



**Food and Agriculture
Organization of the
United Nations**

FISHERY COMMITTEE FOR THE EASTERN CENTRAL ATLANTIC

SUMMARY REPORT

FAO WORKING GROUP ON THE ASSESSMENT OF SMALL PELAGIC FISH OFF NORTHWEST AFRICA 2025

INTRODUCTION

This summary provides the **preliminary results, not yet validated** by the Scientific Sub-Committee (SSC) of the Fishery Committee for the Eastern Central Atlantic (CECAF), of the twenty-fourth meeting of the FAO Working Group on the Assessment of Small Pelagic Fish off Northwest Africa, from 20 to 28 May 2025 in Nouakchott, Mauritania. Scientists from the Gambia, Mauritania, Morocco, Senegal, Spain, and the Netherlands attended the meeting, as well as representatives of the European Commission (DG MARE), the Russian Federation, the Norwegian Institute of Marine Research (IMR), and the EAF-Nansen programme. The overall objective of the Working Group is to assess the state of the small pelagic resources in Northwest Africa and make recommendations on fisheries management and exploitation options aimed at ensuring optimal and sustainable use of small pelagic fish resources for the benefit of coastal countries.

During the meeting, the Working Group members discussed the submitted data by species (chapter), performed the stock assessments (including exploratory approaches), and formulated the final management recommendations. The meeting was organized by the CECAF Secretariat, hosted by the Mauritanian Institute of Oceanographic Research and Fisheries (IMROP) and supported by the EAF-Nansen Programme.

The species assessed by the Group were: sardine (*Sardina pilchardus*), round and flat sardinella (*Sardinella aurita* and *Sardinella maderensis*), horse mackerel (*Trachurus trecae*, *Trachurus trachurus* and *Caranx rhonchus*), chub mackerel (*Scomber colias*), bonga (*Ethmalosa fimbriata*) and anchovy (*Engraulis encrasicolus*) in the region between the southern border of Senegal and the northern Atlantic border of Morocco. The Canary Islands stocks are also considered by the group.

The Working Group was chaired by Mr Cheikh-Baye Braham (IMROP, Mauritania).

KEY FINDINGS AND RECENT DEVELOPMENTS IN THE FISHERIES

Five out of eleven stocks were determined to be within biologically sustainable limits (status of fully exploited), while six stocks were considered overexploited. The results of the assessments highlight the urgent need for action to rebuild stocks of sardine in zone A+B and zone C, round sardinella, flat sardinella, and bonga in the subregion and chub mackerel in the Canary Islands.

Table 1: Summary of assessment results.

Species*	Area	Not fully exploited	Fully exploited	Overexploited
Sardine (<i>Sardina pilchardus</i>)	Zone A+B			√
	Zone C			√
Round sardinella (<i>Sardinella aurita</i>)	Whole subregion**			√
	Canary Islands		√	
Flat sardinella (<i>Sardinella maderensis</i>)	Whole subregion**			√
European horse mackerel (<i>Trachurus trachurus</i>)	Whole subregion**		√	
Cunene horse mackerel (<i>Trachurus trecae</i>)	Whole subregion**		√	
Chub mackerel (<i>Scomber colias</i>)	Whole subregion**		√	
	Canary Islands			√
Anchovy (<i>Engraulis encrasicolus</i>)	Zone N & Zone A+B		√	
Bonga (<i>Ethmalosa fimbriata</i>)	Mauritania / Senegal / Gambia			√

*No assessment for *Caranx rhonchus*.

** The assessments for the “whole subregion” do not include data for the Canary Islands.

OVERALL REGIONAL TRENDS

CATCH

The total catch of small pelagics has been fluctuating since the beginning of the time series in 1990 (Figure 1 and 2, Table 1). There was a moderately increasing trend from 2013 to 2019, followed by a decrease down to 2.1 million tonnes in 2024. This is slightly higher than the average value of 2.0 million tonnes for the whole time series (1990–2024), but lower than the five-year average for the period 2020–2024 of 2.4 million tonnes.

Sardines make up most of the total catch of small pelagics in the sub-region at 34 percent, followed by Chub mackerel at 22 percent and *Trachurus trecae* at 17 percent of the total.

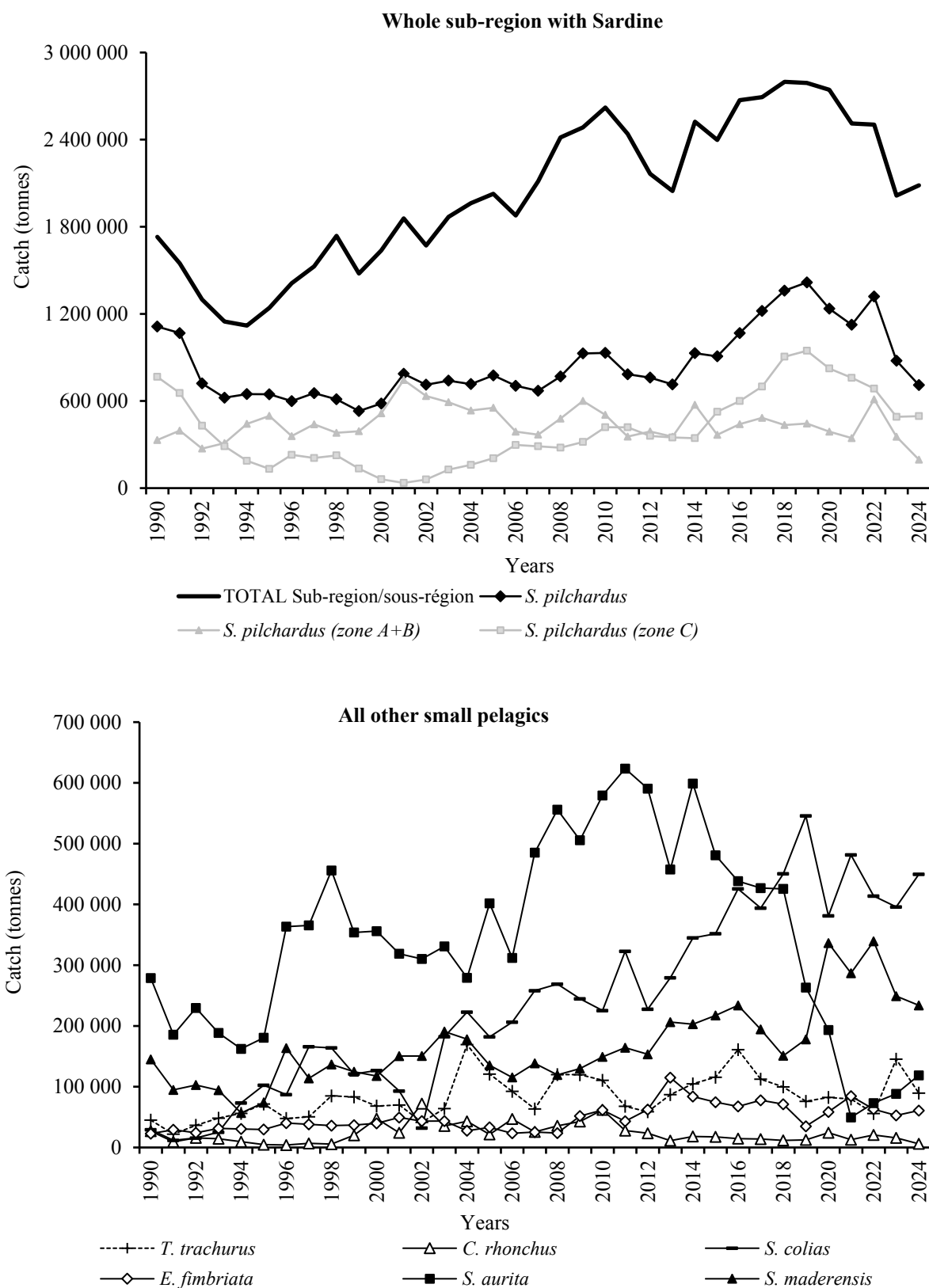


Figure 1: Total catch of small pelagic species and sardine catch in the whole subregion (top) and catch of other small-pelagic species in the subregion.

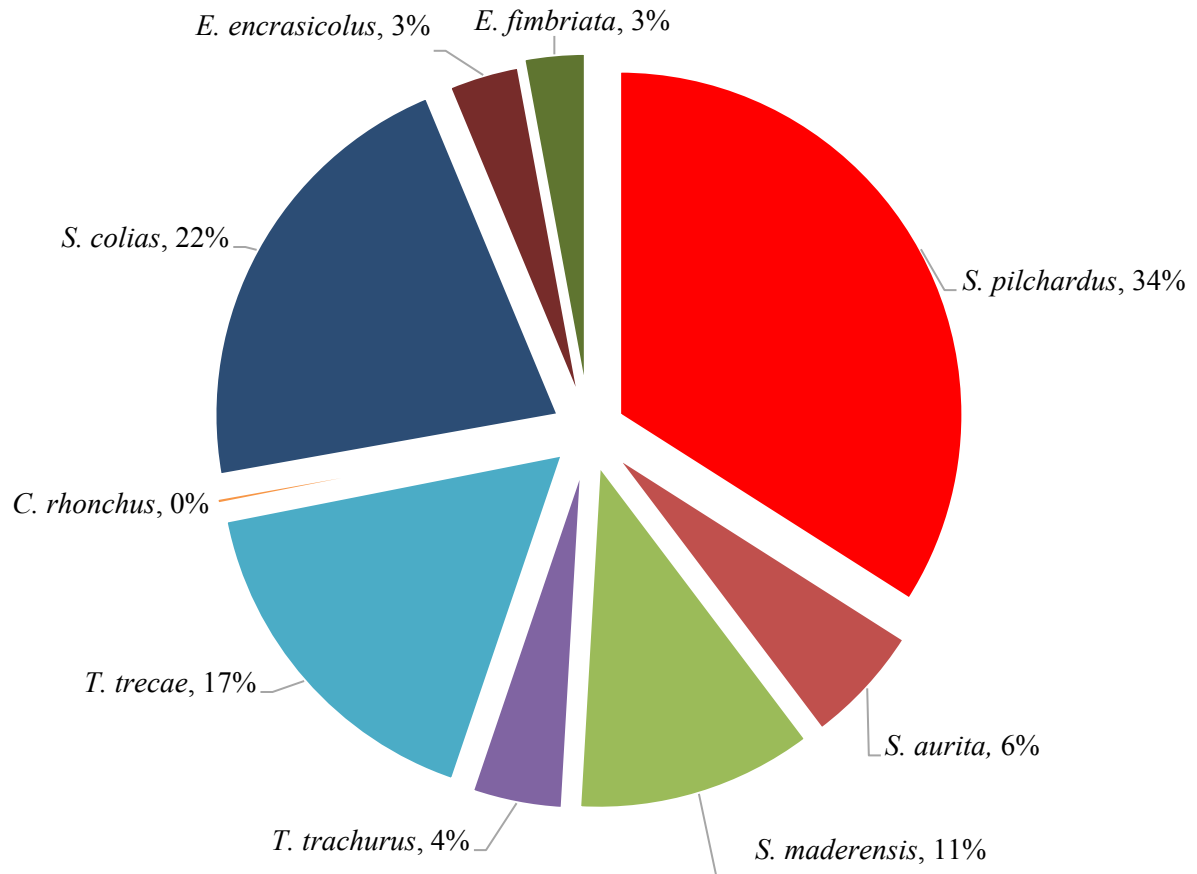


Figure 2: Percentage of each species in catches in Northwest Africa region in 2024.

Table 2: Comparative catches between 2020 and 2024 in tonnes, for the whole region without the Canary Islands.

Species	Catch 2020*	Catch 2021*	Catch 2022*	Catch 2023*	Catch 2024*	% of total catch in 2024*	Average (2020-2024)*	Average (1990-2024)*
<i>S. pilchardus</i>	1 235 530	1 125 055	1 320 085	877 323	709 521	34%	1 053 503	855 991
<i>S. aurita</i>	193 436	49 344	72 835	88 261	118 587	6%	104 496	343 542
<i>S. maderensis</i>	336 480	286 826	339 223	248 934	233 793	11%	289 052	166 460
<i>T. trachurus</i>	237 626	266 868	55 800	145 179	89 444	4%	158 983	93 105
<i>T. trecae</i>	226 459	155 861	197 669	152 979	348 116	17%	216 217	191 703
<i>C. rhonchus</i>	24 507	12 824	20 638	15 898	6 095	0%	15 992	23 001
<i>S. colias</i>	380 505	480 815	413 231	395 177	449 234	22%	423 792	237 053
<i>E. encrasicolus</i>	50 629	49 410	20 746	37 774	70 035	3%	45 719	73 874
<i>E. fimbriata</i>	58 454	84 601	63 013	52 809	60 750	3%	63 925	48 317
Total	2 743 625	2 511 604	2 503 240	2 014 334	2 085 575	100%	2 371 676	2 033 047

*Data for the Canary Islands cover the period 2007-2024

Table 2 (continued): Comparative catches between 2020 and 2024 for the Canary Islands (in tonnes).

Species	Catch 2020*	Catch 2021*	Catch 2022*	Catch 2023*	Catch 2024*	% of total catch in 2024*	Average (2020-2024)*	Average (1990-2024)*
<i>S. pilchardus</i>	46	44	34	9	4	1%	27	211
<i>S. aurita</i>	48	179	206	362	255	35%	210	260
<i>S. maderensis</i>	14	41	59	110	111	15%	67	95
<i>Trachurus spp.</i>	636	280	239	120	41	6%	263	379
<i>Scomber colias</i>	723	705	654	710	324	44%	623	768
Total	1 467	1 248	1 192	1 311	734	100%	1 191	1 713

*Data for the Canary Islands cover the period 2007-2024

REGIONAL SURVEYS

The latest acoustic survey in the region with the R/V *Dr Fridtjof Nansen* was carried out in 2023, as part of a synoptic coverage of the pelagic resources and ecosystems off West Africa.

The Russian R/V *Atlantniro* carried out a bottom trawl survey in September-October 2024 in the waters between 20°40' and 16°05'N latitude, in which horse mackerels, anchovy and sardine were caught in the bottom layers. Recruitment survey for horse mackerel, sardine and mackerel was carried out between Cap Cantin and 16°06'N latitude in October-December 2024. The R/V *Atlantniro* together with R/V *Atlantida* carried out an acoustic survey between 26°40' and 16°05'N latitude in January 2025.

Morocco conducted several acoustic surveys in Moroccan waters for small pelagic species in 2024 with the two research vessels *Al Amir Moulay Abdellah* and *Al Hassan Al Marrakchi*. Six acoustic surveys with these vessels covered the region between Cap Spartel and Cap Blanc.

ASSESSMENT RESULTS AND MANAGEMENT ADVICE

The assessment results and management advice by stock as adopted by the Working Group are summarized in Table 3. They are applicable to the whole subregion excluding the Canary Islands, unless stated otherwise in the first column.

Table 3: Summary of the assessments and management recommendations by the 2025 Working Group.

Stock	Catch 2024 In tonnes (avg. 2020-2024)	$B_{CUR}/B_{0.1}$	$F_{CUR}/F_{0.1}$	Assessment	Recommendations
Sardine <i>S. pilchardus</i> Zone A+B	196 000 (379 000)	71% (Biodyn)	37% (Biodyn)	Overexploited	The stock is considered overexploited in terms of biomass, with a low level of fishing mortality. After the peak in catches in 2022, sardine availability has become very limited, and a decline in the average size of sardines caught in the central area has been recorded in recent years. In addition, biomass and recruitment levels are currently lower. Although this stock is impacted by both adverse hydro-climatic conditions and fishing, it is advisable to adjust fishing and production systems to the state of the stock, while further preserving sensitive habitats (nursery and spawning areas, rocky zones, etc.). In this context, biological rest, zoning, minimum sizes and capacity management are potential measures for improving the resilience of stocks to fishing in a context of climate change. The Working Group recommends not exceeding current catch levels (196,000 tonnes).
Sardine <i>S. pilchardus</i> Zone C	496 000 (651 000)	66% (Biodyn)	109% (Biodyn)	Overexploited	The stock has been overexploited in terms of biomass for two years, but with catch levels below sustainable levels. This situation is probably due to the combined impacts of high exploitation and unfavorable ecosystem conditions in recent years. As a first step, the Working Group recommends, as a minimum, not exceeding the current catch level (496,000 tonnes). In addition, it is recommended to adjust fishing and production systems to the state of the stock, while further preserving sensitive habitats (nursery and spawning areas, rocky zones, etc.). In this context, biological rest, zoning, minimum sizes and capacity management are potential measures for improving the resilience of stocks to fishing in a context of climate change. Given the cross-border nature of this stock, the Working Group stresses the urgent need to set up a concerted management system.

Stock	Catch 2024 In tonnes (avg. 2020-2024)	B _{CUR} /B _{0.1}	F _{CUR} /F _{0.1}	Assessment	Recommendations
Sardinella <i>S. aurita</i>	118 000 (104 000)	27% * (JABBA)	200% (LCA – Y/R)	Overexploited (<i>S. aurita</i>)	The round sardinella stock has been overexploited since 2016, with a critical biomass level since 2020, despite a slight improvement in 2023 and 2024.
		17% * (SPiCT)	103% ** (JABBA)		The flat sardinella stock is overexploited . Fishing mortality has been rising steadily, well above the sustainability threshold since 2020.
		40% * (SS3)	135% ** (SPiCT)		The two species mix in certain areas and are exploited in a mixed context, complicating the application of species-specific measures. In this context, the Working Group recommends that a 60% reduction in fishing mortality for both species be maintained.
			219% ** (SS3)		The Working Group encourages ongoing work to formulate and implement fishing mortality reduction and integrated management measures for all sardinella throughout the sub-region.
<i>S. maderensis</i>	234 000 (289 000)	45% * (JABBA)	323% (LCA – Y/R)	Overexploited (<i>S. maderensis</i>)	Given its cross-border nature, the Working Group stresses the importance of establishing a concerted management system (e.g. biological rest, zoning, minimum sizes and capacity management).
Whole subregion, excluding the Canary Islands		54% * (SPiCT)	260% ** (JABBA)		
			177% ** (SPiCT)		
Round sardinella <i>S. aurita</i>	255 (210)	100% (Biodyn)	70% (Biodyn)	Fully exploited	The stock of round sardinella is fully exploited . The Working Group recommends not exceeding the catch levels of the last year (255 tonnes).
Canary Islands					Given those species availability is highly influenced by environmental factors, is exploited opportunistically, and that catches can vary significantly from year to year, the Working Group recommends adjusting fishing effort in line with the natural fluctuations of this stock.

* B_{CUR}/B_{MSY}

** F_{CUR}/F_{MSY}

Stock	Catch 2024 In tonnes (avg. 2020-2024)	B _{CUR} /B _{0.1}	F _{CUR} /F _{0.1}	Assessment	Recommendations
Horse mackerel					Based on the results of the production model, the Working Group has concluded that the Atlantic horse mackerel (<i>Trachurus trachurus</i>) stock is fully exploited .
<i>T. trachurus</i>	89 000 (159 000)	124% (Biodyn)	71% (Biodyn)	Fully exploited (<i>T. trachurus</i>)	The Cunene horse mackerel (<i>Trachurus trecae</i>) stock is fully exploited . There is an increase in biomass with good recruitment observed from 2022 to 2024. However, <i>Trachurus trecae</i> catches exceeded the MSY level in 2024.
<i>T. trecae</i>	348 000 (216 000)	127% (Biodyn)	113% (Biodyn)	Fully exploited (<i>T. trecae</i>)	The Working Group recommends maintaining the current level of catches of <i>Trachurus trachurus</i> and reducing the level of catches of <i>Trachurus trecae</i> , so that the combined level of catches of the two species does not exceed 375,000 tonnes at sub-regional level.
Whole subregion, excluding the Canary Islands					The Working Group reiterates its recommendation to strengthen the protection of juvenile horse mackerel through harmonized management measures.
Chub mackerel					Based on the results of the production model and other analytical models, the Working Group concluded that the stock is fully exploited . However, catch levels are above sustainable levels, and fishing mortality is too high (XSA).
<i>Scomber colias</i>	449 000 (424 000)	116% (Biodyn)	94% (Biodyn)	Fully exploited	The various projections applied to this stock have been inconclusive. As a result, the Working Group was unable to adopt projections on the evolution of this stock, complicated by inter-annual fluctuations in recruitment.
Whole subregion, excluding the Canary Islands		100% (XSA)	126% (XSA) 101% (LCA – Y/R)		As a precautionary approach, the Working Group recommends reducing current catches to a sustainable level, estimated at 380,000 tonnes for the sub-region as a whole.
					The Working Group reiterates its recommendation to strengthen the protection of juvenile horse mackerel through harmonized management measures.

Stock	Catch 2024 In tonnes (avg. 2020-2024)	B _{CUR} /B _{0.1}	F _{CUR} /F _{0.1}	Assessment	Recommendations
Chub mackerel <i>Scomber colias</i> Canary Islands	504 (900)	86% (Biodyn)	50% (Biodyn)	Overexploited	The stock of chub mackerel is overexploited in terms of biomass but not in overexploitation in terms of fishing mortality. Although the biomass appears to be recovering, the group recommends not exceeding the current catch levels (504 tonnes). Given that species are exploited opportunistically, its availability is considered to be highly influenced by environmental factors, and that catches can vary significantly from year to year, the Working Group recommends seeking to adjust fishing effort in line with the natural fluctuations of this stock.
Anchovy <i>Engraulis encrasicolus</i> Zone North+A+B	70 000 (46 000)	-	109% (LCA – Y/R)	Fully exploited	The anchovy assessment was carried out for stocks in Zone North+A+B, in the absence of available data in Zone C. The combined analysis of assessment model results and other available information indicates that anchovy is in a fully exploited state, as evidenced by the significant increase in the biomass level of this species and the high levels of recruitment. This improvement is reflected in the high availability of this species, with catches in 2024 well above the average for the last five years (2020-2024). Given that anchovy availability is highly dependent on environmental factors, that it is exploited opportunistically, and that catches vary considerably from year to year, the Working Group recommends adjusting fishing effort to stock capacity. As a precautionary approach, the Working Group recommends not exceeding the average catch of the last three years 2022-2024 (43,000 tonnes).
Bonga <i>Ethmalosa fimbriata</i> Mauritania, Senegal, and The Gambia	61 000 (64 000)	-	345% (LCA-Y/R)	Overexploited	The Working Group concludes that bonga remains overexploited across the subregion and recommends reducing fishing effort compared to 2024. As a precautionary measure, considering the uncertainty in the assessment and stock identity, the Working Group recommends maintaining the catch at 25,000 tonnes which corresponds with the minimum catch value in the time series.

OVERALL RECOMMENDATIONS FOR DATA AND RESEARCH

- Increase the intensity of biological sampling, particularly for size frequencies of sardinella, anchovy (southern zone) and bonga.
- Develop comprehensive documentation on the processes of data collection, data preparation and standardization of abundance indices.
- Ensure standardization of CPUE across fisheries.
- Organize a horse mackerel Working Group to harmonize and prepare data for the application of analytical models.
- Countries organize systematic acoustic surveys in their territorial waters.
- Prepare size frequencies data for small pelagic species collected during Nansen surveys.
- Collaborate with the ongoing research project in the Canary Islands on stock identification of *Trachurus picturatus*, *Scomber colias* and *Sardinella aurita*.
- Organize a workshop on the development of relevant climate indicators for the assessment and management of fisheries resources in the sub-region.
- Continue studies on the influence of environmental parameters on the abundance and distribution of small pelagics.
- Encourage scientific collaboration to enhance the value of data collected in the sub-region and their use to improve understanding of population dynamics.
- Generalize more integrated stock assessment approaches (e.g. SS3) to other stocks.
- Continue to apply the SAM model to horse mackerel and mackerel stocks.
- Initiate cooperation with other scientific groups (International Council for the Exploration of the Sea, General Fisheries Commission for the Mediterranean, Northwest Atlantic Fisheries Organization, Western Central Atlantic Fisheries Commission, etc.) on stock assessment methods for small pelagics.
- Ensure that follow-up to recommendations is monitored by the leader of each sub-group. This requires a formalization of the leader role under CECAF framework.
- Ensure that Working Group documentation is updated on the FAO CECAF website.
- Carry out acoustic campaigns around the Canary Islands to estimate abundance indices of small pelagic species.
- Improve data on fishing effort in the Canary Islands (e.g. by implementing a vessel monitoring system, VMS).
- Improve catch data in the Canary Island by including more accurate monitoring and estimates of "bait" catch data (e.g. by enhancing data reporting).

METHODS AND APPROACH

METHODS

Consistent with previous years, one of the main models used by the Working Group was the dynamic version of the Schaefer (1954) model. This model was applied to sardine, horse mackerel and chub mackerel. Simple medium-term projections of future yields and stock development were made using this model fitted to historical data with a projected time horizon of three/five years. All projections took as their departure point the estimated stock status in the last year of data available. Future management strategies were defined as changes in fishing mortality and/or catch relative to those estimated for the last year of data available. An Excel spreadsheet implementation of the dynamic version of these models ("Biodyn"), with an observation error estimator, was used. The model was fitted to the data using the non-linear optimizer built into Excel, Solver.

For round and flat sardinella, chub mackerel, bonga and anchovy, a length cohort analysis (LCA) was applied to estimate the current F-level and the relative exploitation pattern on the fishery over the last few years. A length-based Yield per Recruit Analysis was then run on these estimates, to estimate the state of the stock in relation to the biological reference points F_{MAX} and $F_{0.1}$. Both the LCA and the yield-

per-recruit analysis (YR) were implemented as Excel spreadsheets, specifically developed for this Working Group.

For sardine, the State-space Assessment Model (SAM) was used for the first time for an exploratory assessment of exploitation levels. SAM is a statistical age-based model that estimates fishing mortality by age class. It describes the dynamics of a fish population, including features like recruitment, growth, and mortality. Unlike traditional models, SAMs can estimate time-varying parameters, such as fishing selectivity, and incorporate multiple fleets, providing a more flexible and detailed assessment of fish stocks.

For the mackerel stock, catch-at-age data from the Russian fleet, that covered most of the reported catches, were available. The result of the analysis of correlation within cohorts was considered acceptable and the Working Group decided to proceed with applying the age-based methods, extended survivor analysis (XSA), as well as the dynamic production model.

For sardinella, several models were used as the basis the provision of the management advice. The Stochastic Surplus Production Model in Continuous Time (SPiCT) is a state-space stochastic model that incorporates a surplus production model within a statistical framework based on maximum likelihood estimation. SPiCT can be seen as a model with two statistical parts. First, the process part which describes the dynamics of the stock and of the fishing mortality; second the observation model, which links the observations (catch and abundance indices) to the model. JABBA, *Just Another Bayesian Biomass Assessment*, based on a similar methodology, was also applied. Like SPiCT and Biodyn, JABBA uses catch and abundance indices. Finally, the integrated model Stock Synthesis 3 (SS3) was applied. This approach integrates a range of biological, fishery, and survey data to produce quantitative stock assessments. It is a generalized age-structured population model that can accommodate various life histories, data types, and fishery structures.

ASSESSMENT CLASSIFICATION

The Working Group adopted three assessment categories:

- **Not-fully exploited:** The stock is in good condition and fishing pressure can be increased without affecting sustainability. All increases must be seen in the context of the general environmental situation.
- **Fully exploited:** The fishery operates within the limits of sustainability. Current fishing pressure seems sustainable and can be maintained.
- **Overexploited:** The fishery is in an undesired state in terms of biomass and/or fishing mortality. Fishing pressure should be reduced to allow the stock to grow.

BIOLOGICAL REFERENCE POINTS

The Working Group, consistent with CECAF, has adopted the following Biological Reference Points (BRPs):

Target Reference Points: $B_{cur}/B_{0.1}$ and $F_{cur}/F_{0.1}$

Limit Reference points: B_{cur}/B_{MSY} and F_{cur}/F_{MSY}

Where:

$F_{0.1}$ – The fishing mortality rate at which the slope of the yield-per-recruit curve is only 1/10th the slope of the curve at its origin, or 90 percent of F_{MSY} .

F_{MSY} – Value of F (and of other characteristics of the stock) where the long-term total yield is maximum.

F_{Max} – Consider the long-term yield per recruit, Y/R , as a function of F , for a certain exploitation pattern F_{Max} is the point of the curve, Y/R against F , where Y/R is maximum.

B_{0.1} – is the value of Biomass corresponding to $F_{0.1}$.

B_{MSY} – is the value of Biomass corresponding to F_{MSY} .

The target reference points indicate what the current situation is like in terms of biomass and fishing mortality related to the ideal situation for the stocks whereas the limit indicate that the current situation related to what we want to avoid. The more conservative $F_{0.1}$ and $B_{0.1}$ have been selected as target reference points rather than the more traditional F_{MSY} and B_{MSY} , due to the inconsistencies of some data sets, and in line with the precautionary approach.

The Working Group estimates the status of the stocks and fisheries in relation to these agreed reference points adopted by CECAF. Whenever possible, the Group made projections of future yields and stock status under different scenarios for future management measures.

The management advice for the stocks is given in relation to the agreed reference points and on the basis of the projections. The advice is intended to provide guidance to management on how to make the different stocks can be maintained or develop in a direction where exploitation can be sustained at a level more conservative due to the inconsistencies of some data. As far as possible, advice for each stock is given both in terms of effort and/or catch levels. Since most of the stocks are shared by two or more countries in the region, the Working Group strongly recommends the reinforcement of regional cooperation in research and management.

DEFINITIONS

- **Effort** – The fishing activity can be measured in a given unit of time e.g. number of boats, number of days fishing, number of trips, number of hours trawled per day, number of hooks set per day, number of hauls per day, etc..
- **CPUE** – Catch per unit of effort is the catch of fish in numbers or weight taken by a defined period of effort.
- **Exploitation rate (E)** – Ratio between the number of individuals caught and the total number of individuals dead, over a certain period of time, that is, $E = C/D$ or can be $E = F/(F+M)$ and is $0 < E < 1$.
- **Exploitation pattern** – Fraction of the individuals of a given size, available to the gear, which is caught Also designated by Selectivity or partial recruitment.
- **Fishing mortality (F) (fishing mortality coefficient)** – Relative instantaneous rate of the mortality of the number of individuals that die due to fishing.
- **Recruitment to the exploitable phase (R)** – Number of individuals of a stock that enter the fishery area for the first time each year.
- **Biomass** – Total weight of the stock in the ecosystem.
- **Structural models** – Models that consider the structure of the stock by ages or sizes. These models allow one to analyze the effects on catches and biomasses, due to changes in the fishing level and exploitation pattern.
- **Global Models** – These models consider the stock globally, in particular the total abundance (in weight or in number) and study its evolution, the relation with the fishing effort, etc.. They do not consider the structure of the stock by age or by size.