



Strengthening fisheries sustainability outside EU
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WP2 – Advancing biological knowledge and evaluation of current stock assessment models

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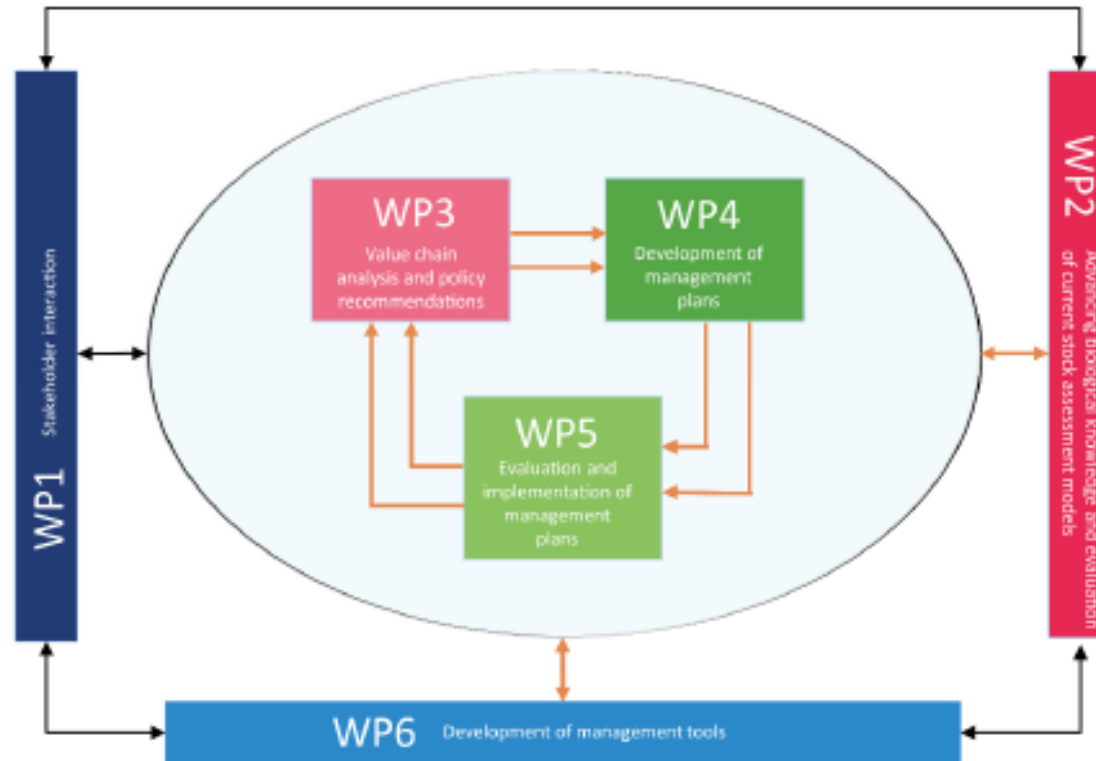
WP2 overall objective

The overall objectives of WP2 relate to SO1 where the aim is to advance knowledge and collate data related to the biological characteristics of the main fish stocks in the selected fisheries, and to evaluate the appropriateness, relevance and applicability of stock assessment models currently in use for these fisheries.

Tasks:

- analysis of the current status of relevant stocks and the ecosystems they live in,
- how the stock assessments are made,
- what data is available,
- how data is gathered,
- what models/tools are used for stock assessment and decision making,
- advance biological and ecological knowledge in the CSs by compiling, and making available information,
- develop a self-sampling plan for the EU fishing fleet,
- create a Data Management Plan under the H2020 Open Research Data Pilot.

WP2: WP Interactions and Dependencies



- provide biological and ecological data
- data will feed into the data base (FFDB), and into models and management tools,
- data will also be used for making visualization materials,
- outputs will be used by WPs1, 3, 4 & 5



Progress of work

- Task 2.1. Case study characterization -D2.1 submitted.
- Task 2.2. Data Management Plan under the H2020 Open Research Data Pilot (1st version) – D2.2 submitted.
- Task 2.3 Advancing biological and ecological knowledge
 - list of species for each case study fishery (target and by-catch species)
 - data needs for WP6 (Data limited methods; template)
 - national institutes, RFMOs etc. consulted– what data are available?
 - Literature search (published and grey literature) ongoing
- Task 2.4. Evaluation of stock assessment models
 - Not started
- Task 2.5. Self sampling programme
 - Literature review of self-sampling programmes
 - Evaluation of existing sampling programmes on CS fleets



Timeline for the next 6-12 months

- Data management plan will be updated (once within each reporting period; participants will be asked to update their forms in September/October 2018)
- Continue compilation of data (focus on WP6 data requirements)
- Submit D2.3 - Report on biological and ecological data in FFDB pilot version 1 (31.07.2018)
- Prepare templates and protocols for self-sampling; training programmes (e.g. for identification of black hakes) with WP7
- Submit D2.4 - Report on Templates and protocols for self-sampling (30.09.2018)
- Review of stock assessment methods
- Submit D2.5 - Report on the evaluation of current stock assessment models used in CS (31.05.2019)



Case study: Senegal (demersal trawl fishery for black hake)

Target species:

- Tropical African hake (*Merluccius polli*)
- Senegalese hake (*Merluccius senegalensis*)

Total reference catch (SFPA) (both hake species): 2 000 tons/year (MSY= 1 657 tons/year)

Vessels: Deep-sea trawlers (Spain)

Catch of hake by EU + Senegal in Senegal EEZ is approximately 6,000 tons a year.

By-catch:

- Fish: *Zenopsis conchifer*, monkfish (Lophiidae: *Lophius spp.*), *Brotula barbata*, *Zeus faber*, *Helicolenus dactylopterus*, Sea breams (Sparidae), Rays (Rajidae) and Tetraodontiade
- Crustaceans: *Chaceon maritae*, *Palinurus mauritanicus* and *Aristeus varidens*
- Cephalopods: *Todarodes sagittatus* and *T. eblanae*
- Maximum by-catch limits: Fish (15%), Cephalopods (15%), Crustaceans (15%)
- Discards estimated by observers to be approximately 45% of the total catch



Case study: Senegal

Stock Assessment methods (CECAF and FAO Working Groups): Dynamic Surplus Production Models based on different times series (Mauritania and Senegal)

Senegal (1983-2005 series with environmental variables):

- $F_{cur}/F_{sycurB}(\%) = 9$
- $B/BMSY(\%) = 186$

Mauritania (2000-2012):

- $F_{cur}/F_{sycurB}(\%) = 75$
- $B/BMSY(\%) = 140$

State of black hake: Stocks are considered moderately exploited.

Current management recommendations: Do not increase the fishing effort pending new data.

Problems/limitations: species identification (combined catch data); stock structure unknown; limited time series of data; lack of information from other fleets



Case study: Mauritania (SFPA category 1: shrimp trawl fishery)

Target species:

- Langostino/Prawn (*Farfantepenaeus notialis*)
- Gamba/Southern pink shrimp (*Parapenaeus longirostris*)
- Other shrimp species: *Melicertus kerathurus*, *Aristeus varidens*, *Plesionika heterocarpus*, *Aristaeopsis edwardsiana*
- Total reference catch (SFPA): 5 000 tons/year

By-catch:

- Main by-catch species (2014-2016):
 - Fish (0.1 to 3.4%): mainly monkfish (*Lophius* spp.) and soles (Soleiidae)
 - Cephalopods (0.1 to 4.7%) mainly octopus (*Octopus vulgaris*)
- High discard rates
- Maximum by-catch limits: Fish (15%), Cephalopods (8%), Crabs(10%)



Case study: Mauritania (SFPA category 1: shrimp trawl fishery)

Stock Assessment methods (CECAF and FAO Working Groups): Dynamic Surplus Production Models

- *P. notialis*; 2013: Under-exploited with low Fishing mortality
- *P. longirostris*, 2013: Fully exploited (2002-2012), but with low Fishing mortality.
- *P. longirostris*; 2015: Not fully exploited
- *P. notialis*; 2015: Fully exploited

Stock	$B_{cur}/B_{0.1}$	B_{cur}/B_{MSY}	$F_{cur}/F_{0.1}$	F_{cur}/F_{MSY}
<i>P. longirostris</i>	140%	154%	44%	39%
<i>P. notialis</i>	92%	101%	29%	26%

Source: FAO (2015)

Recommendations:

- Maintain current catch limits
- Study total catch composition (i.e. discards problem)
- Study the influence of environmental variability on shrimp



Case study: Mauritania (SFPA category 2: hake longline and trawl)

Target species:

- Tropical African hake (*Merluccius polli*)
- Senegalese hake (*Merluccius senegalensis*)
- Total reference catch (SFPA): 6 000 tons/year

By-catch:

- Main by-catch species (2014-2016):
 - Fish (7.1 to 10.9%; up to 32 species): Sparidae, Zeidae, Stromateidae, Bramidae, Scorpaneidae, Lophiidae, Brotulidae, Haemulidae, Soleidae, Polyprionidae, Sciaenidae and Elasmobranchs
- High discard rates
- Maximum by-catch limits:
 - Longline (50%)
 - Trawl (25%)
 - Cephalopods and crustean by-catch not allowed



Case study: Mauritania (SFPA category 2: hake longline and trawl)

Stock Assessment methods (CECAF and FAO Working Groups): Dynamic Surplus Production Models (Spanish trawler data)

- Results suggest stock is not over-exploited
- Limitations: catches of other fleets not known
- Pooled catch and effort data for the two species of hake (problem of identification)

Stock/ Indice d'abondance	$B_{cur}/B_{0.1}$	B_{cur}/B_{MSY}	$F_{cur}/F_{0.1}$	F_{cur}/F_{MSY}	F_{cur}/F_{SYcur}
<i>Merluccius</i> spp. (Mauritanie) CPUE chalutiers espagnols de pêche fraîche, période 2000-2012	127%	140%	50%	45%	75%

Source: FAO (2015)

Recommendations:

- Improve catch and effort data for all fleets
- Study total catch composition (i.e. discards problem)
- Study the influence of environmental variability
- Trawl selectivity studies: mitigation of by-catch and discards of demersal species



Case study: Cape Verde (tuna, swordfish and blue shark)

Target species:

- Tropical tuna (bigeye, yellowfin and skipjack tuna)
- Swordfish and Blue shark
- Total reference catch (SFPA): 5 000 tons/year

Fisheries:

- Tuna seiners: up to 28 vessels; reference catch of 85t
- Surface longliners: up to 30 vessels; reference catch of 50t
- Pole-and-line vessels: up to 13 vessels; reference catch 9t

Stocks:

Species	2016 Catch	MSY	Stock status	Surplus
Bigeye tuna (<i>Thunnus obesus</i>)	72	79	overexploited	overexploited
E Skipjack tuna (<i>Katsuwonus pelamis</i>)	217	143-170	at MSY level	at MSY level
Yellowfin tuna (<i>Thunnus albacares</i>)	128	147	overfished	overfished
N Swordfish (<i>Xiphias gladius</i>)	12	14	at MSY level	at MSY level
N Blue shark (<i>Prionace glauca</i>)	37	n.a.	uncertain	uncertain



Case study: Seychelles (tropical tunas)

Target species:

- Tropical tuna (albacore, bigeye, yellowfin and skipjack tuna)
- Swordfish and Blue shark
- Total reference catch (SFPA): 50 000 tons/year

Fisheries:

- Tuna seiners: up to 40 vessels; reference catch of 700t
- Surface longliners: up to 6 vessels; reference catch of 90t or 120t

Stocks:

Species	2016 Catch	MSY	Stock status	Surplus at regional level
Albacore (<i>Thunnus alalunga</i>)	36	39		at MSY level
Bigeye tuna (<i>Thunnus obesus</i>)	87	104		at MSY level
Skipjack tuna (<i>Katsuwonus pelamis</i>)	447	510		at MSY level
Yellowfin tuna (<i>Thunnus albacares</i>)	413	422		overexploited
Swordfish (<i>Xiphias gladius</i>)	31	32		at MSY level
Blue shark (<i>Prionace glauca</i>)	32	33		at MSY level



Case study: Southwest Atlantic (squid)

Target species:

- *Illex argentes*; main fishing area on the high seas, 44°-47°S.

Fisheries:

- Jigging vessels from China, Taiwan and Korea
- Bottom trawlers, mostly from Spain

Catches:

- Highly variable catches, ranging from 25 – 412 thousand tons during 2000 – 2010
- Around 100,000 t in 2010; catches by Spanish vessels vary (670 – 2700 t)

Stock status:

- Wang et al. 2018 used an environmentally dependent surplus production (EDSP) to assess the stock 2000 to 2010
- MSY estimated at 352 – 685 thousand tons and a biomass from 1.3 – 1.8 million tons



Case study: Southwest Atlantic (Argentine hake)

Target species:

- *Merluccius hubbsi* both in international waters and in Falkland waters; 44°-48°S
- Minor catches of Southern hake, *Merluccius australis*

Fisheries:

- Bottom trawlers from several countries, including Spain

Catches:

- Catches have been around 250 thousand tons in 2010-2011, dominated by the southern stock (roughly 90%)
- The Spanish SGP reported total landings of hakes (common and austral hakes) caught within Falkland waters vary from 3,760 t to 11,252 t in the period 2009 - 2013

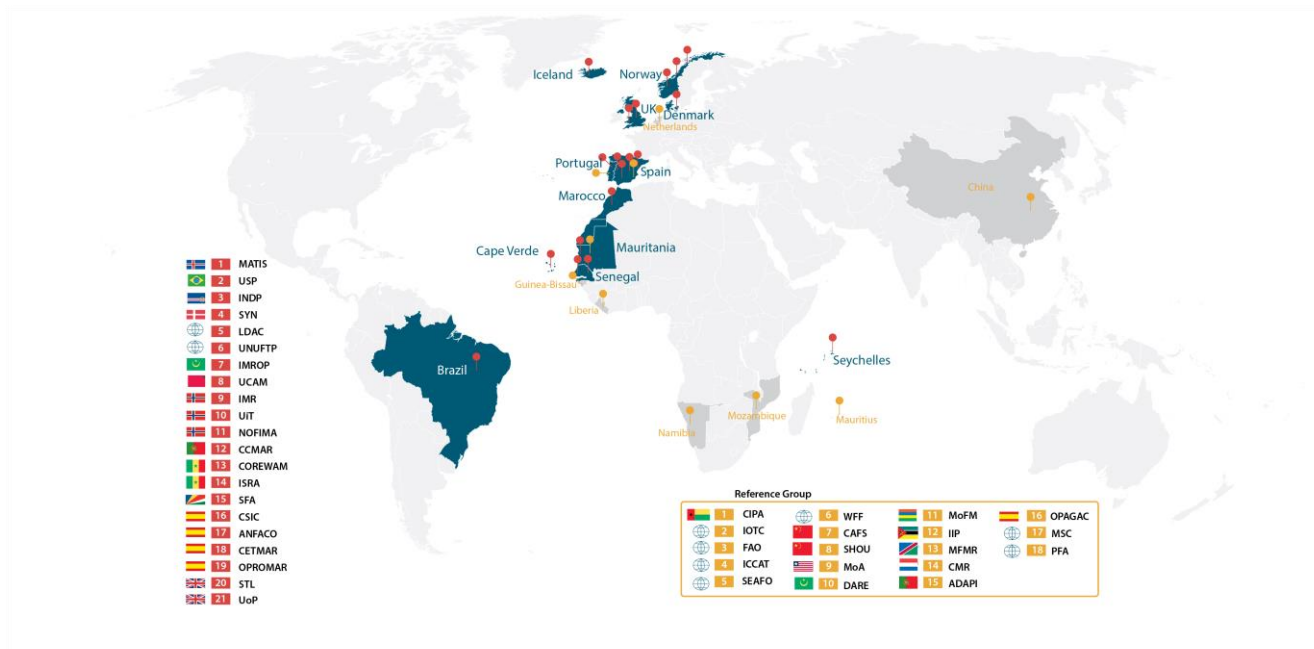
Stock status:

- Not available



FarFish will contribute by:

- Improving stock discrimination (hakes)
- Improving species-specific knowledge (biology, ecology, distribution, catch and effort)
- Implementing or improving self-sampling protocols (including sampling for stock identification);
- Incorporating environmental variability effects (i.e. shrimp)
- Improved stock assessment of hakes (and by-catch species): species-specific F, SSB and HCR
- Providing data for application of data limited methods (DLM) for some species.



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