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Deliverable D2.3

Report on biological and ecological data in FFDB pilot version 1

31/07/2018



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www.farfish.eu

Executive Summary

Task 2.3 of work package 2 (Advancing biological knowledge and evaluation of current stock assessment models) focuses on the compilation of biological, ecological and fisheries dependent and fisheries independent data that is required for other FarFish WPs. During the first year of FarFish, some modifications in the objectives occurred, resulting in changes in the species. For example, in the Cape Verde and Seychelles CSs, the focus is now on by-catch species that are not assessed by the Regional Management Fisheries Organizations (RMFO): the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Indian Ocean Tuna Commission (IOTC). Lists of species for each CS have now been drawn up, sources of data identified, contacts have been made with RMFOs and DG MARE, and data is being compiled. Data compilation has been largely driven by the FarFish Data Base (FFDB) template developed in WP 6 (see deliverables D6.1 and D6.4). On the other hand, other data required for visualization purposes, especially time series, is also being compiled or requested. A formal data request is being prepared for DG MARE, while coastal state CS participants will be requested to provide data for the FFDB. Talks are also ongoing with RFMOs, especially CECAF, regarding data acquisition and how FarFish can contribute or add value to assessment and management. Actions that need to be taken by Task 2.3 participants include the provision of data and uploading of data to the FFDB. Task 2.3 is ongoing (Report on biological and ecological data in FFDB pilot version 2, due in Month 26 (July 31, 2019)).



Abbreviations

CA	Convention Area
CCAMLR	Convention for the Conservation of Antarctic Marine Living Resources
CECAF	Fishery Committee for the Eastern Central Atlantic
CS	Case studies
DG Mare	Directorate General of Maritime Affairs
EU	European Union
FAO	The Food and Agriculture Organization of the United Nations
FFDB	FarFish DataBase
ICCAT	International Commission for the Conservation of Atlantic Tunas
IEO	Instituto Español de Oceanografía
IMROP	The Institut Mauritanien de Recherches Océanographiques et de Peches
INIDEP	Instituto Nacional de Investigación y Desarrollo Pesquero (Argentina)
IOTC	Indian Ocean Tuna Commission
MPO	Management Plan Zero (describing current situation)
MPR	Management Plan Recommendations
RFMO	Regional Fisheries Management Organisation
SEAFO	South East Atlantic Fisheries Organisation
STECF	(EU) Scientific, Technical and Economic Committee for Fisheries
TAC	Total Allowable Catch
VME	Vulnerable Marine Ecosystems
WP	Work Package



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1 Introduction

WP2 focuses on the biological and ecological status of resources within the selected case studies. In Task 2.3 (Advancing biological and ecological knowledge), biological and ecological data for the relevant stocks in the different Case Studies (CS) is being compiled and in part, will be made available in the FarFish data base (FFDB) developed in WP6. The data collected will feed into models and management tools that will provide better understanding of the biology and ecology of the respective species and ecosystems, and will be used by other WPs (1, 3, 4, 5 & 6) for stakeholder interaction, development of management plan recommendations (MPR), modelling, stock assessment and for visualisation tools.

In this deliverable, we provide an overview of the work that has been carried out so far with regards to advancing biological and ecological knowledge in the FarFish project. During this first year of the project, the work has been driven mainly by the requirements of WP 4 & WP 6 in particular. We also outline the actions that are required with regard to data acquisition and uploading.



2 Overview of data requirements

Based on meetings with CS participants, other WPs and D4.1 (MPO for each case study), data requirements, species and issues of interest were identified. Table 1 provides an overview of the target and by-catch species of interest for each of the CSs, as identified in the MPO, along with sources of information (mainly on catches, assessment etc..) and data gaps. Following meetings with CS representatives and discussion of issues considered important for particular case studies, more species were included.

Table 1. Target and by-catch species considered for data compilation, largely based on the MPO*

SW Atlantic (FAO area 41)		
Category	Species	Available information, data & assessments
Target catches	Argentine Hake (<i>Merluccius hubbsi</i>), Austral hake (<i>Merluccius australis</i>), Argentine shortfin squid (<i>Ilex argentinus</i>), southern blue whiting (<i>Micromesistius australis</i>).	<p>No management advisory body or Regional Fisheries Management Organisation (RFMO) exists for International waters of the Patagonian Shelf. There are EU fisheries both in International Waters and in Falkland waters. The available fisheries data appears to be fragmented and not easily accessible (not public). Data holders include Argentinian and Falkland Islands fisheries institutions as well as distant-water fishing nations.</p> <p>Argentine hake is targeted by bottom trawlers from several countries, mostly Spain. International waters are the most important area for Spanish trawlers targeting for hakes in the SW Atlantic. Catches are dominated by Argentine hake and minor catches of Austral hake. The main fishing grounds for <i>M. hubbsi</i> are located between parallels 44°-48°S.</p> <p>Argentine shortfin squid is the most important cephalopod species in the area and it is the target of major fisheries by both bottom trawlers and jigging vessels during the first half of the year. Bottom trawlers are mainly from Spain, whereas jiggers belong to several Asian countries such as Japan, Korea, Taiwan and China. The main fishing area on the high seas is between parallels 44°-47°S.</p> <p>Southern blue whiting is fished as by-catch in shortfin squid and hake fisheries by bottom trawlers from several countries, mainly from Spain. However, it is a target fishery in Falkland waters.</p> <p>The Instituto Español de Oceanografía (IEO, Spanish Institute of Oceanography) conducted 13 multidisciplinary research cruises in international waters of the SW Atlantic between October 2007 and April 2010</p>



	<p>to provide scientific advice for the Spanish Fisheries Administration. The core of this advice, consisting in the proposal of nine candidate areas for closure along the Patagonian Shelf and slope, due to identified presence of Vulnerable Marine Ecosystems (VMEs) or sensitive habitats and/or organisms. According to this advice, the Spanish Administration implemented on 1st July 2011 a fishing ban in the proposed areas for the Spanish bottom trawling fleets operating in the high seas of the SW Atlantic, this ban being still in force.</p> <p>STECF considers that it is unclear if the stocks in international waters constitute separate stocks from those in Argentine or Falkland Islands' waters, so efforts to improve stock identification are desirable.</p> <p>STECF notes also that in order to provide informative advice, information from the fisheries exploiting this stock throughout its range is required. STECF also notes the need for a multilateral approach for the assessment and management of the fisheries in the SW Atlantic.</p> <p>Information sources:</p> <p>STECF 2014. Review of scientific advice for 2015. Consolidated Advice on Fish Stocks of Interest to the European Union (STECF-14-24)</p> <p>INIDEP (Instituto Nacional de Investigación y Desarrollo Pesquero) (http://www.inidep.edu.ar/), Argentina</p> <p>Falkland Islands Fisheries Dept. (http://www.fig.gov.fk/fisheries/): Basic statistics (catch)</p> <p>Wang et al. 2018. A stock assessment for <i>Illex argentinus</i> in Southwest Atlantic using an environmentally dependent surplus production model. Acta Oceanol. Sin., 2018, Vol. 37, No. 2, P. 94–101; DOI: 10.1007/s13131-017-1131-y</p> <p>Haimovici M, Santos R A D, Bainy M C R S, et al. 2014. Abundance, distribution and population dynamics of the short fin squid <i>Illex argentinus</i> in Southwestern and Southern Brazil. Fisheries Research, 152: 1–12</p> <p>Information gaps/needs:</p> <p>Information on non-EU fleets (e.g. China, Japan, Korea and Taiwan) – important to define how to get the needed information.</p>
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Bycatches	Patagonian grenadier (<i>Macruronus magellanicus</i>), Patagonian toothfish (<i>Dissostichus eleginoides</i>), Rays mantas nei (Rajiformes), Stingrays (<i>Dasyatis</i> spp.), Longtail southern cod (<i>Patagonotothen ramsayi</i>), Forkbeard (<i>Phycis phycis</i>),	The Patagonian toothfish fishery in the Falklands Zone is targeted by a single longline vessel (occasionally two vessels) in waters deeper than 600m, and is a non-targeted by-catch species in the trawl fisheries on the shelf. This is managed by the Falkland Islands Fisheries Dept. There is no management advisory body for International waters of the Patagonian Shelf (not covered by CCAMLR). The IEO Spanish surveys also provide information on other demersal and deep-sea resources such as Rockcod (<i>Patagonotothen ramsayi</i>) and Deep-sea grenadiers (<i>Macrourus carinatus</i> , <i>Macrourus holotrachys</i>).
SE Atlantic (FAO area 47)		
Category	Species	Available information, data & assessments
Target catches	Alfonsino (<i>Beryx splendens</i>), boarfish/pelagic armourhead (<i>Pseudopentaceros richardsoni</i>), orange roughy (<i>Hoplostethus atlanticus</i>), skates, sharks, deep-sea crab (<i>Chaceon erytheiae</i>), Patagonian toothfish (<i>Dissostichus eleginoides</i>), Wreckfish (<i>Polyprion americanus</i>), Grenadiers nei (<i>Macrourus</i> spp.), Blue antimora (<i>Antimora rostrata</i>), King crab (<i>Lithodidae</i> spp., <i>Lithodes ferox</i> , <i>Paralomis formosa</i>)	<p>These Deep-sea resources are managed by the RFMO established for this purpose (non-tunas): the SE Atlantic Fisheries Organisation (SEAFO). The SEAFO Convention Area (CA) is a large area with several seamount chains, isolated seamounts, guyots and banks, beyond national jurisdictions. All fishing in SEAFO occurs on or around seamounts. Nowadays vessels have mainly concentrated fishing operations on three distinct areas: Valdivia Bank seamounts complex, Meteor, and Discovery Seamounts. The sum of all TACs amounts to less than 1,000 MT. Fishing appears to have all but ceased.</p> <p>The Commission takes account of scientific advice provided by the Scientific Committee and adopts annual total allowable catch (TACs) for orange roughy (<i>Hoplostethus atlanticus</i>), alfonsino (<i>Beryx splendens</i>), Patagonian toothfish (<i>Dissostichus eleginoides</i>), southern boarfish (<i>Pseudopentaceros richardsoni</i>), and deep-sea red crab (<i>Chaceon erytheiae</i>).</p> <p>SEAFO data is not readily available (www.seafo.org), but the report of the Scientific Committee is downloadable.</p> <p>Important to note that it is CCAMLR who has the responsibility of assessing Patagonian toothfish and recommending a TAC.</p>
Bycatches	Warty dory (<i>Allocyttus verrucosus</i>), Spiky oreo (<i>Neocyttus rhomboidalis</i>), Guinea oreo (<i>Allocyttus guineensis</i>), Smoot oreo dory (<i>Pseudocyttus maculatus</i>)	Data appear to be very limited (e.g. Nansen and other exploratory surveys)



Cape Verde		
Category	Species	Available information, data & assessments
Target catches	Yellowfin tuna (<i>Thunnus albacares</i>), Bigeye tuna (<i>Thunnus obesus</i>), Skipjack tuna (<i>Katsuwonus pelamis</i>), Swordfish (<i>Xiphias gladius</i>), Blue shark (<i>Prionace glauca</i>)	All stocks assessed by ICCAT; detailed reports available for all study targets ICCAT public data: Task I – nominal catch Task II – catch and effort Task II – size data CATDIS – spatial catch data raised to total landings (5x5 square) Effdis – spatial effort for LL and PS Catch-at-size – available for study target species (except for Blue shark) Tagging data – all study target species
Bycatch	Seabirds, turtles *Wahoo (<i>Acanthocybium solandri</i>)	Pending review of existing ICCAT and other papers
Senegal		
Category	Species	Available information, data & assessments
Target catches	Black hakes: Tropical African hake (<i>Merluccius polli</i>) & Senegalese hake (<i>Merluccius senegalensis</i>). *Tropical tunas – PS, LL, PL	Same as below for Black hakes (Mauritania) Tunas assessed by ICCAT (see above Cape Verde) Useful references: Cervantès A., Fall M., White C., Sow F. N., Fernández-Peralta L., Thiam N., Jouffre D. 2017. Rapport de la réunion annuelle du Comité Scientifique Conjoint relatif à l'Accord de pêche signé entre la République du Sénégal et l'Union européenne. Madrid, Espagne, 09 février, 10 et 11 octobre 2017. Rapports des Comités Scientifiques Conjoints. Bruxelles, 60p. + Annexes. Information gaps/needs: Hake species discrimination (the species have overlapping distribution and are mixed in catches and are commonly marketed as <i>Merluccius</i> sp and evaluated as a single stock; lack of knowledge on the two species of hake). Contacts with hake specialists have been made.
Bycatches	Varies between 7-15% of trawler catches, consisting mostly of demersal fish, cephalopods and crustaceans	Somewhat similar to the situation in Mauritania



Mauritania		
Category	Species	Available information, data & assessments
Target catches	Langostino/Prawn (<i>Farfantepenaeus notialis</i>) and Gamba/Southern pink shrimp (<i>Parapenaeus longirostris</i>). *Black hakes - trawlers *Small pelagics – sardine, sardinella, horse mackerel, mackerel *Atlantic pomfret (<i>Brama brama</i>) - longliners *Tropical tunas – PS, LL, PL	Latest assessments of by FAO/CECAF in 2015 and 2017 (in press), but the data has to be extracted from reports. IMROP is to carry out an assessment of cephalopods (i.e. <i>Octopus vulgaris</i>) in 2018 Tunas assessed by ICCAT (see above Cape Verde) Useful reference: Bouzouma M., Corte, A., Daniel, P., 2016. Rapport de la Réunion annuelle du Comité Scientifique Conjoint relatif à l'Accord de pêche signé entre la République islamique de Mauritanie et l'Union européenne. Nouakchott, Mauritanie, 05 au 07 septembre 2016. Rapports des Comités Scientifiques Conjoints. Bruxelles, 72 p. + Annexes. <u>Information gaps/needs:</u> Stock discrimination (hakes), environmental forcing on small pelagics: Sardine (<i>S. pilchardus</i>), horse mackerels (<i>T. trachurus</i> , <i>T. trecae</i>), mackerel (<i>Scomber colias</i>) and shrimps
Bycatch	Other commercial by-catch species in EU catches: *Shrimp: Alistado (<i>Aristeus varidens</i>), (<i>Penaeus kerathurus</i>), (<i>Aristaeopsis edwardsiana</i>), (<i>Plesionika spp.</i>) *Fish in order of importance: Zeidae, Sparidae, Sharks & Rays, Scorpaeniformes, Lophiidae, Ophidiidae	A few other fish are assessed (Sparidae) by FAO/CECAF
Seychelles		
Category	Species	Available information, data & assessments
Target catches	Yellowfin tuna (<i>Thunnus albacares</i>), Bigeye tuna (<i>Thunnus obesus</i>), Skipjack tuna (<i>Katsuwonus pelamis</i>). *Swordfish (<i>Xiphias gladius</i>), Blue shark (<i>Prionace glauca</i>)	All stocks assessed by IOTC; detailed reports available from relevant working parties (i.e. tropical tuna) IOTC public data: Nominal catch (by species, gear, flag, reporting country) Catch and effort Length frequency data



Bycatches	<p>Bonito (<i>Euthynnus affinis</i>), Dolphin fish (<i>Coryphaena hippurus</i>), Rainbow runner (<i>Elegatis bipinnulata</i>), triggerfish (Balistidae) billfish (Istiophoridae), wahoo (<i>Acanthocybium solandri</i>)</p>	<p>IOTC collects data and carries out stock assessment for: 4 species of billfish and swordfish 4 species of small tunas Indo-Pacific king mackerel (<i>Scomberomorus guttatus</i>) Narrow-barred Spanish mackerel (<i>Scomberomorus commerson</i>) Note: but not for wahoo Some information available on other bycatch species, mostly through scientific papers, but these are not assessed</p>
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*Additional species included after discussions/meetings with CS leaders.



3 Compilation of data

Data is being compiled for the species in Table 1. The priority is to obtain data for the FFDB that can be used for stock assessment using data limited methods (Carruthers and Hordyk, 2017). The data and parameters that can be uploaded are described in D6.1. The type of data includes: annual catches (landings) or annual indices of relative abundance, catch-at-age data, catch-at-length data, and parameters such as reference points, life history parameters (mortality, growth, length-at-maturity, weight-length), and coefficients of variation (Table 2).

Table 2. Data and parameters being compiled for uploading in the FFDB.

Catch (landings) and/or indices of abundance
Catch-at-age data
Length-at-age
Parameters & reference points
avg_catch_over_time depletion_over_time M FMSY/M BMSY/B0 MSY BMSY length_at_50pc_maturity length_at_95pc_maturity length_at_first_capture length_at_full_selection current_stock_depletion current_stock_abundance Von_Bertalanffy_K Von_Bertalanffy_Linf Von_Bertalanffy_t0 Length-weight_parameter_a Length-weight_parameter_b maximum_age reference_overfishing_catch_limit



Coefficients of variation of:

- catch
- depletion_over_time
- avg_catch_over_time
- abundance_index
- M
- FMSY/M
- BMSY/B0
- current_stock_depletion
- current_stock_abundance
- Von_Bertalanffy_K
- Von_Bertalanffy_Linf
- Von_Bertalanffy_t0
- length_at_50pc_maturity
- length_at_first_capture
- length_at_full_selection
- Length-weight_parameter_a
- Length-weight_parameter_b
- length_composition

In addition to the data and parameters that can be uploaded to the FFDB, the following data are also being compiled for the relevant species: stock structure, distribution, migrations, catch and effort data, by-catch and discards, gear selectivity, and historical time series (e.g. research cruise surveys).



4 Sources of data

4.1 Published literature

Information on life history parameters, distribution, migrations and gear selectivity is being compiled from the primary literature based on the Web of Science platform, as well as online data bases such as Fishbase (www.fishbase.org). Searches for grey literature such as project reports is also being carried out directly through online searches (e.g. Google Scholar) or by contacting individuals with access to the literature.

4.2 National data bases

Case study representatives have been requested to provide data from national data bases (national catch statistics, research cruise surveys, selectivity and by-catch and discards studies). In addition to the case study countries, European institutes involved in case study fisheries research, such as the Spanish Institute of Oceanography (IEO) have also been contacted.

4.3 FAO and Regional Fisheries Management Organizations (RFMO)

The Food and Agricultural Organization (FAO) and RFMOs such as the ICCAT, IOTC, SEAFO) and CECAF have been approached as potential sources of data. In fact, the RFMOs compiled information and data from the partner countries and carry out stock assessment, with reports and data available online in some cases. RFMOs such as ICCAT and IOTC have been contacted with requests for information (e.g. Coelho et al. 2017) and to identify how FarFish can contribute, given that in these fisheries, at least for the target species, state of the art stock assessment is already being carried out.

4.4 EAF-Nansen Program

The EAF-Nansen Program "Strengthening the Knowledge Base for and Implementing an Ecosystem Approach to Marine Fisheries in Developing Countries" is funded by the Norwegian Ministry of Foreign Affairs through NORAD. A new EAF-Nansen Programme started in January 2017, carrying forward the objectives of the Nansen Programme, with particular attention to issues of sustainability and threats to marine ecosystems. The Program is a source of data on the status of the marine environment, resource abundance and distribution of living resources. Surveys have been carried out at various times in all the case study countries (Cape Verde, Mauritania, Senegal and Seychelles). In the SE Atlantic (SEAFO area) a survey was carried out in January – February 2015, and access to the survey data is available in the cruise report.

A new cruise with the R/V "Dr Fridtjof Nansen" in the SEAFO area is scheduled for January – February 2019.

4.5 Directorate General of Maritime Affairs (DG MARE)

DG MARE has data from the Fisheries Partnership Agreements (SFPA) and high-seas fisheries fleets. A meeting was held in Brussels between the coordinator of FarFish and DG MARE in which the



access to data was requested. It was agreed that FarFish should submit a single, combined request and that data would be provided in an aggregated form. Different WPs have sent their requests to the coordinator of FarFish who is currently compiling the formal data request. In the case of WP2, the request was prepared in collaboration with WP6:

Catch, effort and biological data (size frequency distributions, age frequency distributions, abundance indexes, etc.), as far back as possible for the following:

SENEGAL:

a) Trawl fishery: According to report of the joint scientific committee (Fall et al., 2016), the main by-catch species of the hake trawl fishery (EU vessels) are:

- 1) Fish: *Zenopsis conchifer*, monkfish (Lophiidae: *Lophius budegassa*, *Brotula barbata*, *Zeus faber* and *Helicolenus dactylopterus*. Fall et al. (2016) also refer to sea breams (Sparidae), skates (Rajidae) and Tetraodontidae, but do not identify the species. If information for species of the latter families is available, this is also requested.
- 2) Crustaceans: *Chaceon maritae*, *Palinurus mauritanicus* and *Aristeus varidens*
- 3) Cephalopods: *Todarodes sagittatus* and *T. eblanae*

If available, catch and biological data for these species is requested. We would like to include at least a few of these species for the Data Limited Methods.

b) Tuna fishery: according to Fall et al. (2016), information from the observer program on by-catch was not available at the time of the preparation of the report. If it is available now, this is also requested. It would also be important to know what the by-catch species are of the EU tuna seiners and what data is recorded by the observers.

SE ATLANTIC (FAO 47)

For this case study, information for the following species is requested:

- a) Target species: deep sea red crab (mainly *Chaceon erytheiae*), alfonsino (*Beryx splendens*); Patagonian toothfish (*Dissostichus eleginoides*) and pelagic armourhead/southern boarfish (*Pseudopentaceros richardsoni*).
- b) By-catch species: blackbelly rosefish (*Helicolenus moulachezi*) and macrourid species (*Macrourus* sp.).

SEYCHELLES

We are particularly interested in the non-target species included in the Resolution 17/04 ban on discards:

- 1) non-target tunas (*Euthynnus affinis* – kawakawa, *Auxis thazard* - frigate tuna, and bullet tuna - *A. rochei*)
- 2) sharks: silky shark (*Carcharhinus falciformis*), oceanic whitetip shark (*C. longimanus*)



3) rainbow runner (*Elegatis bipinnulatus*), pelagic triggerfish (*Canthidermis maculatus*), dolphinfish (*Coryphaena* spp.), carangids (*Caranx sexfasciatus*, *Seriola rivoliana*, *Naucrates* sp., *Carangoides* spp.), barracuda - *Sphyraena* spp.), Wahoo (*Acanthocybium solandri*)

4) marlins: black marlin (*M. indica*), striped marlin (*Kajikia audax*) and Indo-pacific sailfish (*Istiophorus platypterus*).

CAPE VERDE

By-catch by species.

MAURITANIA

Small pelagics: Catch by month (seasonality) by vessel.

The same (or similar) data from the partners in the coastal states will also be requested. In fact, copies of agreements made with foreign fleets and catch data for all fleets within their EEZ by species have been requested.



5 Conclusions and discussions

During this first year of FarFish, progress in Task 2.3 has been hampered by changes in some of the objectives, with a long time required to reach a consensus regarding the species to focus on. Nevertheless, lists of species for each CS are now available, data sources identified and data compilation is ongoing. However, important data, especially time series of catch and effort and data on by-catch species caught by the European fleet is still missing. Given that other WPs are dependent on data from WP2, it is now necessary to advance rapidly with acquiring and uploading of data in the FFDB:

Data acquisition:

- the formal data request to DG MARE should be delivered as soon as possible
- continue with attempts to obtain data from CECAF
- data requested from coastal states:
 - Cabo Verde: focus on by-catch species not assessed by ICCAT
 - Seychelles: focus on by-catch species not assessed by IOTC
 - Senegal: focus on data for application of DLM for selected species
 - SE Atlantic: focus on data for implementation of DLM for selected species

Data uploading:

- participants in WP2, especially CS representatives, should upload available data as soon as possible.



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