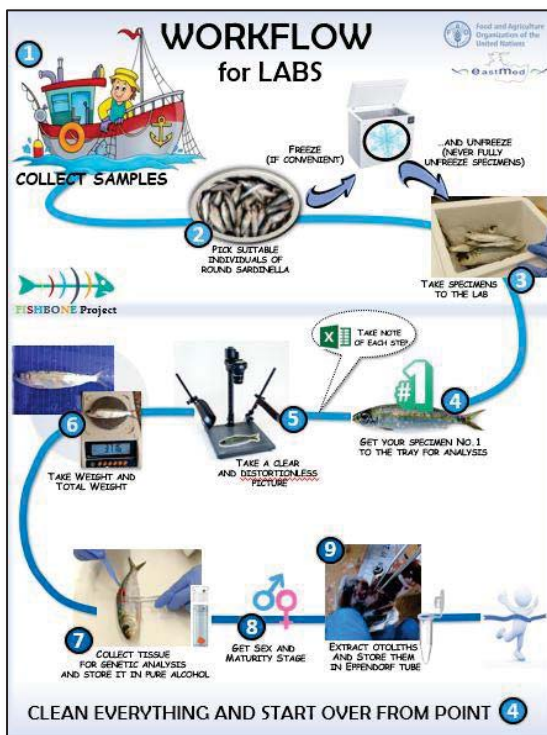


Figure 3. Infographic showing the workflow for the laboratory treatment of samples.

Participants from Palestine and Syria remarked their will to participate to the project and to overcome any difficulty that may arise in terms of sampling and logistics. Prior the meeting in Bari, Cyprus assured its participation to the project by collecting samples following agreed protocols.

### 2.3. Collation of data for stock assessment and analysis of possible sources of bias

Stefano Lelli introduced this activity and emphasized its relevance to the planned benchmark assessment of sardinella. He noted that a number of length-based data-limited methods exist and could be used to assess the stock of sardinella, but before proceeding a thorough analysis of the available data was necessary. Participants were guided through the data template and agreed protocol for the analysis of biases in stock assessment data, prepared in the previous data preparation meeting.

Participants from Egypt regretted recent gaps in data collection and highlighted the importance

of observers on board to collect a full set of information valuable for sound stock assessment. Hatem Hanafy expressed the interest of the Arab Academy for Science, Technology & Maritime Transport (AAST) in carrying out data collection with the guidance and support of the EastMed, taking advantage of a new generation of qualified students from the academy. The Group agreed on completing the form and analysis by September 2019.

#### **2.4. EastMed Study Group on inter-calibration of fish otolith reading**

The EastMed Study Group on inter-calibration of fish otolith reading was established in July 2018 as a permanent group to support the shared definition of ageing scheme and ageing criteria of priority species in the sub-region. The final aim of the group is to develop sound age-length keys for use in stock assessment of the species. The meeting of the group was held from 2 to 5 July 2019, during the EastMed Working Groups on round sardinella. In the first part of the meeting participants presented an update on biological data and fisheries information on round sardinella.

The Chair of the study group, Pierluigi Carbonara presented the outcomes of the previous (2018) exercise of common reading, highlighting the good level of accordance, taking into account that some of the readers were unexperienced. The percentage of agreement (PA) and coefficient of variation among readers (CV) were 61.5% and 51.9% respectively. Nonetheless, the high coefficient of variance (CV) was indicative of issues in the reading of specific ages. Moreover, the Chair called the attention to the presence of false rings (usually one or two) before the first translucent ring.

Considering the date of capture and the margin type (opaque or transparent), the group adopted an age scheme based on the 1<sup>th</sup> July as theoretical birthday. The 150 otoliths read in 2018 were read again (blind for the length and ensuring that they were from same sample) for comparison and to assess any improvement on the level of reading. Additional 128 otoliths were read blind for the length by the group. The results of the reading were discussed in plenary in order to highlight the inconsistencies such as false rings, identification of the first winter increment and margin type. Preliminary analyses of the results showed an increased level of accordance and a significant reduction of the CV and increase the PA. For the sample of 2018 the PA and CV were 70.1% and 48.3 % respectively. For the new sample the PA and CV were 73.3% and 18.8% respectively. Detailed results will be presented in the final report that will be drafted to wrap up all the outcomes of the 2019 exercise. Finally, the group agreed on an ageing scheme and ageing criterion to be used in the age reading of round sardinella. A specific handbook on age reading will be prepared by the group based on the agreed scheme and criterion.

### **3. Conclusions and follow-up**

The Working Group tackled different aspects of the sub-regional effort to enhance the knowledge on the biology, population dynamic and stock status of round sardinella in the Eastern Mediterranean.

There was a general agreement on the need to improve the quality of the data collection by on board observations and to avoid interruption in data collection. The need for data with good quality was considered essential to a robust stock assessment of the species.

The group agreed to complete the task of compilation of available length frequency and biological data and analysis of potential sources of bias by the Joint EastMed/GFCM Data Preparation Meeting to be held in September 2019 within the EastMed Working Group on Data Analysis. During the data preparation meeting participants are also expected to progress in the analysis of the performance of different data-limited methods proposed for the species, including VIT and LIME, if possible with the assistance of an international expert.

To advance with the FISHBONE project, data collection will start in September 2019 with the involvement of GSAs 22, 24, 25, 26 and 27 as well as GSA 18 (alternatively GSA19). Participants also agreed to actively participate in the MED\_UNITS project with the support of EastMed.

The collective exercise of otolith reading through a sharing program was meant to assess precision in the age estimation and to inter-calibrate otolith readers among the participating countries. The focus of the study group were the ageing schemes and ageing criteria for a correct age determination of *Sardinella aurita* otoliths. Under the supervision of Pierluigi Carbonara, the group agreed to prepare a handbook on the age determination of *Sardinella aurita* and a scientific publication on sardinella age and growth in the Eastern Mediterranean.

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## Annex 2. AGENDA OF THE WORKING GROUP

FAO EastMed

### EastMed Study Group on Round sardinella Bari, Italy 1-5 July 2019 Agenda

Morning, 09.30 – 13.00 hours / Afternoon, 14.30 – 17.30 hours

#### Monday 1 July 2019

##### 09.00-09.30

Welcome to the participants

Approval of the agenda

##### 09.30-11.00

##### FISHBONE Project:

Introduction on the EastMed activity on the definition of stock boundaries of *Sardinella aurita* in the EMed (S. Lelli – FAO/EastMed Project)

Task on morphometry, meristics and life history traits: technical aspects and potential issues (R. Fahim, AAST)

Task on otolith Shape Analysis: technical aspects and potential issues (S. Jemaa – CNRS-L)

##### 11.00-11.30 Coffee break

##### 11.30-13.00

Task on genetic markers for stock boundaries analysis: technical aspects and potential issues (A. Ferrari - University of Bologna)

Task on review of environmental information and fisheries data: technical aspects and potential issues (M. Tirasin – Dokuz Eylul University)

##### 13.00-14.30 Lunch break

##### 14.30 – 15.30

##### MED\_UNITS Project:

Presentation of the project “Study on Advancing fisheries assessment and management advice in the Mediterranean by aligning biological and management units of priority species” (M. T. Spedicato or P. Carbonara, COISPA)

##### 15.30 - 16.00 Coffee break

##### 16.00 - 17.30 Coffee break

Discussion on combination of protocols and optimisation of practices between the FISHBONE and MED\_UNITS projects



## Tuesday 2 July 2019

**09.30-11.00**

### **COLLATION OF INFORMATION AND POSSIBLE SOURCES OF BIAS**

Collation of information and identification of possible sources of bias for a reliable stock assessment of *Sardinella aurita* in the EMed (in view of the upcoming benchmark assessment of the species)

**11.00-11.30 Coffee break**

**11.30-13.00**

Cont'

**13.00-14.40 Lunch break**

**14.30 – 16.00**

Countries' update on biological data and fisheries information on round sardinella. Short presentations given by:

- Egyptian researchers
- Turkish researchers

**16.00 - 16.30 Coffee break**

**16.30 – 17.30**

Short presentations:

- Lebanese researchers
- Palestinian researcher

Any other communication from participating Countries

## Wednesday 3 July 2019

**9.30-11.00**

Round sardinella: Ageing criteria and Ageing scheme (Pierluigi Carbonara)

Discussion and definition of a set of samples for practical exercise

**11.00-11.30 Coffee break**

Cont'

**11.30-13.00**

Practical exercise

**13.00-14.30 Lunch break**

**14.30 – 17.30**

Cont'

**16.00 - 16.30 Coffee break**

## Thursday 4 July 2019

**09.30-11.00**

Discussion on the results obtained

**11.00-11.30 Coffee break**

**11.30-13.00**

Cont'

**13.00-14.40 Lunch break**

**14.30 – 16.00**

Data elaboration (group work)

**16.00 - 16.30 Coffee break**

**16.30 – 17.30**

Data elaboration (group work)

## Friday 5 July 2019

**9.30-11.00**

Definition of a handbook on the age determination of *Sardinella aurita*

**11.00-11.30 Coffee break**

**11.30-13.00**

Planning of future work

Any other matter and meeting closure

**13.00-14.30 Lunch break**