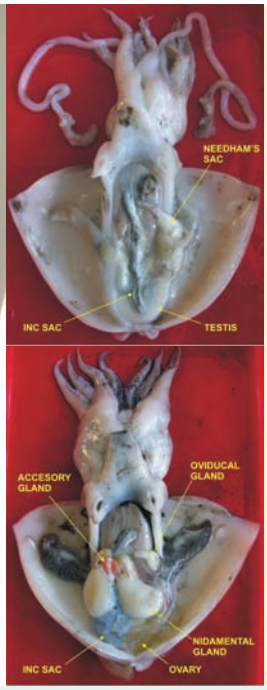
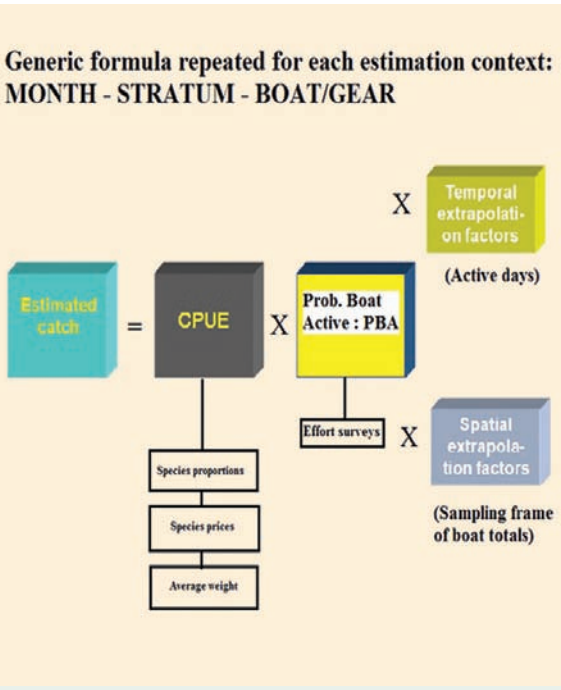
EastMed TECHNICAL DOCUMENTS 12





SAMPLING PROTOCOL FOR THE PILOT COLLECTION OF CATCH, EFFORT AND BIOLOGICAL DATA IN EGYPT

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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 Greece, Italy and EC.

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, CopeMed II and ArtFiMed. 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

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** aims at contributing to the sustainable management of marine fisheries in the Eastern Mediterranean, and, thereby, at 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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Preparation of this document

This document is the final version of the Report of the sampling protocol for the collection of Catch, Effort and Biological data in Egypt compiled by the FAO-EastMed Project (Scientific and Institutional Cooperation to Support Responsible Fisheries in the Eastern Mediterranean).

Acknowledgements

The General Authority for Fish Resources Development (GAFRD) from the Ministry of Agriculture of Egypt, that provided information on it`s organisation, is gratefully acknowledged.

Dimech M., Stamatopoulos C., El-Haweet A.E., Lefkaditou E., Mahmoud H.H., Kallianiotis A., Karlou-Riga C., 2012. Sampling protocol for the pilot collection of Catch, Effort and Biological data in Egypt. GCP/INT/041/EC – GRE – ITA/TD-12. Athens 2012:53 pp.

ABSTRACT

This protocol is the result of two training courses which were conducted in Egypt in November 2010 in Port Said and in June 2012 in Alexandria. A pilot survey first on Catch and Effort data which was then followed by biological sampling has been started in Egypt with the Support of the EastMed project. The aim of the protocol is to assist the data collectors both in the field and in the laboratories to conduct sampling during the pilot phase. The first part of this document contains guidelines on the routine collection of catch and effort data from the ports of Alexandria, Damiette, Kafr-El-Sheikh, Madiaa and Port Said. The second part of the document describes guidelines for the collection of biological data including length, weight, sex, sexual maturity, gonad weight and hard structures for age reading. It also includes guidelines on sampling frequencies and number of samples to be collected for catch, effort and biological data. The protocol will also serve as a basis if Egypt intends to pursue a routine data collection system for the collection of fisheries data for stock assessment purposes.

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SAMPLING PROTOCOL FOR THE COLLECTION OF CATCH, EFFORT AND BIOLOGICAL DATA IN EGYPT

Part I - Egyptian Fisheries

prepared by

Alaa Eldin El-Haweet

1.1 Administrative set-up of the Fisheries Department in Egypt

Egypt is situated in the Eastern part of North Africa, in the South Eastern Mediterranean Sea, in the General Fisheries Commission for the Mediterranean (GFCM) Geographical Sub-Area (GSA) 26 South Levant. The country has borders with Libya in the West and Gaza Strip in the East. The coastline of Egypt on the Mediterranean Sea is about 1,100 km long, extending from Sallum in the West to Rafah in the East, and contains six Northern coastal lagoons opening to the Mediterranean Sea (Maruit, Edku, Burollus, Manzala, Port Fouad and Bardawil).

The main fishing ground used by the Egyptian fishing fleet is the continental shelf off the Nile delta. Recently the fleet also extended its activities to the Eastern side off Sinai and seasonally to the Western side of Alexandria. The region near the Nile delta has a large continental shelf which becomes progressively narrow on the western and eastern parts. Along the middle and eastern coast, the seabed is flat with mostly muddy and sandy bottoms. On the western coast trawlable grounds are limited since the region is dominated by rocky bottoms. Apart from trawling, inshore fisheries are very common with a high number of artisanal fishers along the coast. There are ten fisheries centres along the coast with five developed fishing ports in Alexandria, Maaddia, Borollus, Damietta and Port Said (Fig. 1).

The General Authority for Fish Resources Development (GAFRD) within the Ministry of Agriculture is the state agency responsible for managing and controlling Egyptian fisheries including the enforcement of the fisheries legislation with the support of the coastal guard. Four central offices, for the western coastal provinces (Western region), Delta provinces (Central delta region), Damietta provinces and Port Said provinces (Eastern region), are part of the headquarter complex in Cairo, with another three local offices for the Nile provinces, Aswan region and Red Sea province. The headquarters office is also responsible for development projects, applied research, national and international agreements, and maintenance activities (Seham and Salem, 2004).

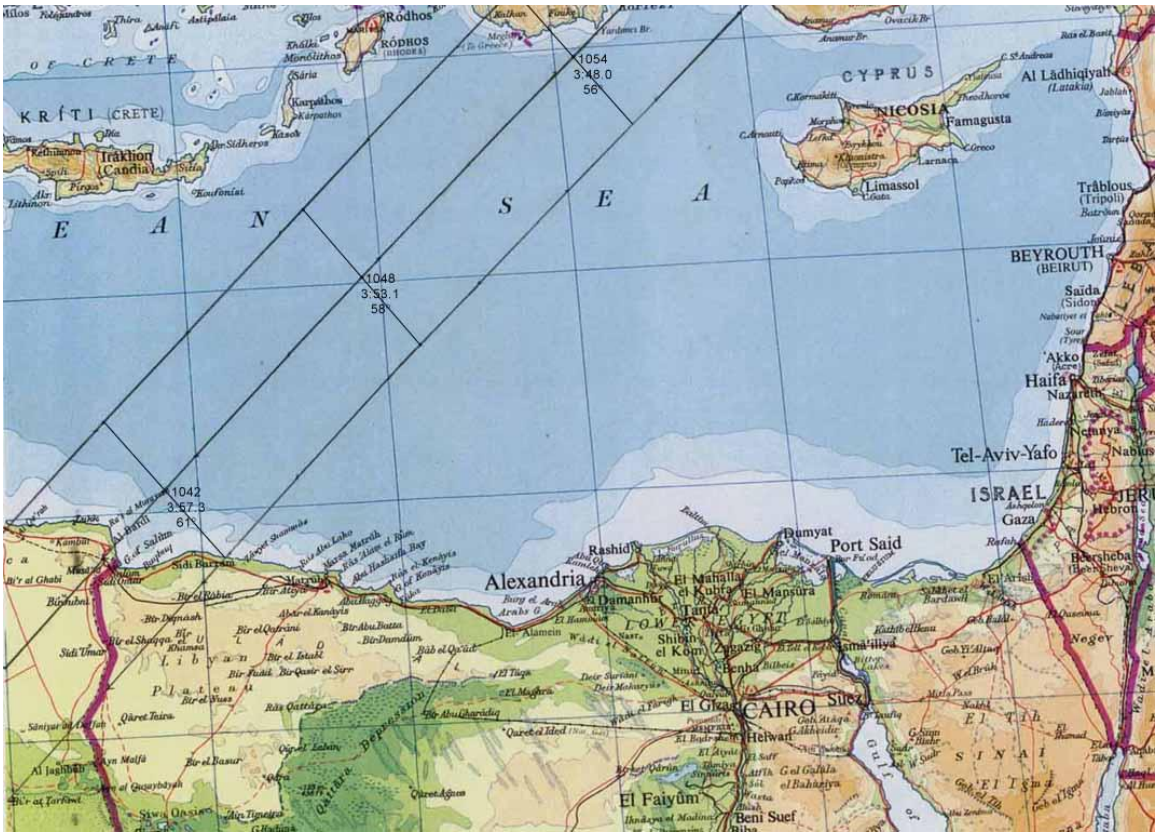

Fig. 1. Egyptian coast at Mediterranean Sea.

The department for fisheries is chaired by the vice head of the GAFRD (Head of Central Department for the Chairman's Office Affairs) and comprises 4 sections: the cooperation section, which manage the Union of the Fishers Cooperatives, the rental and the ports sections and the fisheries section. The latter is composed of a department for fisheries management and a department for the development of natural resources.

The department for fisheries management is an administrative one and controls several local fisheries "sub departments", which are in charge of the control activities and of the updating of the database of the fishing fleets. It establishes the licences for fishing vessels and fishers, renews them every year, registers all fishing vessels with the respective technical characteristics and keeps a daily record of the fish landings by gear and landing site.

For the collection of information of the fishing fleets, every GAFRD site has a local office in order to register its fishing vessels, whether they are motorized or have sails and gathers information on fishing gears. The offices update the information on a yearly basis and send it to the main office in Cairo at the last quarter of every year. The GAFRD maintains a fishing fleet register for motorized vessels, which contains information on the serial number, ID number, date and port, owners, and each owners share, vessel name, length overall (LOA), width, body material, gross tonnage (GT), net tonnage, engine

power (hp), manufacture name, cooperative name, fishing area, gear and number of fishers.

For the estimation of the catch statistics, GAFRD uses two different systems simultaneously in almost every landing site to estimate fisheries production with a special data entry form containing: GAFRD site, GAFRD office, vessel identification, name, engine power, number of fishers, navigator equipment, landing port, fishing area, arrival and departure date, gear, species in local name, number of boxes, number of fish per kilo, landing price and recorder name. Fisheries officers estimate the landings of every boat per species, when the vessels offload their landings. The simple random sampling approach involves two sampled vessels for each gear category twice per week. Effort is estimated by determining the number of active boats per month. These data are compiled, aggregated and summarized, then sent to GAFRD head office in Cairo, to check data quality. The computerization of this system is actually ongoing and the communication between the various local staffs and the GAFRD headquarters will be facilitated by an internet system, which at the moment is in the process of being installed. To allow the storage and the processing of these data, a computer application SAMAC (Statistical Approaches for the Monitoring and Assessment of Capture fisheries) was developed by GAFRD staff during 2003-2005. This application incorporates international standards (including FAO/GFCM standards) to be able to respond to requests from international partners. Two important parts of the fishery information system are the fishing fleet census, and the catch statistics collection system. SAMAC is now under implementation in the GAFRD main office in Cairo. The application is designed to integrate monthly estimates into a database and to produce statistical reports and plots on biological and economic data. Due to the high dispersion of landing sites of the artisanal small scale fishery the activity of this sector, which contributes substantial part of the landings, has certainly been underestimated but empirical correction factors have been applied recently in order to produce statistics that give a more realistic picture of the Egyptian Mediterranean fisheries.

The department for the development of natural resources is working in cooperation with another department of the GAFRD, the department of productivity, which is the main body dedicated to the management of the fisheries and aquaculture sector. To achieve this task the department cooperate with the National Institute of Oceanography and Fisheries (NIOF) which is the official scientific consultant of the GAFRD in the field of fisheries. The chairman of the NIOF is a member of the board of directorial of the GAFRD. Among other tasks this department is also responsible to follow up the activities of the FAO EastMed project.

1.2 Bottom Otter Trawl Fishery

There are 1061 registered bottom otter trawlers in Mediterranean coast of Egypt, with an average length of 19.2 m, which varies from 16 to 30 m (GAFRD, 2009). Each vessel is powered by a main engine of 50 to 800 hp with the majority (86 %) having an engine from of 100-250 hp. All vessels are provided with mechanised winches. Some of them are equipped with echo-sounders and GPS and use an old Italian type of net with some

modifications. Trawlers of different sizes exploit different fishing grounds depending on depth and distance from the port. The main target species during the entire year are shrimps (*Penaeus* spp., *Metapenaeus* spp., and *Marsupenaeus* spp.), *Sepia officinalis*, and some fish species like *Mullus* spp, *Saurida undosquamis* and species of the family Sparidae. Many other commercial species are also caught as bycatch. Discards are mainly composed of small sized fish and non commercial species including fish and some invertebrates.

1.3 Purse Seine Fishery

Purse seining is a very important fishery in Egypt for the capture of pelagic species. In 2008 there were 238 registered purse seiners, which ranged from 15 to 25 m in length. They are powered by engines from 50 to 500 hp with the majority (68 %) having engines from 100 - 200 hp (GAFRD, 2009). Small purse-seiners operate during the day without artificial light in shallow regions, while larger seiners operate at night with the assistance of slave boats equipped with lights that concentrate the fish before setting the net. Usually fishing at night stops for a period of approximately 10 days per month when there is full moon. The net's length is between 200 and 400 m and its depth ranges from 40 to 60 m. The nets are hauled manually and the number of crew ranges between 25 and30 persons per vessel. Sardines (*Sardinella aurita*) and European anchovy *Engraulis encrasicolus* are the main target species.

1.4 Artisanal Fisheries

With respect to the artisanal fisheries there are 1797 vessels, which range from 7-15 m in length and are powered by small outboard or inboard engines from 8 to 150 hp (GAFRD, 2009). The fishing trip takes from 1-5 days and the number of crew ranges from 2 to 8 fisher per vessel. The main fishing gears include hand lines, longlines, gillnets and trammel nets. They target both demersal and pelagic species which change from one season to another.

Part II - Guidelines for the collection of Catch and Effort data

prepared by

Constantine Stamatopoulos

2.1 Introduction

This chapter contains guidelines for the routine collection of catch and effort data. Data collection activities (which also include biological data) constitute the principal component of an EastMed Pilot Phase for Egypt involving selected ports and sites from the major statistical strata of W. Mediterranean (Alexandria, Mex, Aboukir, Madyaa), Delta (Damiette and Kafr-El-Sheikh) and Eastern Mediterranean (Port Said and Arish).

During November 2010 and June 2011 a series of presentations and training sessions took place in Port Said and Alexandria respectively. The proceedings were attended by data collectors, supervisors and fisheries officers and had as objective the setting-up and implementation of regular data collection programmes for catch/effort and biological data. Data collection forms were drafted and field-tested and workplans were agreed upon with respect to data collection. Concerning computer operations the GAFRD-owned catch/effort system SAMAC has been operating since June 2011 for handling the basic functions of the sample-based catch/effort programme; the software was revised in February 2012 to use internet services and operate in a decentralized mode (see Fig 2).

The present chapter does not intend to repeat theoretical and practical aspects that were presented at the two workshops of November 2010 and June 2011. It would nevertheless seem practical to highlight a number of key points that concern collection of catch/effort data by means of sample-based surveys.

a) There can be up to four surveys in a catch/effort sampling programme and each survey corresponds to a specific component (box) of the generic catch/effort formula[1] described in Figure 1.
b) Estimation of CPUE requires only one survey commonly known as “landings”.
c) Estimation of fishing effort may require up to three surveys: One for determining PBA (e.g. Probability Boat Active), a second one for determining boat totals[2] and a third for setting-up temporal extrapolation factors (Active Days[3]).
d) Footnotes (2) and (3) indicate that the present data collection schemes focus only on landings (for CPUE) and monthly fishing effort (for PBA).

[1] The document assumes that readers are familiar with the structure and functions of this generic expression which was examined in detail during the two workshops.
[2] If boat totals are obtainable from a reliable vessel register then this survey is not needed.
[3] Due to the type of effort scheme in use (collection of information on monthly effort), the Active Days are automatically set to the number of calendar days in the reference month, and hence no Active Days survey is needed.

e) The generic estimation approach is repeated for each estimation context that is formed by a combination of: month – stratum – boat/gear category.
f) Regularly monitored sampling accuracy is of paramount importance in order to maintain the quality of catch/effort estimates on a long-term basis.
g) Sampling accuracy has two components: Spatial and Temporal.
h) A 90% temporal accuracy is achieved by 8 sampling days (2 days/week); a 95% by 12 sampling days (3 days/week).
i) Spatial accuracy is a direct function of sample size, i.e. total number of samples collected over a month.
j) Accuracy levels for spatial accuracy are variable, depending on the size of population under study. When the populations are large then 32 samples will suffice for a sampling accuracy of 90%, whereas 128 will be needed for an accuracy level of 95%. This general rule is good and simple for large populations but it can lead to over-sampling when the populations are small, as it happens for some ports and boats/gears.
k) In this document sample sizes will be determined by port and boat/gear category.
l) Annex A illustrates the data collection form in use for landings.
m) Annex B illustrates the data collection form in use for monthly fishing effort.

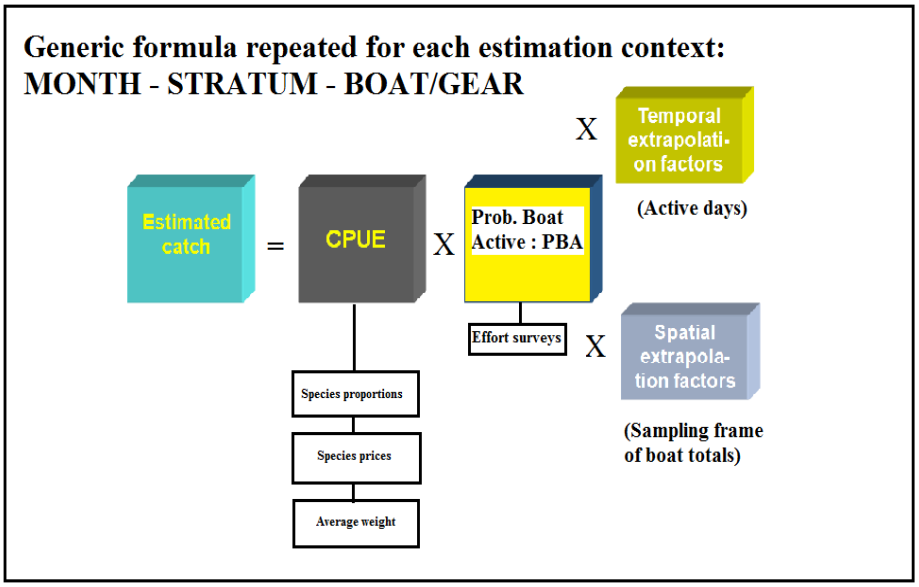

Figure 2.1. Illustration of the generic approach for estimating catch, effort and secondary parameters. The approach is generic because it can adapt to any data collection scheme. Please note that application of the formula is repeated for each estimation context.

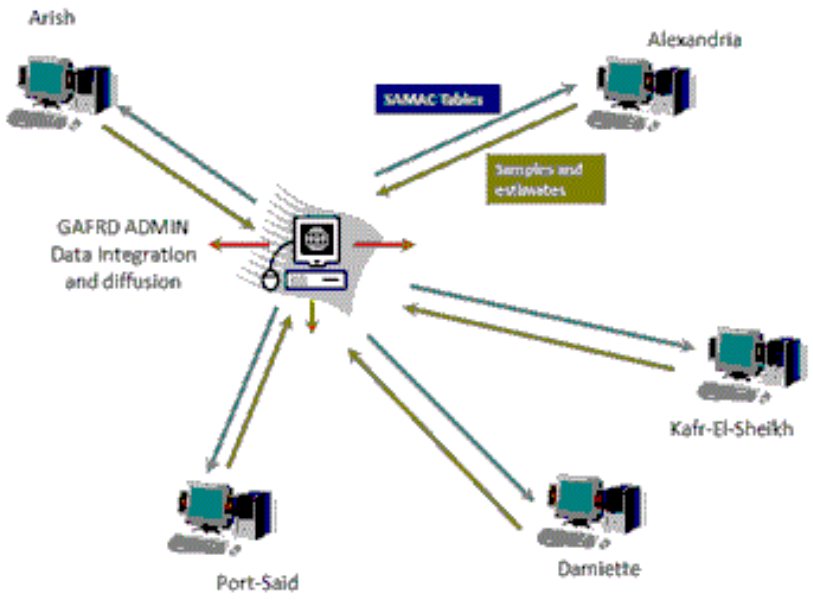

Figure 2.2. SAMAC configuration

2.2 Data reliability aspects

There are two major considerations in the EastMed Pilot Phase: (i) risks of bias in data collection and, (ii) controlling the size and frequency of samples to attain a certain level of accuracy.

Concerning consideration (i) Tables 3.1 – 3.4 provide a summary of observations and suggested actions aiming at reducing the level of uncertainty and/or bias in data collection operations for fleet, catch and effort information.

Regarding consideration (ii) three case studies are presented illustrating sampling size and frequencies for the three ports of Port Said, Damiette and Kafr-El-Sheikh. The examples in Sections 4, 5 and 6 are tabulated to correspond to two accuracy levels: 90% and 95%. For purposes of operational simplicity and in anticipation of eventual difficulties in data collection activities the recommended sample sizes are slightly higher than those resulting directly from basic sampling theory. The latter are also referred to as "red lower limits" and are displayed in red. These limits constitute the minimum indispensible sample size below which desired accuracy levels cannot be guaranteed.

Separate detachable pages are used to describe sample size requirements by port and boat/gear category.

It should be noted that:

- Current figures in sampling requirements for Port Said, Damiette and Kafr-El-Sheikh will be revised sites as soon as reasonably accurate figures of fleet data have become available.

- The detachable pages of sampling size requirements will include all selected ports and sites as soon as reasonably accurate figures of fleet data have become available.

2.3 Data collection aspects

Fleet data

Total numbers of fishing units by port and boat/gear category are used as spatial extrapolating factors in the estimation of total fishing effort. These figures are of key importance since they affect directly the scaling-up of sampled fishing effort and catch, irrespective of the data quality of the latter.

Table 1. Potential risks of bias in the fleet data

Potential problem(s)	Impact	Suggested action
(a) Whole boat / gear classes are missing and/or current figures do not reflect the actual situation.	Effort underestimated.	Set-up procedures for the seasonal reviews of all boat/gears as categorized by SAMAC. The decentralized SAMAC operations make such a review feasible.
(b) Presence of boats that land at this port but operate from elsewhere.	Boats will be double-counted and the effort overestimated.	Do not record boats that are known to operate from different ports.
(b) A fishing unit operates more than one gear whether on a seasonal basis or concurrently.	Effort will be overestimated for some primary gears and underestimated for alternative gears.	Both gears should be recorded as two different boat/gear units. This is not double counting because estimates are always produced for each boat/gear separately.

Fishing effort

The sampling scenario for fishing effort is day-orientated and uses monthly responses from selected fishermen regarding their activities during the past month. These data are used to formulate the variable PBA (=Probability Boat Active) separately for each boat/gear category. It is recalled that fishing effort is estimated by multiplying PBA by the number of boats/gears (see fleet data considerations above) and the number of Active Days which, in the scenario used by the EastMed Pilot Phase, will always coincide with the calendar days of the reference month. The following considerations apply:

Table 2. Potential risks of bias in the monthly effort survey

Potential problem(s)	Impact	Suggested action
(a) Fishermen have responded accurately as to the number of days worked but these include a second (or even a third) gear.	PBA will be overestimated for the gear inspected and underestimated for the alternative gears unmentioned.	In cases where use of alternative gears is possible, the question regarding the days worked should be formulated accurately to include alternative gears. The different answers should be recorded as separate effort samples by gear.
(b) Concern about bad weather, weekend days, holidays, etc.	No impact.	These "inactive" days have been incorporated into the responses. No adjustment is needed for effort samples or Active Days.

Landings

The sampling scenario for landings involves inspection of selected landings by port and boat/gear. The minimum frequency of visits should be twice a week for four weeks. The following considerations apply:

Table 3. Potential risks of bias in the landings survey

Potential problem(s)	Impact	Suggested action
(a) A landing shows zero or partial catch. This occurs because the fisherman has landed his catch elsewhere.	CPUE will be underestimated.	Fishermen should be asked if they have landed any quantity anywhere before landing at this port. If the answer is yes, the sample should be dropped.
(b) A landing shows zero or very little catch. This occurs because the fisherman has not been successful during his trip.	CPUE will be overestimated if this catch is not included.	Include "zero" catch if real fishing effort has been exerted.

(c) A landing shows zero or very little catch. This occurs because the fisherman has encountered a technical problem and returned to port.	CPUE will be underestimated if this catch is included.	The sample should be dropped since no real fishing effort was exerted.
(d) Misreporting of trip duration when this is longer than one day.	CPUE will be overestimated.	Except for in obvious cases, the trip duration should be queried and recorded accurately.
(e) Multiple trips during the same day but each trip made with different gear.	No impact.	No action to be taken.
(f) Rare cases of multiple trips during the same day using the same gear.	CPUE will be underestimated.	If multiple trips are suspected/declared, the sample should be dropped.
(g) Regular occurrences of multiple trips during the same day using the same gear.	CPUE will be underestimated.	Asking how many trips were made last time the fisherman worked. Set duration = 1/answer. Example: 2 trips yesterday. Duration = 1 / 2 = 0.5 days.
(h) Boat landed at this port but has operated from elsewhere.	No impact.	Sample to be included.
(i) Boat has used gear X but is licensed with gear Y.	No impact.	Sample should be recorded with the actual gear Y inspected.
(j) Species are locally identified but have not been included in the standard pre-printed species list and are recorded as OTHER.	If there are too many such cases the OTHER species entry will be disproportionately high.	Data collectors and local supervisors must agree on a commonly accepted species description and add the species manually into the form. At a later stage GAFRD will assign these species a scientific name and produce an updated species list. Such difficulties are expected at the initial stage of a fisheries statistical monitoring programme.
(k) Recording the number of individuals in the catch. First approach concerns larger fish.		The data collector estimates the total number of fish in the observed catch.
(l) Recording the number of individuals in the catch. Second approach concerns small fish.		The data collector estimates the total number of fish in one kg. He/she then multiplies it by the species catch to estimate the number of individuals.

Table 4. Data consistency checks

Variable(s)	Data consistency action
(a) Total catch	The data collector to calculate manually the species totals and record the result in the special box of the input form. This total will be inputted together with catch by species. SAMAC computes automatically the species catch and compares it to the inputted total. The two figures must tally, else an error occurs. Refer also to SAMAC manuals – Inputting of Landings.
(b) Days worked during the month.	SAMAC checks that this figure must be less than or equal to the number of calendar days. Refer also to SAMAC manuals – Inputting of Effort.
(b) CPUE, prices, duration of trip, number of fish per kg.	SAMAC offers the MAX-MIN function under REPORTS. This function lists extreme values and corresponding input documents. Refer also to SAMAC manuals – Data Quality Checks.

2.4 Port Said: Sampling size and frequency in tabular form

Landings – daily sampling requirements for >=90% spatial and temporal accuracy

------ Sampling days -------

Boat/Gear	# of units	POP size[4]	1	2	3	4	5	6	7	8	**TOT**	**RED[5] LIMIT**
Trawlers	231	6930	6	6	6	6	6	6	6	6	**48**	**27**
Longliners	237	7110	6	6	6	6	6	6	6	6	**48**	**28**
Purse seiners	55	1650	4	4	4	4	4	4	4	4	**32**	**21**

Landings – daily sampling requirements for >=95% spatial and temporal accuracy

---------- Sampling days ----------

Boat/Gear	# of units	POP size	1	2	3	4	5	6	7	8	7	10	11	12	**TOT**	**RED LIMIT**
Trawlers	231	6930	12	12	12	12	12	12	12	12	12	12	12	12	**144**	**105**
Longliners	237	7110	12	12	12	12	12	12	12	12	12	12	12	12	**144**	**106**
Purse seiners	55	1650	6	6	6	6	6	6	6	6	6	6	6	6	**72**	**67**

Effort – monthly sampling requirements for >=90% spatial accuracy

Boat/Gear	# of units	POP size[6]	**# boats to be sampled (asked)**	**RED LIMIT**
Trawlers	231	231	**20**	**13**
Longliners	237	237	**20**	**13**
Purse seiners	55	55	**15**	**9**

Effort – monthly sampling requirements for >=95% spatial accuracy

Boat/Gear	# of units	POP size	**# boats to be sampled (asked)**	**RED LIMIT**
Trawlers	231	231	**40**	**32**
Longliners	237	237	**40**	**33**
Purse seiners	55	55	**20**	**17**

[4] In landings surveys the target population is the maximum number of landings. In the current approach the population size is determined by the number of boats multiplied by 30.

[5] **Red limit is the lowest permissible number of samples collected over the month. Below this point the desired accuracy level cannot be guaranteed.**

[6] In monthly effort surveys the target population is the answers on monthly effort from all boats, hence the population size is equal to the number of boats.

2.5 Damietta: Sampling size and frequency in tabular form

Landings – daily sampling requirements for >=90% spatial and temporal accuracy

----- Sampling days --------

Boat/Gear	# of units	POP size[7]	1	2	3	4	5	6	7	8	**TOT**	**RED LIMIT[8]**
Trawlers	638	19140	6	6	6	6	6	6	6	6	**48**	**32**
Longliners	166	4980	5	5	5	5	5	5	5	5	**40**	**26**
Purse seiners	16	480	3	3	3	3	3	3	3	3	**24**	**16**
Trammel net	12	360	3	3	3	3	3	3	3	3	**24**	**15**

Landings – daily sampling requirements for >=95% spatial and temporal accuracy

---------- Sampling days ----------

Boat/Gear	# of units	POP size	1	2	3	4	5	6	7	8	7	10	11	12	**TOT**	**RED LIMIT**
Trawlers	638	19140	12	12	12	12	12	12	12	12	12	12	12	12	**144**	**127**
Longliners	166	4980	10	10	10	10	10	10	10	10	10	10	10	10	**120**	**95**
Purse seiners	16	480	5	5	5	5	5	5	5	5	5	5	5	5	**60**	**43**
Trammel net	12	360	4	4	4	4	4	4	4	4	4	4	4	4	**48**	**39**

Effort – monthly sampling requirements for >=90% spatial accuracy

Boat/Gear	# of units	POP size[9]	**# boats to be sampled (asked)**	**RED LIMIT**
Trawlers	638	638	**25**	**17**
Longliners	166	166	**20**	**12**
Purse seiners	16	16	**8**	**6**
Trammel net	12	12	**7**	**5**

Effort – monthly sampling requirements for >=95% spatial accuracy

Boat/Gear	# of units	POP size	**# boats to be sampled (asked)**	**RED LIMIT**
Trawlers	638	638	**60**	**48**
Longliners	166	166	**40**	**28**
Purse seiners	16	16	**12**	**9**
Trammel net	12	12	**9**	**7**

[7] In landings surveys the target population is the maximum number of landings. In the current approach the population size is determined by the number of boats multiplied by 30.

[8] **Red limit is the lowest permissible number of samples collected over the month. Below this point the desired accuracy level cannot be guaranteed.**

[9] In monthly effort surveys the target population is the answers on monthly effort from all boats, hence the population size is equal to the number of boats.

2.6 Kafr-El-Sheikh: Sampling size and frequency in tabular form

Landings – daily sampling requirements for >=90% spatial and temporal accuracy

----- Sampling days -------

Boat/Gear	# of units	POP size[10]	1	2	3	4	5	6	7	8	**TOT**	**RED LIMIT[11]**
Trawlers	13	390	3	3	3	3	3	3	3	3	**24**	**15**
Longliners	193	5790	5	5	5	5	5	5	5	5	**40**	**27**
Purse seiners	24	720	3	3	3	3	3	3	3	3	**24**	**17**

Landings – daily sampling requirements for >=95% spatial and temporal accuracy

---------- Sampling days ----------

Boat/Gear	# of units	POP size	1	2	3	4	5	6	7	8	7	10	11	12	**TOT**	**RED LIMIT**
Trawlers	13	390	4	4	4	4	4	4	4	4	4	4	4	4	**48**	**40**
Longliners	193	5790	10	10	10	10	10	10	10	10	10	10	10	10	**120**	**100**
Purse seiners	24	720	5	5	5	5	5	5	5	5	5	5	5	5	**60**	**50**

Effort – monthly sampling requirements for >=90% spatial accuracy

Boat/Gear	# of units	POP size[12]	**# boats to be sampled (asked)**	**RED LIMIT**
Trawlers	13	13	**7**	**5**
Longliners	193	193	**20**	**12**
Purse seiners	24	24	**10**	**7**

Effort – monthly sampling requirements for >=95% spatial accuracy

Boat/Gear	# of units	POP size	**# boats to be sampled (asked)**	**RED LIMIT**
Trawlers	13	13	**10**	**8**
Longliners	193	193	**40**	**30**
Purse seiners	24	24	**15**	**11**

[10] In landings surveys the target population is the maximum number of landings. In the current approach the population size is determined by the number of boats multiplied by 30.

[11] **Red limit is the lowest permissible number of samples collected over the month. Below this point the desired accuracy level cannot be guaranteed.**

[12] In monthly effort surveys the target population is the answers on monthly effort from all boats, hence the population size is equal to the number of boats.

Part III - Guidelines for the collection of Biological data

prepared by

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3.1 Introduction

This part of the document was developed after a training course, which was conducted in Egypt in June 2011. It contains guidelines for the collection of biological data including length, weight, sex, sexual maturity, gonad weight and hard structures for age reading during the pilot study in Egypt. It also includes guidelines on sampling frequencies, number of samples to be collected, sampling methodology, the treatment of the samples and the laboratory analyses, which need to be carried out.

During the pilot study the samples for the following species will be collected *Sardinella aurita, Saurida undosquamis, Mullus surmuletus, Metapenaeus stebbingi* and *Sepia officinalis.*

The final aim of the data collection process is to analyse the data using analytical models in order to undertake stock assessments and give scientific advice to the fisheries administration on the status of the resources. The protocol will also serve as a basis if Egypt intends to pursue a routine data collection system for the collection of biological data for stock assessment purposes.

3.2 Sampling methods and frequency of sampling

3.2.1 General Guidelines

Sampling must be performed in order to evaluate the quarterly length distribution of the species in the landings. Biological data should be collected by gear category and for the stocks listed in table 1. The spatial units for sampling will be the 4 separate ports, Port Said, Damietta, Kafr-El-Sheikh and Maadia.

During the pilot study in Egypt the collection of biological data will be conducted from the landing ports without any sampling of discards, since discard are mainly the non target species and smaller sizes of commercial species which may considered as lower economical value in Egyptian fisheries (Alsayes *et al.*, 2009). For the landings, the sampling unit shall be the fishing trip (landing trip) and the number of fishing trips to be sampled shall ensure good coverage of the fleet segment. When sampling a fishing trip, the species mentioned in table 1 shall be sampled. This means that a sample of every species should be collected from a fishing trip. It is important to note that when a species

is sampled for biological parameters the total weight of the catch from the vessel of the particular species should be recorded.

For species in which a size category exists, samples should be collected from each size category and the total weight of the catch of each market category should be recorded. When sampling a species, the number of individuals measured must ensure quality and accuracy of the resultant length frequency.

Table 1 shows the species selected for biological sampling together with the quantity of samples (kg) per port, month and size category. From the quantity of fish sampled, length weight, and sex measurements should be taken for all the individuals in the sample. For the other biological parameters including individual maturity, gonad weight and age hard structures, not more than 25% of the sample should be collected per port per month.

3.2.2 Port sampling

Port sampling should be conducted when the majority of the fleet enters into port. Sampling in periods outside the main landing period should be avoided. Once a month, the data collector should enter the landing site and purchase the fish according to table 1. If, due to storage problems all the fish cannot be purchased in one visit to the port, two or more visits can be conducted to purchase different species, working in continuous days, to ensure that the sampling came from the same fish stock. The data collector will have to adjust the visits to the port depending on the local conditions.

When the catch is landed, the field data collector should purchase a random box per species and size category from one random fisherman. The data collector should also record the total weight of the catch per size category of that particular species from the fisherman.

3.2.3 Sample storage

Once the fish are purchased they should be transferred immediately to the laboratory and stored for further processing. Fish samples should be stored at -20 to -32^{o}C, in a freezer and can be stored up to 6 months. If some of the fish will be processed the same day or the day after they can be stored in a refrigerator at 1 to 4^{o}C. Although samples can be stored for a long period of time, ideally samples should be processed during the same week they are purchased. This is important to be able to identify accurately the maturity stages, especially for crustaceans such as shrimps, since colouration of the gonads tends to pale out by time. In the case that fish gonads are oing to be weighed it is also important to measure this parameter as soon as possible after the sampling.

If samples have been frozen, they should be taken out of the freezer and put into the refrigerator one day before processing (overnight). This will allow the fish to thaw. If fish do not thaw properly, one can always put the fish under water for one hour or two until the thawing process has been completed. However in species that can easily deteriorate, such *Mullus surmuletus*, it is better to work with a semi frozen samples.

Table 1 Table showing the species selected for biological sampling together with the quantity of samples (kg) per port, month and size category.

GFCM Fleet segment		GFCM Fishing gear class	Stock	GFCM Target species group	Port	Size category at landings	Quantity of Fish to be sampled (Kg)
Purse Seine	12-24	Seine Nets	*Sardinella aurita*	Small gregarious pelagic	Port Said	Large specimens	2
						Small specimens	2
					Damietta	Large specimens	2
						Small specimens	2
					Kafr-El-Sheikh	Large specimens	2
						Small specimens	2
					Maadia	Large specimens	2
						Small specimens	2
Trawl	12-24	Trawl	*Mullus surmuletus*	Demersal shelf Species	Port Said	Large specimens	2
						Small specimens	2
					Damietta	Large specimens	2
						Small specimens	2
					Kafr-El-Sheikh	Large specimens	2
						Small specimens	2
					Maadia	Large specimens	2
						Small specimens	2
			Saurida undosquamis	Demersal shelf Species	Port Said	Large specimens	2
						Small specimens	2
					Damietta	Large specimens	2
						Small specimens	2
					Kafr-El-Sheikh	Large specimens	2
						Small specimens	2
					Maadia	Large specimens	2
						Small specimens	2
			Penaeus semisulcatus Metapenaeus stebbingi	Demersal shelf Species	Port Said	Large specimens	2
						Small specimens	2
					Damietta	Large specimens	2
						Small specimens	2
					Kafr-El-Sheikh	Large specimens	2
						Small specimens	2
					Maadia	Large specimens	2
						Small specimens	2
			Sepia officinalis	Demersal shelf Species	Port Said	Large specimens	2
						Small specimens	2
					Damietta	Large specimens	2
						Small specimens	2
					Kafr-El-Sheikh	Large specimens	2
						Small specimens	2
					Maadia	Large specimens	2
						Small specimens	2

3.3 Collection of Biological parameters

Once the samples have been thawed the laboratory officers should check the sample for any accessory species. Once the extra species have been identified these should be discarded. In the case of shrimps since many species can be present in one sample, all the individuals should be identified and separated. The total weight of the sample per species should be measured.

The data entry sheets should be prepared before collecting the biological parameters. The date of sampling, name of vessel, gear, the species name (Arabic & scientific), and the type of length measurement should be recorded in the data entry sheet. Once the data collection for a specific month has been completed, all the data should be immediately entered into an excel database according to the template provided.

Length, individual weight and sex measurements should be taken for all the individuals in the sample. For the other biological parameters including, maturity, gonad weight, and age, hard structures not more than 25% of all the sample should be collected per port per month. However the data collectors must make sure to sample all the size categories of the samples, (i.e. do not collect biological parameters for only small or big individuals).

With respect to otoliths, once removed, both otoliths (left and right) are cleaned with water and subsequently preserved dry in small paper envelopes with the numeration of the specific fish. This is important in order to be able to trace the biological data of the fish from which the otoliths were collected (for details see section 3.3.6 on age sampling).

Each specimen will be characterized by a progressive number (1, 2, 3 etc.) and by its specific measures.

Irrespective of the taxa considered, for a given sample any damaged/broken specimens will be removed, counted and weighed separately.

The apparatus and materials required for the measurement of biological parameters include data sheets, writing equipment, electronic balance (up to 1 decimal place), fish measuring boards, vernier callipers (for shrimps), identification keys and manuals, dissecting instruments (scissors, scalpels, tweezers, etc.), envelopes or epindorf tubes and labels for the storage of otoliths.

3.3.1 Length sampling

The length measurements to be taken depend on the species under study. The length of fishes is measured with graduated fish measuring boards, while vernier callipers are used for shrimps (Jennings *et al.*, 2001). It is important that any specimen whose length is not measurable is considered as "damaged/broken", and the total weight of the "damaged/broken" individuals should be recorded on the data sheet.

For fish, the Total Length (TL) is measured to the lower half centimetre from the tip of the snout to the end of the caudal fin (Fig. 3). The length measurement is shown in the figures below:

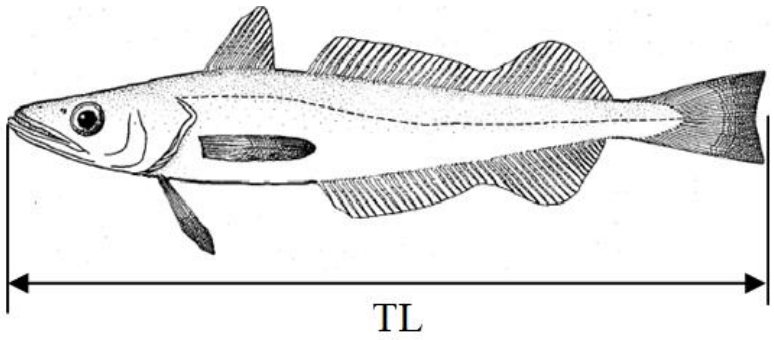

Fig. 3. Illustration showing the measurement of Total Length (TL) in teleost fish species.

For crustaceans, Carapace Length (CL) is measured in millimetres from the back border of the eye orbit to the back median border (Fig. 4) using vernier callipers. The length measurement is taken to the lower millimetre.

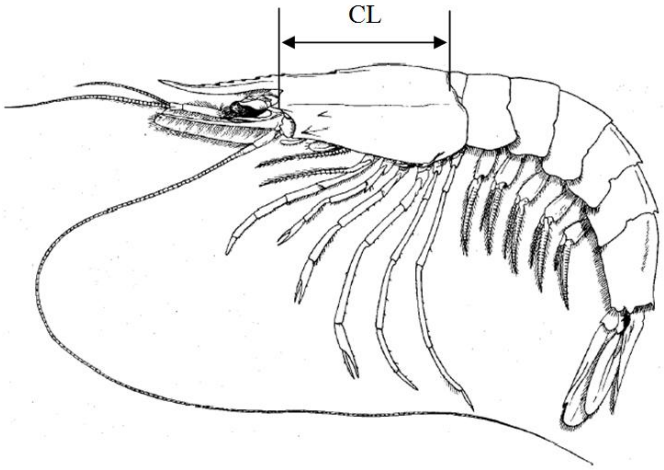

Fig. 4. Illustration showing the measurement of Carapace Length (CL) in crustaceans.

For cephalopods, Dorsal Mantle Length (DML) is measured to the nearest half inferior centimetre from the median line, passing for the eyes, to the apex of the mantle as shown in figure 5.

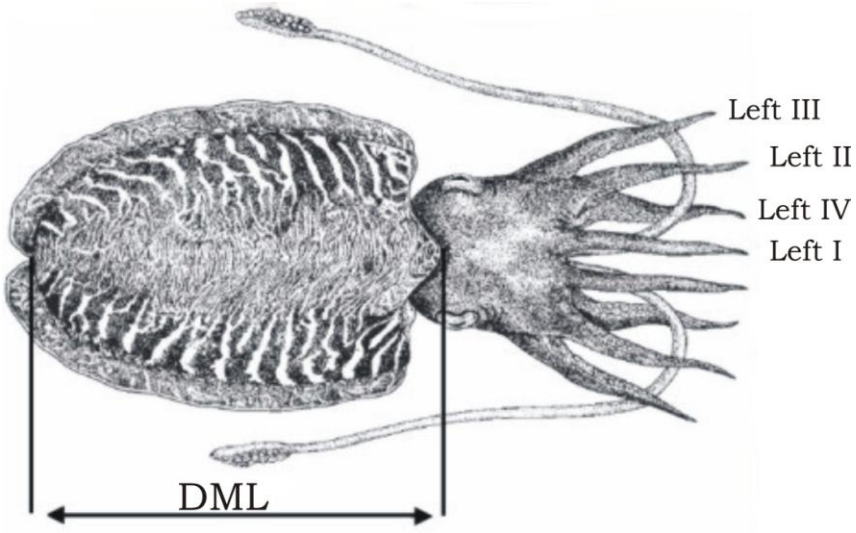

Fig. 5. Illustration showing the measurement of Dorsal Mantle Length (DML) and definition of arms in cuttlefish.

3.3.2 Individual weight

Before taking weight measurements, make sure that the windows are closed and/or there is no draft in the room and that ventilators or air conditioners are far away from the balance. Any wind in the laboratory may change the reading on the electronic balance. Make sure to weight the fish on a tray and not directly on the balance. This will avoid blood or any other fluids from entering the balance which may damage it beyond repair. Once the tray is placed on the balance use the tare button to have a zero value.

For fish and cephalopods the total weight of each individual is weighed to the nearest 1.0g using an electronic balance. In the case of shrimps, the weight should be recorded to the nearest 0.1g. For every individual always make sure that the reading on the balance is zero before taking any further weight measurements.

3.3.3 Sex

Sex is defined into three categories: Male (M), Female (F), and undetermined (U; when it is impossible to determine it by the naked eye). Some species are hermaphrodites. This means that fish can change sex during their life either from male to female (protandrous) or from female to male (protogynous), a change which may occur more than once. Some others even have both sexes, at the same time. In the latter case the sex is determined on the base of the most developed gonad.

The determination of sex for fish is only possible by dissecting the specimens since the internal body cavity must be exposed, and the shape and appearance of the gonads must be examined (Fig. 6).

Fig. 6. Sexual macroscopic determination of male (top) and female (bottom) of *Saurida undosquamis*

In the case of shrimps, the petasma (2nd pleopods) and thelycum (4th sternite) will indicate males and females, respectively (**Fig. 7**).

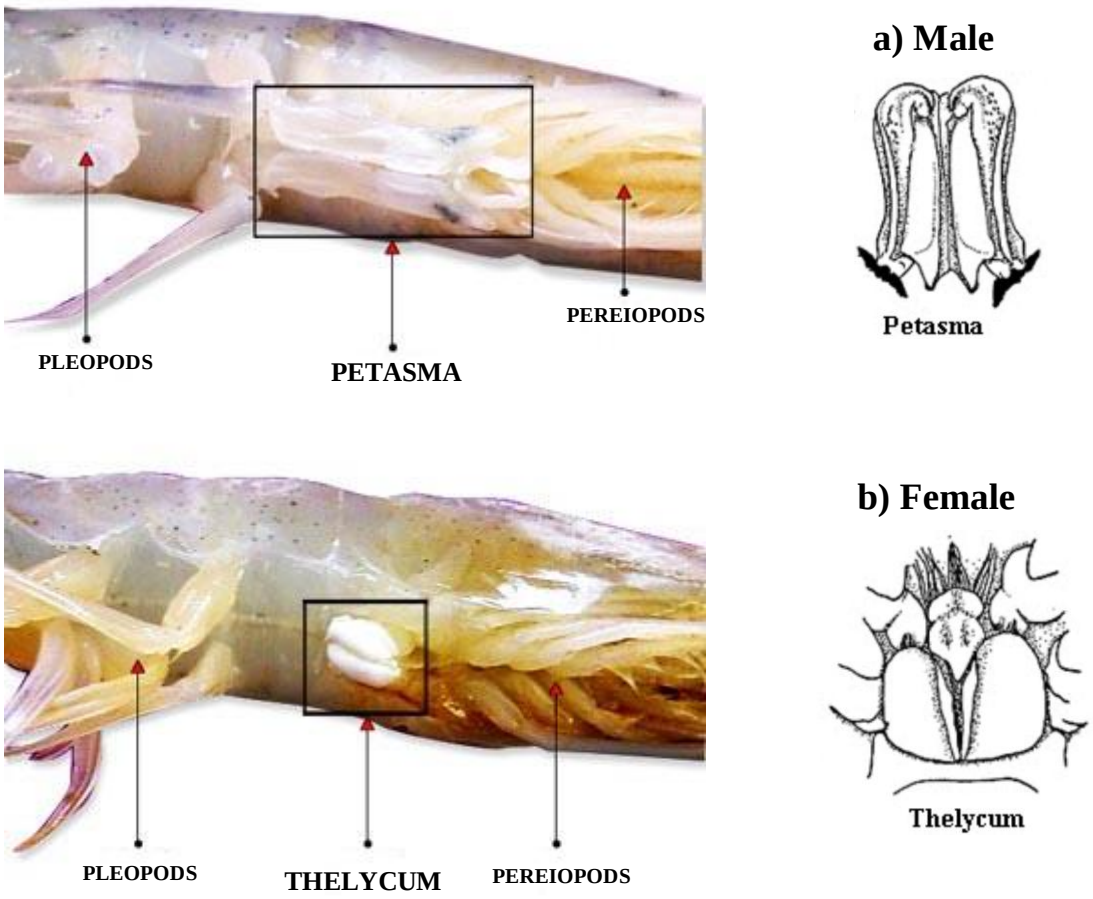

Fig. 7. Sexual macroscopic determination of shrimps.

In the case of cephalopods sex may be determined by the size and distribution pattern of suckers at the proximal part of the left ventral arm, or based on the presence of male and female gonads in the mantle cavity (**Fig. 8**).

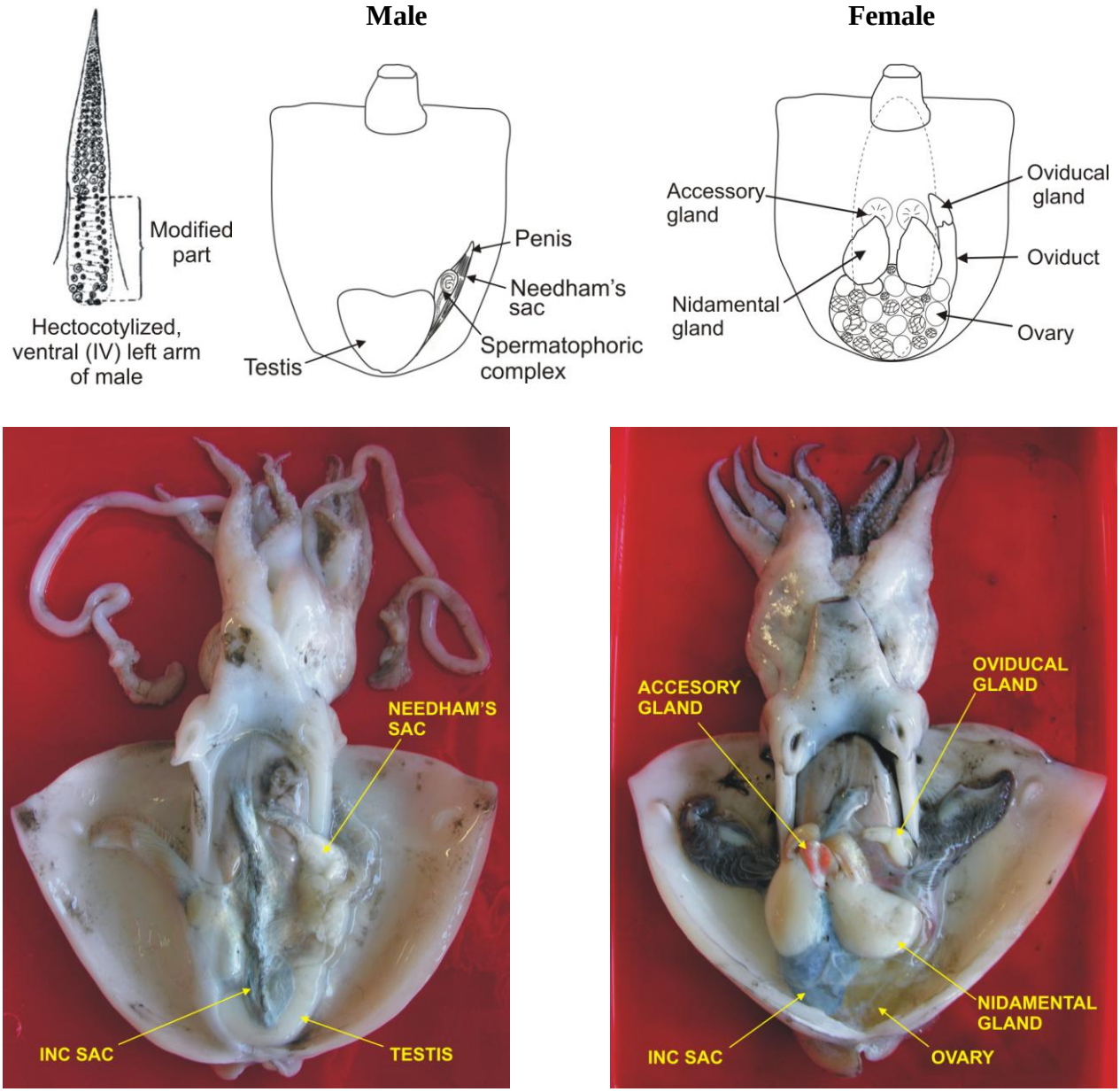

Fig. 8 Sexual macroscopic determination of female and male *Sepia officinalis*.

3.3.4 Sexual maturity stage

The number of maturity stages on macroscopic keys varies from a minimum of two (immature-mature) to a maximum of fourteen and more which can only be identified microscopically. For fisheries monitoring, four-six (4/6) stages can be considered acceptable. For Unsexed specimens the maturity stage cannot be determined and is usually marked as 0.

For fish the six stage Nikolsky scale (table 2) can be used for the determination of the maturity stage (Nikolsky, 1976). The six stages (from 1 to 6) are based on the relative volume, the consistence and the colouring of the gonads, the presence of the sperm in males and the presence and the degree of hydration of the eggs in females. It should be noted that once the individuals spawn for the first time, they return to the stage 2 (resting). However serial spawners (females which spawn many times during their annual spawning cycle), after releasing the eggs of a batch, they return to a developing stage (3 or 4). In this case the gonads remain flaccid in order to continue the development of those oocytes which are kept behind in the ovaries. The serial spawners continue to do follow this spawning pattern until all the oocytes have been developed and spawned (Karlou-Riga and Economidis 1997). In case of a need to award a maturity stage to a serial spawner, the observed maturity stage should be recorded together with the notice of "serial spawner". Appendix VIII shows a reference set of photos for some of the maturity stages.

Table 2. Macroscopic maturity scale of teleost fish (Nikolsky 1976).

Maturity stage		**Females - Ovary**	**Males - Testis**
0	Undetermined	Sex not distinguished with the naked eye	
1	Immature	Rounded translucent up to 2 mm broad; less than a quarter of length of body cavity; no oocytes are visible with the naked eye. Sex may be difficult to determine	Flattened, 1-2 mm broad, translucent; less than a quarter of length of body cavity
2	Resting	Rounded translucent, yellow to orange; about a third of length of body cavity; oocytes are visible only with the use of microscope	Flattened, pink; about a third of length of body cavity
3	Developing	Rounded yellow or orange; about a half of length of body cavity; oocytes are visible with naked eye	Becoming fatter; off white; about a half of length of body cavity
4	Maturing	Firm and yellow; half to whole of length of body cavity; hydrated oocytes may be visible as grey spots, which may run on big pressure	Firm becoming whiter; half to whole of length of body cavity
5	Mature	Fill the whole length of body cavity; hydrated grey oocytes are visible as grey spots on the ovary surface, which run from vent on slight pressure	Becoming soft; fill the whole length of body cavity; milt runs from vent on slight pressure
6	Spent	Flaccid dark red; ; less than half of length of body cavity; a few large residual oocytes may be visible	Flaccid off yellow; less than half of length of body cavity

For shrimps the maturity stage is determined on four stages for males and five stages for females based on 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 either extremely difficult or considerable experience is required to determine the maturity stage of crustaceans macroscopically (Fig. 9).

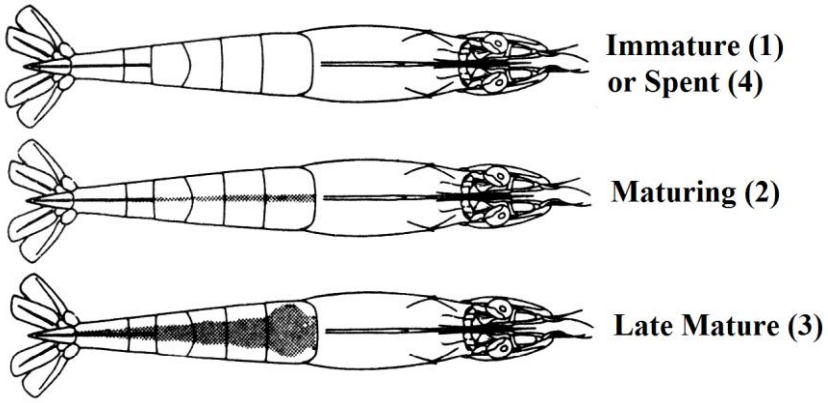

Fig. 9. Diagram to show the development of the female ovaries in shrimps.

For the purpose of fisheries monitoring the maturity stage is recorded only for females in crustaceans with only 4 stages: immature, maturing, late mature and spent. Table 3 can be used to identify the sex and maturity stages of crustaceans (Yassien, 1992). Appendix IX shows a reference set of photos for some of the maturity stages.

Table 3. Macroscopic maturity scale of crustacean species (Yassien, 1992).

Maturity stages		**Female**	**Male**
0	Undetermined	Sex not distinguished with the naked eye	
1	Immature	Ovary is thin, transparent and thread-like.	Testis is very thin and transparent., difficult to distinguish from other tissues
2	Maturing	Ovary increases in size, anterior and middle lobes are developing, slightly visible through the exoskeleton and have a pale colour (according to species).	Testis could be easily differentiated from other tissues, increasing in size and has a pale white colour.
3	Late mature	Ovary occupies all the available space in the abdomen and cephalothorax, very dark in colour and clearly visible through the exoskeleton along the whole length of the abdomen. (colour differ according to species).	Testis has a milky white colour through the whole lobes in the cephalothorax.
4	Spent	Ovary greatly reduced in size and cream in colour, after the extrusion of eggs.	Testis greatly reduced in size and has a pale white colour, after the extrusion of sperms.

Sepia officinalis is a cephalopod species with a structurally complex reproductive system (Fig. 8), consisting of a gonad (testis in males and ovary in females) located in the coelom in the posterior part of the body (under the ink sac), one gonoduct and a complex of glands which produce different secretions for enhancement and protection of ripe sexual cells (Arkhipkin, 1992). A five-stage scale of maturity has been recently proposed by an expert workshop on cephalopods (WKMSCEPH) of the International Council for the Exploration of the SEA (ICES, 2010b), based on the development (or size, colouring and appearance) of ovary (Ov) and Nidamental glands (NG) in females and that of testis and spermatophoric complex (SC) including the Needham 's sac (spermatophore depository) in males. Appendix X shows a reference set of photos for each maturity stage and both the maturity scale and the reference set of photos are used.

Table 3. Macroscopic maturity scale of the family Sepiidae (ICES, 2010b).

Maturity stages		**Female**	**Male**
0	Undetermined	Sex not distinguished with the naked eye	
1	Immature	Translucent ovary, small, with granular structure. Small and translucent Nidamental glands (NG) and Oviducal Glands (OG). Oviduct meander not visible.	Small, white and clearly visible testis. Semitransparent Spermatophoric Complex (SC) with no visible vas deferens.
2	Developing	Creamy ovary, enlarged but not reaching the posterior half of the mantle cavity. Developing and white NG/OG. NG covering some internal organs oviduct meander clearly visible.	Testis increased in volume but not reaching the posterior half of the mantle cavity. SC white with visible vas deferens. Penis appears as a small prominence of SC.
3	Maturing	Pale-yellow ovary, occupying the whole posterior half of the mantle cavity and containing only reticulated oocytes. Large NG and OG; NG covering the viscera below. Oviduct fully developed but empty.	Testis filling the posterior half of the mantle cavity. Spermatophoric duct "Vas deferens" (SD) white, meandering and enlarged. The Needham`s Sac (SS) may contain few spermatophores partially developed (visible as whitish particles) and/or few fully developed spermatophores
4	Mature	Amber-coloured and gelatinous ovary, containing reticulated and smooth oocytes. Enlarged and turgid NG/OG. Oocytes may occur in the oviduct	Well-developed testis with large and white vas deferens. Spermatophores packed in the Needham`s Sac and sometimes present in the penis.
5	Spent	Flaccid ovary with strikingly loose disorderly aspect. Few oocytes, which may be attached to the central tissue. Flaccid NG/OG.	Testis flaccid. SS empty or with few spermatophores

3.3.5 Gonad Weight

In all taxa, the gonad weight will be recorded to the 0.01g. In bony fishes, the gonad weight refers to the unique and well defined gonad.

For crustacean decapods, the evaluation of gonad weight is not included as a routine procedure. It may be taken in case of specific objectives related to a separate project. Crustaceans, in fact, exhibit such structured, the extraction of which is very difficult and time consuming, especially in small and immature females. For the sake of precision, it is worth mentioning that in any case the extruded eggs on the pleopods (such is the case of Norway lobster) should not be included in the measurement of gonad weight.

3.3.6 Extraction of otoliths and scales for age reading

Otolith extraction

The otoliths (or ear bones) of fish are small structures located in the semi-circular canals at the base of the brain. They are formed by the daily accretion of a layer of calcium carbonate bound within a protein matrix. In most teleost fish, there are 3 pairs of otoliths. The sagittal otoliths are the largest of the 3 pairs and are generally used for age determination.

Otoliths can be extracted without the need of magnification. There are various techniques for removal of otoliths from fish, the choice of which depends on the plane of the cranium section.

The common used method is from the ventral side behind the head after removal of the gills (Fig. 10). The otoliths are present at the bony auditory capsules at the back of the cranium in which the semi-circular are found. After locating the otoliths in this area, open the capsules, and carefully removed the otoliths with a forceps.

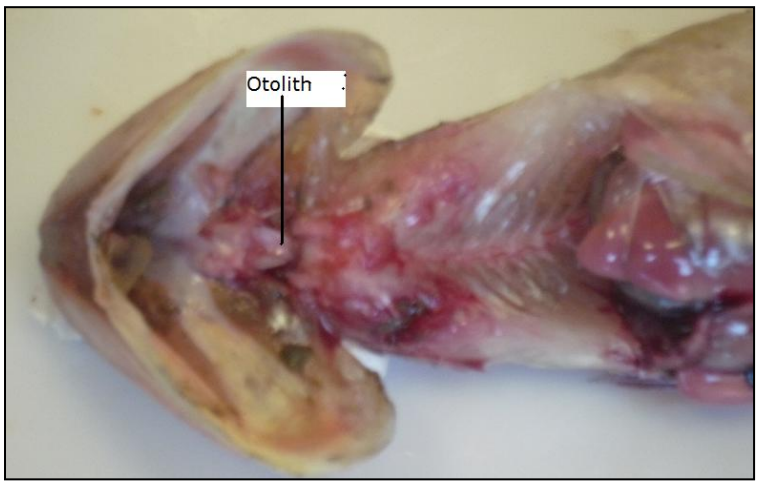

Fig. 10. Otolith of *Saurida undosquamis*.

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ANNEXES

Annex I Landings data collection form

FAO EastMed : Egypt Pilot Survey - Landings					Form no: الرقم:	
Port : الميناء	Kafr-El-Sheikh		Date : التاريخ		Recorder : مدخل البيانات	
Vessel data بيانات المركب						
Vessel Name : الاسم (المركب)			Vessel no : رقم المركب		Gear class : الحرفة	
Length categ : الطول		HP : قوة الحصان			Material : مادة الصنع	
Gear and/or fishing method : الحرفة او طرق						
Fishing operations عمليات الصيد						
Days at sea : ايام العمل		Distance from shore : المسافة من الشاطىء			Depth : العمق	
Landings by species بيانات الانزال						

Species (Arabic) الاسم العربي	Species (scientific) الاسم العلمي	Kg بالكيلو	Price السعر	Av. W توسط الوزن	Fish in 1 kg عدد الاسماك في الكيلو	
A1. Bogue	Boops boops					
A2. Lizard fish	Saurida undosquamis					
A3. Red mullet	Mullus barbatus					
A4. Round sardinella	Sardinella aurita					
A5. Shrimp scad	Alepes djedaba					
A6. Tiger prawn	Marsupenaeus japonicus					
Anchovy	Engraulis encrasicolus	10			80	800
Atlantic lizard fish	Synodus saurus					
Blue crab	Portunus pelagicus					
Common sole	Solea vulgaris					
Cuttlefish	Seppia officinalis					
Egyptian sole	Solea aegyptiaca					
European seabass	Dicentrarchus labrax					
Flathead grey mullet	Mugil cephalus					
Golden grey mullet	Liza aurata					
Grouper (golden)	Epinephelus aeneus					
Grouper (meagre)	Argyrosomus regius					
Kawakawa	Euthynnus affinis	20		5		4
Leaping mullet	Liza saliens					
Marbled Spinefoot	Siganus rivulatus					
Narrow-barred spanish mackere	Scomberomorus commerson					
Sand smelt	Atherina boyeri					
Seabream	Sparus aurata					
Striped red mullet	Mullus surmuletus					
Thinlip mullet	Liza ramada					
White seabream	Diplodus sargus					
Z1. Cartilagenous	*Z1. Cartilagenous*					
Z2. Shrimps	*Z2. Shrimps - other*					
Z9. OTHERS	*Z9. OTHERS*					
New species 1		50			2	100
New species 2		20		2		10

Annex II Data collection form for monthly fishing effort

FAO EastMed : Egypt Pilot Survey - Fishing effort (days at sea in a month)				
Port :	Kafr-El-Sheikh		Recorder :	
Target period	Month:		Year :	
Monthly effort expressed in "days at sea"				
Vessel no.	Vessel Name	Length class	Gear class	Days at sea

Annex III Stratification Scheme for Eastern Delta

Associations sites > Minor strata - March 2011

Code	Minor strata	Sites	Code
1	PORT SAID		
		Port Said	2
2	DAMIETTE		
		Ezbet Elborg	3
3	KAFR-EL-SHEIKH		
		Borolus	4
		El Jazeera	5

Annex IV SAMAC-generated recommended sample size

Frame survey - March 2011

Code	Sites	Fishing units	# Units
S0002+B0001	**Port Said (PORT SAID STRATUM)**	TRAWLERS	231
S0002+B0002		LONGLINERS	237
S0002+B0003		PURSE SEINERS	55
S0002+B0004		TRAMMEL NET	0
S0002+B0005		OTHER GEAR	0
S0003+B0001	**Ezbet Elborg (DAMIETTE STRATUM)**	TRAWLERS	638
S0003+B0002		LONGLINERS	166
S0003+B0003		PURSE SEINERS	16
S0003+B0004		TRAMMEL NET	12
S0003+B0005		OTHER GEAR	0
S0004+B0001	**Borolus (K.E.SHEIKH STRATUM)**	TRAWLERS	13
S0004+B0002		LONGLINERS	193
S0004+B0003		PURSE SEINERS	24
S0004+B0004		TRAMMEL NET	2
S0004+B0005		OTHER GEAR	0
S0005+B0001	**El Jazeera (K.E.SHEIKH STRATUM)**	TRAWLERS	0
S0005+B0002		LONGLINERS	0
S0005+B0003		PURSE SEINERS	0
S0005+B0004		TRAMMEL NET	0
S0005+B0005		OTHER GEAR	0
BY STRATUM	***SURVEY TYPE***	***RECOMMENDED SAMPLE SIZE***	
M0001+B0001	**PORT SAID**	**TRAWLERS**	**231**
	Landing samples for CPUE :	Accuracy level : 90%	28
		Accuracy level : 95%	105
	Boat Activity - Monthly effort :	Accuracy level : 90%	13
		Accuracy level : 95%	32
M0001+B0002		**LONGLINERS**	**237**
	Landing samples for CPUE :	Accuracy level : 90%	28
		Accuracy level : 95%	106

	Boat Activity - Monthly effort :	Accuracy level : 90%	13
		Accuracy level : 95%	33
M0001+B0003		**PURSE SEINERS**	**55**
	Landing samples for CPUE :	Accuracy level : 90%	21
		Accuracy level : 95%	67
	Boat Activity - Monthly effort :	Accuracy level : 90%	9
		Accuracy level : 95%	17
M0002+B0001	**DAMIETTE**	**TRAWLERS**	**638**
	Landing samples for CPUE :	Accuracy level : 90%	32
		Accuracy level : 95%	127
	Boat Activity - Monthly effort :	Accuracy level : 90%	17
		Accuracy level : 95%	48
M0002+B0002		**LONGLINERS**	**166**
	Landing samples for CPUE :	Accuracy level : 90%	26
		Accuracy level : 95%	95
	Boat Activity - Monthly effort :	Accuracy level : 90%	12
		Accuracy level : 95%	28
M0002+B0003		**PURSE SEINERS**	**16**
	Landing samples for CPUE :	Accuracy level : 90%	16
		Accuracy level : 95%	43
	Boat Activity - Monthly effort :	Accuracy level : 90%	6
		Accuracy level : 95%	9
M0002+B0004		**TRAMMEL NET**	**12**
	Landing samples for CPUE :	Accuracy level : 90%	15
		Accuracy level : 95%	39

	Boat Activity - Monthly effort :	Accuracy level : 90%	5
		Accuracy level : 95%	7
M0003+B0001	**KAFR-EL-SHEIKH**	**TRAWLERS**	**13**
	Landing samples for CPUE :	Accuracy level : 90%	15
		Accuracy level : 95%	40
	Boat Activity - Monthly effort :	Accuracy level : 90%	5
		Accuracy level : 95%	8
M0003+B0002		**LONGLINERS**	**193**
	Landing samples for CPUE :	Accuracy level : 90%	27
		Accuracy level : 95%	100
	Boat Activity - Monthly effort :	Accuracy level : 90%	12
		Accuracy level : 95%	30
M0003+B0003		**PURSE SEINERS**	**24**
	Landing samples for CPUE :	Accuracy level : 90%	17
		Accuracy level : 95%	50
	Boat Activity - Monthly effort :	Accuracy level : 90%	7
		Accuracy level : 95%	11

Annex V Biological Data Entry Sheets

BIOLOGICAL DATA ENTRY SHEET							
Date	**Vessel name**		**Gear**	**Total weight of sample (kg)**			**Page No.**
Arabic name :				**Scientific name:**			
No.	**Length (mm)**	**Individual Weight (g)**	**Gutted Weight (g)**	**Sex (F/M/U)**	**Maturity Stage**	**Gonads wt. (gm)**	**Otolith No.**
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Annex VI Species found in Egyptian Mediterranean waters.

Family	Scientific Name	English Common Name	Arabic Name
Bony fish			
Pomacentridae	*Abudefduf sexfasciatus*	Scissortail Sergeant	دمسل
Apogonidae	*Apogon imberbis*	Cardinal Fish	أبجون
	Apogonichthyoides taeniatus	Two belt Cardinal Fish	أبجون
Atherinidae	*Atherinomorus lacunosus*	Hardyhead Silverside	بساريا
Balastidae	*Balistes capriscus*	Grey Triggerfish	خنزير بثلاث شوكات
	Belone belone	Garfish	خرم
Blennidae	*Blenius ocellaris*	Butterfly Blenny	أبو قراع
	Parablennius incognitus	Blenny	أبو قراع
Bothidae	*Arnoglossus kessleri*	Scaldback	موسى
	Bothus podas	Wide-Eyed Flounder	سنجتا
Carangidae	*Alectis alexandrina*	Alexandria Pompano	الجمل
	Alepes djedaba	Shrimp Scad	ميرا
	Caranx crysos	Blue Runner	باغة
	Trachinotus ovatus	Pompano	غلنفيش
	Trachurus mediterraneus	Mediterranean Horse Mackerel	شاخورة
	Trachurus trachurus	Atlantic Horse Mackerel	شاخورة
Centracanthidae	*Spicara flexuosa*	Blotched Picarel	موزة الجر
	Spicara maena	Blotched Picarel	موزة
	Spicara smaris	Picarel	موزة
Cichlidae	*Oreochromis aureus*	Blue Tilapia	بلطي حساني
	Tilapia zilli	Redbelly Tilapia	بلطى أخضر
Citharidae	*Citharus linguatula*	Spotted Flounder	موسى
Clupeidae	*Sardina pilchardus*	European Pilchard	سردينا بلشارد
	Sardinella aurita	Round Sardinella	سردينا مبرومه
	Sardinella maderensis	Madeiran Sardinella	سردينا مفطره
	Etrumeus teres	Red-eye Round Herring	*مموبوزيا سردينا*
	Dussumieria acuta	Rainbow Sardine	سردينا
Engraulidae	*Engraulis encrasicolus*	European Anchovy	أنشوجه
Congridae	*Ariosoma balearicum*	Bandtooth Conger	ثعبان
	Conger conger	European Conger	ثعبان
Exocoetidae	*Parexocoetus mento*	African Sailfin flying fish	طيارة

Family	Scientific Name	English Common Name	Arabic Name
Bony fish continued			
Fistulariidae	*Fistularia commersonii*	Bluespotted Cornetfish	ابو صفارة
Gobiidae	*Gobius niger*	Black Goby	أبوكرش
	Gobius paganellus	Rock Goby	أبوكرش
Hemiramphidae	*Hemiramphus far*	Black-barred Halfbeak	أبو منقار
	Hemiramphus picarti	African Halfbeak	أبو منقار
Holocentridae	*Sargocentron rubrum*	Redcoat	جحاية
Labridae	*Coris julis*	Mediterranean Rainbow Wrasse	عروسه
	Labrus spp.	Wrasse	عرائس
	Pteragogus pelycus	Sideburn Wrasse	عروسة بخط بنى
	Symphodus spp.	Grey Wrasse	عرائس
	Xyrichthys novacula	Pearly Razorfish	ببغاء
Leiognathidae	*Leiognathus klunzingeri*	Pony Fish	أبو العريان
Merluccidae	*Merluccius merluccius*	European Hake	نازلي
Monacanthidae	*Stephanolepis diaspros*	Reticulated Leatherjacket	خنزير بشوكة
	Stephanolepis hispidus	Planehead Filefish	خنزير بشوكة
Moronidae	*Dicentrarchus labrax*	European Seabass	قاروص
	Dicentrarchus punctatus	Spotted Seabass	نقط
Mugilidae	*Liza aurata*	Golden Grey Mullet	أصفر ودن
	Liza ramada	Thinlip Grey Mullet	طوباره
	Liza saliens	Leaping Mullet	جران
	Mugil cephalus	Flathead Grey Mullet	بوري حر
Mullidae	*Mullus barbatus barbatus*	Red Mullet	بربوني
	Mullus surmuletus	Surmullet	بربون حجر
	Upeneus francisi	Francis' Goatfish	بربونى
	Upeneus moluccensis	Goldband Goatfish	بربونى
Nemimpteridae	*Nemipterus japonicus*	Japanese Threadfin Bream	صرع
Ophichthidae	*Dalophis imberbis*	Armless Snake Eel	ثعبان
Pomacentridae	*Chromis chromis*	Damselfish	فناشة
Pomatomidae	*Pomatomus saltatrix*	Bluefish	مياس
Scaridae	*Sparisoma cretensis*	Parrotfish	مرزبان
Sciaenidae	*Argyrosomus regius*	Meagre	لوت
	Umbrina cirrosa	Shi Drum	شفش

Family	Scientific Name	English Common Name	Arabic Name
Bony fish continued			
Scombridae	*Scomberomorus commerson*	Narrow-barred Spanish Mackerel	دراك
	Katsuwonus pelamis	Skipjack Tuna	بلاميطه
	Thynnus alalunga	Albacore	*تونه*
	Thunnus thynnus	Atlantic Bluefin Tuna	*تونه زرقاء*
	Scomber japonicus	Chub Mackerel	سكومبر
	Scomber scomber	Atlantic Mackerel	سكومبر
	Euthynnus alletteratus	Little Tunny	بلاميطه -كبريت
Scorpaenidae	*Scorpaena notata*	Small Red Scorpionfish	عقرب أحمر
	Parascorpaena picta	Northern Scorpionfish	عقرب بنى
	Scorpaena porcus	Black Scorpionfish	عقرب بنى
Serranidae	*Epinephelus aeneus*	White Grouper	وقار
	Epinephelus fasciatus	Blacktip Grouper	وقار
	Serranus cabrilla	Comber	شيخ
	Serranus hepatus	Brown Comber	شيخ
	Serranus scriba	Painted Comber	شيخ
Siganidae	*Siganus luridus*	Dusky Spinefoot	بطاطا
	Siganus rivulatus	Marbled Spinefoot	بطاطا
Singnathidae	*Hippocampus hippocampus*	Short Snouted Sea Horse	حصان البحر
Soleidae	*Microchirus ocellatus*	Foureyed Sole	شبه موسي بدوائر
	Solea aegyptiaca	Egyptian Sole	موسى
	Solea impar	Adriatic Sole	موسى
	Solea nasuta	Blackhand sole	موسى مزركشة
	Solea vulgaris	Common Sole	موسى
Sparidae	*Boops boops*	Bogue	موزة
	Dentex dentex	Common Dentex	عضاض
	Diplodus annularis	Annular Seabream	سبارس
	Diplodus bellottii	Senegal Seabream	وزانية
	Diplodus cervinus	Zebra Seabream	تيس
	Diplodus puntazzo	Sharpsnout Seabream	شرغوش ببوز
	Diplodus sargus sargus	White Seabream	شرغوش حر
	Diplodus vulgaris	Common Two-Banded Seabream	شرغوش رشيدى
	Lithognathus mormyrus	Sand Steenbras	مرمار

Family	Scientific Name	English Common Name	Arabic Name
Bony fish continued			
Sparidae	*Oblada melanura*	Saddled Seabream	كحلة
	Pagellus acarne	Axillary Seabream	غزيله برونزية
	Pagellus erythrinus	Common Pandora	غزيله حمراء
	Pagrus pagrus	Red Porgy	مرجان
	Sarpa salpa	Salema	سرب
	Sparus aurata	Gilthead Seabream	دنيس
Sphyraenidae	*Sphyraena chrysotaenia*	Yellowstripe Barracuda	مغازل
	Sphyraena sphyraena	European Barracuda	مغازل
Synodontidae	*Saurida undosquamis*	Brushtooth Lizardfish	مكرونة مخططة
	Synodus saurus	Atlantic Lizardfish	مكرونة صفراء
Terapontidae	*Terapon puta*	Small-Scaled Terapon	شخرم
Tetraodontidae	*Lagocephalus sceleratus*	Silver-Cheeked Toadfish	أرنب ببقع
	Lagocephalus spadiceus	Half-Smooth Golden Pufferfish	أرنب
	Tetraodon lineatus	Globe Fish	فهاقة
Torbedenidae	*Torpedo* spp.	Torpedo	رعاد
Trachinidae	*Trachinus araneus*	Spotted Weever	بلامة
	Trachinus draco	Greater Weever	بلامة
	Trachinus radiatus	Starry Weever	بلامة
Trichiuridae	*Trichiurus lepturus*	Largehaid Hairtail	سيوف
Triglidae	*Lepidotrigla cavillone*	Large-Scaled Gurnard	فرخة
	Trigloporus lastoviza	Streaked Gurnard	فرخة حمراء
	Chelidonichthys lucerna	Tub Gurnard	فرخة
	Trigla lyra	Piper Gurnard	فرخة
Uranoscopidae	*Uranoscopus scaber*	Stargazer	قط
Zeidae	*Zeus faber*	John Dory	عفريت

Family	Scientific Name	English Common Name	Arabic Name
Cartilaginous fish			
Dasyatidae	*Dasyatis pastinaca*	Common Stingray	راية مزركشة بازرق
	Himantura uarnak	Honeycomb Stingray	بقره
Triakidae	*Mustelus mustelus*	Smooth-hound	قرش
Myliobatidae	*Myliobatis aquila*	Common Eagle Ray	وطواط
Scyliorhinidae	*Scyliorhinus canicula*	Small-Spotted Catshark	قرش
Rajidae	*Raja miraletus*	Brown Ray	راي بعينين
	Raja radula	Rough Ray	رايه
Rhinobatidae	*Rhinobatus rhinobatus*	Common Guitarfish	محرات
Mollusca			
Loliginidae	*Loligo vulgaris*	Common European Squid	كاليماري
Sepiidae	*Sepia officinalis*	Common cuttlefish	سبيط
Octopodidae	*Octopus vulgaris*	Common octopus	أخطوبوط
	Eledone moschata	Musky octopus	أخطوبوط
	Octopus macropus	Grass octopus	أخطوبوط
Crustacea			
Penaeidae	*Metapenaeus monoceros*	Speckled shrimp	جمبري أحمر
	Metapenaeus stebbingi	Peregrine shrimp	جمبري ابيض
	Parapenaeus longirostris	Deep water pink shrimp	جمبرىاحمر انجليزى
	Marsupenaeus japonicus	Kuruma prawn	جمبرى يابانى
	Penaeus kerathurus	Caramote prawn	جمبرى قزاز
	Penaeus latisulcatus	Western king prawn	جمبرى لاتى
	Penaeus semisulcatus	Green tiger prawn	جمبرىسويسى
	Trachypenaeus curvirostris	Southern rough shrimp	(جمبرى عجوز(عقر
Portunidae	*Liocarcinus vernalis*	Grey swimming crab	كبوريا بشعر
	Polybius henslowii	Henslow's swimming crab	كابوريا زيتونى
	Portunus pelagicus	Blue swimmer crab	كابوريا زرقاء
Palinuridae	*Panulirus homarus*	Scalloped spiny lobster	أستاكوزا
Squillidae	*Oratosquilla massavensis*	Red Sea mantis shrimp	شكاله
Squillidae	*Squilla mantis*	Spottail mantis shrimp	شكالة
Scyllaridae	*Scyllarus latus*	Locust lobster	استاكوزا

Annex VII List of species for which biological sampling will be conducted

Species name	Type of length measurement
Penaeus semisulcatus	CL to the lower mm
Metapenaeus stebbingi	CL to the lower mm
Mullus surmuletus	TL to nearest inferior ½ cm
Sardinella aurita	TL to nearest inferior ½ cm
Saurida undosquamis	TL to nearest inferior ½ cm
Sepia officinalis	DML to the lower mm

Annex VIII Teleost Fish Reference photos

Brushtooth lizardfish - *Saurida undosquamis*

Developing Female - Maturity Stage 3

Maturing Female - Maturity Stage 4

Mature Female - Maturity Stage 5

Photos by Alaa Eldin El-Haweet

Developing Male - Maturity Stage 3

Maturing Male - Maturity Stage 4

Mature Male - Maturity Stage 5

Photos by Alaa Eldin El-Haweet

For more reference photos please refer to ICES Maturity workshops in which other Mediterranean teleost fish species were examined.

Annex IX Crustacean Shrimp Reference photos

Peregrine shrimp - *Metapenaeus stebbingi*

Immature Female - Maturity Stage 1

Maturing Female - Maturity Stage 2

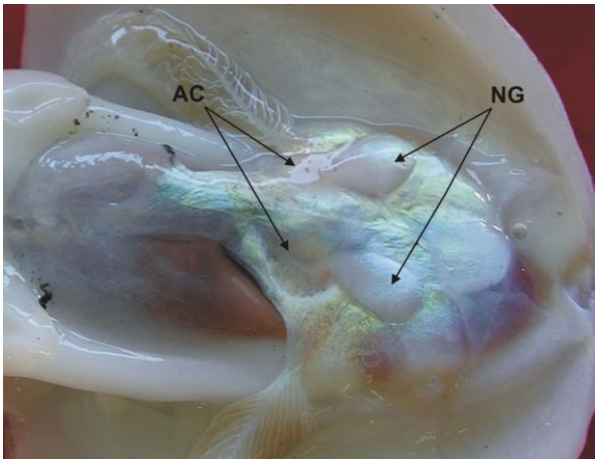
Late Mature Female - Maturity Stage 3

Photos by Alaa Eldin El-Haweet

For more reference photos from other Mediterranean species please refer to ICES (2010). Report of the Workshop on crustaceans (*Aristeus antennatus*, *Aristaeomorpha foliacea*, *Parapenaeus longirostris*, *Nephrops norvegicus*) maturity stages (WKMSC), 19-23 October 2009, Messina, Italy. ICES CM 2009/ACOM:46. 77 pp.

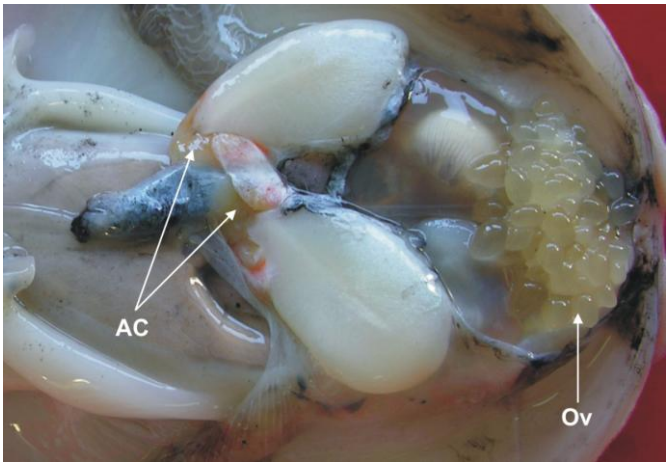
Annex X Cephalopod Reference photos

Common cuttlefish - *Sepia officinalis* (NG: Nidamental glands, Ov: ovary, AC: Accessory glands, OG: Oviducal gland, TS: testis, SC: Spermatophoric complex, SD: Vas defeerens, SS: Needham's sac)

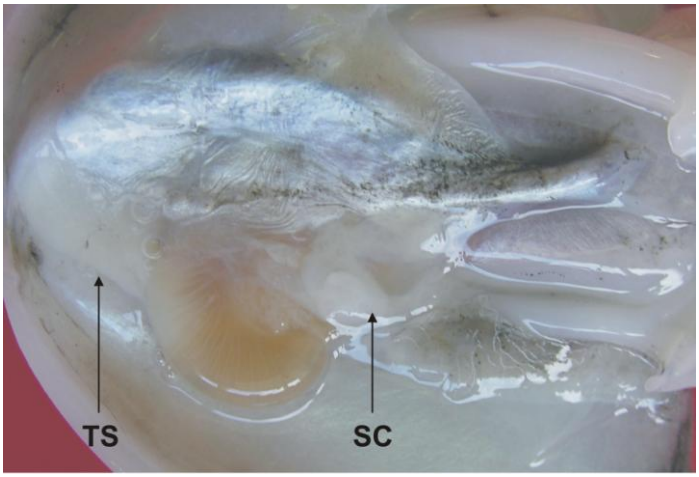


Developing Female - Maturity Stage 2

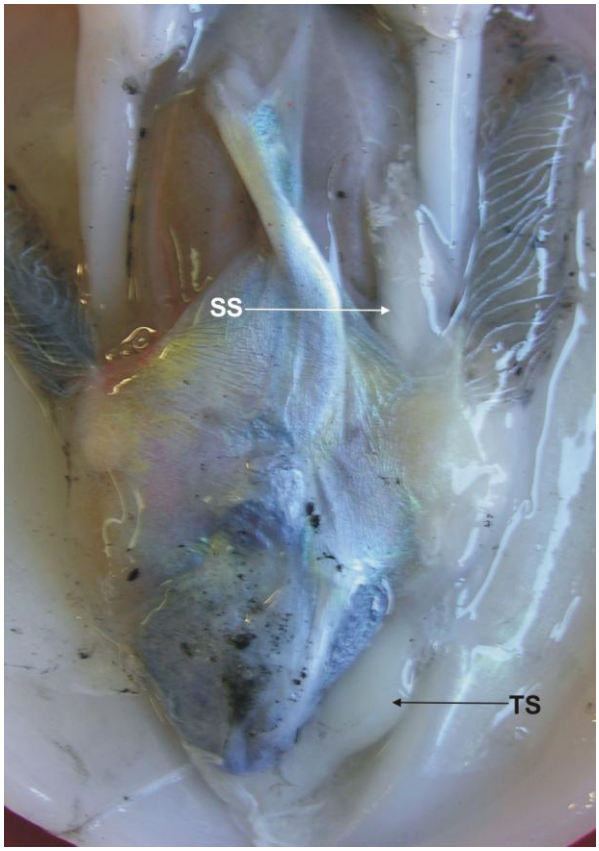
Maturing Female - Maturity Stage 3



Mature Female - Maturity Stage 4



Developing Male - Maturity Stage 2



Mature Male - Maturity Stage 4

Photos supplied by Eugenia Lefkaditou

For more reference photos from the Mediterranean please refer to ICES (2010). Report of the Workshop on Sexual Maturity Staging of Cephalopods, 8-11 November 2010, Livorno, Italy. ICES CM 2010/ACOM:49. 97 pp.

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