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Cover photo: Photo of the participants at the 7th session of Scientific Sub-Committee of CECAF (Tenerife, Spain)
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SNV:  http://www.snvworld.org/en/countries/ghana
**ACRONYMS**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPUE</td>
<td>Catch per Unit Effort</td>
</tr>
<tr>
<td>CECAF</td>
<td>Food and Agriculture Organization Fishery Committee for the Eastern Central Atlantic</td>
</tr>
<tr>
<td>FC</td>
<td>Fisheries Commission</td>
</tr>
<tr>
<td>FEU</td>
<td>Fisheries Enforcement Unit</td>
</tr>
<tr>
<td>GNCFC</td>
<td>Ghana National Canoe Fishermen Council</td>
</tr>
<tr>
<td>GIFA</td>
<td>The Ghana Inshore Fisheries Association</td>
</tr>
<tr>
<td>GITA</td>
<td>Ghana Industrial Fisheries Association</td>
</tr>
<tr>
<td>IUU</td>
<td>Illegal, unreported and unregulated</td>
</tr>
<tr>
<td>LCA</td>
<td>Length based cohort analysis</td>
</tr>
<tr>
<td>MOFAD</td>
<td>Ministry of Fisheries and Aquaculture Development</td>
</tr>
<tr>
<td>NAFPTA</td>
<td>National Fish Processors and Traders Association</td>
</tr>
<tr>
<td>NMFMP</td>
<td>National Marine Fisheries Management Plan</td>
</tr>
<tr>
<td>SFMP</td>
<td>Sustainable Fisheries Management Project</td>
</tr>
<tr>
<td>STWG</td>
<td>Science and Technical Working Group</td>
</tr>
<tr>
<td>TOR</td>
<td>Terms of Reference</td>
</tr>
<tr>
<td>USAID</td>
<td>US Agency for International Development</td>
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INTRODUCTION

The senior Fisheries Advisor attended the seventh session of the CECAF Scientific Sub-Committee in Tenerife, Spain from 14-16 October 2015 to present the Terms of references for the sardinella stock identification study commissioned by the USAID/Sustainable Fisheries Management Project (Ghana). The purpose of the study is to identify the genetic structure of the sardinella fish stocks between Morocco and Angola for management purposes.

STATUS OF THE SMALL PELAGIC STOCKS

Small pelagics Fish Working Group – North (Morocco, Mauritania, Senegal, Gambia)

The results of the working group since the Sub-committee's last session held in Casablanca from 20-25 July 2015.

For sardine (Sardina Pilchardus), the results of the production model show that the status of the sardine stock in Morocco is continuing to improve, and the stock is now considered to be not fully restored. A fisheries management has been in place since 2012 with various management measures, including annual quotas and closed seasons. However, given the instability of this resource with regard to environmental changes, a precautionary approach was adopted and a catch limit for sardines in the different zones of the Atlantic: North (A+B) was set around 550,000 tonnes and Atlantic South zone C to maintain status quo.

The assessment of sardinella species (Sardinella aurita and Sardinella maderensis) continued to pose a problem for the working group due to the absence of abundance indicators. Data on the size frequencies allowed the group to carry out length-based cohort analysis (LCA) and yield-per-recruit assessment. This analysis was carried out of the round sardinella (S. Aurita). The results of the assessments show that the stock is overexploited. The working group maintains its recommendation of reducing the fishing effort for all segments of the fleet.

The Cunene horse mackerel (Trachurus Trecace) remains overexploited whilst the Atlantic horse mackerel (Trachurus Trachurus) is considered to be fully exploited. Given the mixed nature of this fishery and the results of projections, as a precautionary measure, the working group recommends that the fishing efforts and catches of both species should be reduced.

The assessment of the Atlantic chub mackerel (Scomber colias) indicates that the mackerel stock is considered to be fully exploited. The working group recommends that in 2014 the average catch size over the last five years should not be exceeded across the entire subregion.

The anchovy (Engraulis encrasicolus) is considered to be overexploited. The working group recommends that current fishing efforts should be reduced and that in the long term they should be adjusted to suit the natural fluctuations in this stock.

The results of the assessment show that the bonga (Ethmalosa fimbriata) is overexploited at a subregional level. The working group recommends that the current level of fishing effort should be reduced with a view to finding a catch level that ensures the sustainability of this species.

The hypothesis of grouping together the bonga in the form of a single stock at a regional level was discussed in relation to a recent study on the identity of the stock. The suitability of carrying out stock identity studies was mentioned, but currently there is no certainty regarding the existence of several stocks.
The Committee welcomes the USAID/SFMP initiative to address stock discrimination of sardinella. Members recommended to form a study group to dedicate resources and time to this project. The Committee felt that the study will reveal much needed information for regional management, especially as member countries begin to discuss regional quotas of shared stocks.

**Small Pelagic Fish Working Group – South (Guinea Bissau – Angola)**

The status of small pelagic fish resources in the south of the CECAF region, that is area stretching from Guinea-Bissau to Angola, and based on the results of the working group held at Pointe-Noire in the Republic of the Congo from 17 to 23 March 2014.

The mean small pelagic fish species in the zone are the round sardinella (*Sardinella Aurita*), the Madeiran sardinella (*Sardinella maderensis*), bonga (*Ethmalosa Fimbriata*), anchovy (*Engraulis Encrasicolus*) and members of the family Carangidae. This is spread out across four subzones:

- North (Guinea, Guinea Bissau, Sierra Leone, Liberia)
- West (Côte d'Ivoire, Ghana, Togo, Benin)
- Centre (Nigeria, Cameroon)
- South (Republic of the Congo, Democratic Republic of the Congo).

Thus, sixteen stocks were analysed with the use of the Schaefer dynamic production model applied to data series on catches and fishing efforts. The working group also had access to data on independent fishing from surveys carried out by the R/V Dr. Fridtjof Nansen.

The results of the assessment were (a) round sardinella stocks, west zone, anchovy, west zone, *Trachurus trecae* north zone, south zone, *Decapterus* spp., south zone, north zone, are overexploited; (b) the stocks of *S. maderensis*, west zone, *Sardinella* spp., north *E. fimbriata*, north, south zone are fully exploited; (c) the stock of *E. encrasicolus*, south zone is not fully exploited and (d) it was not possible to assess the stocks of *S. aurita*, centre zone, *S. maderensis* centre zone, *E. fimbriata*, centre zone, *E. fimbriata*, west zone, or *T. trecae*, west zone.

Questions were raised related to insufficiencies or lack of data for assessing the stocks or incoherence regarding the reporting of these data. In relation to these, recommendations were made.

In terms of general recommendations regarding future scientists, the following points were noted:

- The strengthening of regional cooperation in research and management because most stocks are shared between the different countries in the region.
- Overexploited stocks, the catch levels should not exceed the average for the last five years in order to allow for the renewal of the stock.
- Fully exploited stocks, the catch level should not exceed the average catch level recorded for the last three years.
- Since most fisheries in the region are multi-specific, there should be a global reduction in fishing efforts.
- Improve statistical and biological sampling systems in the countries within the subregion.
- Intensify the sampling of the length frequencies and the specific composition of the catches (take bycatches into account also)
• Continue to develop catch-per-unit-effort (CPUE) series of stock studies and commercial fishing.
• Continue to carry out scientific studies of stocks and independent abundance rates of commercial fisheries.

Continue to collect data on artisanal fishing including the effort and catches by species and by gear use a series of presentations were made on the importance of artisanal fisheries and their role in the contribution to food security and the eradication of poverty, for example on both regional and global scales, in developing countries and within the CEFAF zone.

FISH STOCK DISCRIMINATION INITIATIVE USING NUCLEAR DNA OF SARDINELLA IN WEST AFRICA. A STUDY BY USAID/SFMP.

The USAID/SFMP recognizes that the major small pelagic, particularly sardinella spp, stocks are a trans-boundary resource that extends beyond the borders of Ghana from Morocco to Namibia and beyond. The management of these shared stocks within the context of national boundaries may not achieve the desired management objectives in the absence of an effective coordination within the regional management bodies. In this context, the USAID/SFMP seeks to organize a regional study to define the genetic background of the various stock units of Sardinella aurita and Sardienlla maderensis between Morocco and Namibia. The study will involve the participation of scientists and partners from selected country to provide adequate samples of fish landed within their boundaries and take the responsibility to send them to the University of Rhode Island for analysis. These collaborators will be charged to carefully examine and provide existing data and other genetic related studies to the lead investigator. The project will focus on building the capacity of the collaborators and utilize the local resources to the extent possible.

Method and timeline (November 2015 – November 2016)

• Develop a TOR with collaborators.
• Collect a fin clip (pectoral, pelvic, adipose or caudal) from each fish being sampled, preferably during spawning season.
• Place the fin clip into a small plastic vial containing high strength (80% to 95%) ethanol (does not need to be refrigerated).
• Minimum 30 samples per species (S. Aurita and S. Maderensis)
• Ship it to SFMP in Ghana via DHL.
• Nuclear DNA analysis at URI and/or within West Africa if possible,
• Results published with co-contributors.
• Validate results and share report with CECAF (Nov. 2016).
### Table 1  Management recommendations summary sheet - Small pelagics – CECAF

<table>
<thead>
<tr>
<th>Stock</th>
<th>Catch¹ (5years avg.) (1 000 tonnes)</th>
<th><em>B^cru/B^cru</em></th>
<th><em>F^cru/F^cru</em></th>
<th>Assessment</th>
<th>Management recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sardine</strong>&lt;br&gt;S. pilchardus&lt;br&gt;Zone A+B</td>
<td>573 (435)**</td>
<td>122%</td>
<td>48%</td>
<td>Non-fully exploited (2013)</td>
<td>The stock continues improve as compared the 2013 assessment and the stock is considered non-fully exploited. The results of the projections were not conclusive. However, considering the instability of this resource vis-a-vis environmental changes call for the adoption of a precautionary approach requiring setting a catch limit for sardine in this zone at the same level as for 2014, which is around 550 000 tonnes .</td>
</tr>
<tr>
<td><strong>Sardine</strong>&lt;br&gt;S. pilchardus&lt;br&gt;Zone C</td>
<td>344 (378)**</td>
<td>141%</td>
<td>32%</td>
<td>Non fully exploited (2013)</td>
<td>The stock is influenced by environmental factors and shows fluctuations independent of fishing. Considering the observed fluctuations, total catch should be adjusted according to observed natural changes in the stock. The stock structure and abundance should be closely monitored by fishery independent methods covering the complete distribution area.</td>
</tr>
<tr>
<td>Sardinella&lt;br&gt;S. aurita&lt;br&gt;S. maderensis&lt;br&gt;Sardinella spp.&lt;br&gt;Whole subregion</td>
<td>598 (570)</td>
<td>-</td>
<td>250% (LCA-Y/R)</td>
<td>Overexploited</td>
<td>The working group notes that in the absence of acoustic estimates for recent years and the deterioration of CPUE series the production model traditionally applied could not be used. However improved length frequency data made possible the application of an LCA model and a yield per recruit analysis. The results of the assessments indicate that the stock is overexploited. The working group further notes that the catches in recent years (since 2007) are high, despite the state of overexploitation indicated by the working group. The increase of catches over a longer period, despite a stock being overexploited, could be linked to an increase in the level of recruitment during this period. There is no guarantee that such a high level of recruitment will continue in the future and high catches do not necessarily reflect the state of the stocks. As a precautionary measure, the Working Group retains its recommendation of previous years to reduce fishing effort for all fleet segments. The Working Group could not make a catch recommendation as at present it does not dispose an adequate index of abundance and is unable to predict future recruitment.</td>
</tr>
</tbody>
</table>

¹ Catch = (5 years avg.) (1 000 tonnes)
<table>
<thead>
<tr>
<th>Stock</th>
<th>Catch2 (5 years avg.) (1 000 tonnes)</th>
<th>*Beur/B0.1</th>
<th>*Fcur/F0.1</th>
<th>Assessment</th>
<th>Management recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horse mackerel</td>
<td>104 (95)</td>
<td>105%</td>
<td>104%</td>
<td>T. trachurus fully exploited and T. trecae are overexploited.</td>
<td>An increase in catch and effort is observed in 2014 compared to 2013 for both of the Trachurus species. T. trecae remains overexploited whereas T. trachurus is fully exploited. Given the mixed nature of this fishery and the results of the projections, the working group, as a precautionary approach, recommends to reduce both effort and catch for the two species.</td>
</tr>
<tr>
<td>T. trachurus</td>
<td>222 (228)</td>
<td>23%</td>
<td>1329%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T. trecae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole subregion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chub mackerel</td>
<td>344 (280)</td>
<td>135%</td>
<td>140%</td>
<td>Fully exploited</td>
<td>The working group adopted, based on the results of both the production model and the analytical model that the stock is fully exploited. The Working Group recommends not to exceed the mean level over the last five years 280 000 tonnes in 2014 for the whole sub-region.</td>
</tr>
<tr>
<td>Scomber colias</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole subregion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anchovy</td>
<td>19 (94)***</td>
<td>NA</td>
<td>112%</td>
<td>Over exploited</td>
<td>The results of the model indicate that the species is overexploited. The availability of this species is highly dependent on environmental factors and is fished opportunistically, thus the catches varies considerably from one year to another. Assessment was carried out on information from Zone North +A+B. The Working Group recommends that current effort should be reduced and on the long term be adjusted according to the natural fluctuations in this stock.</td>
</tr>
<tr>
<td>Engraulis encrasicolus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole subregion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bonga</td>
<td>83 (67)</td>
<td>NA</td>
<td>164%</td>
<td>Overexploited</td>
<td>The working group notes a general increasing trend in catches even though a decrease was observed in 2014. The Working Group recommends that effort should be decreased as compared to current levels for bonga to regain a catch level that can ensure sustainability.</td>
</tr>
<tr>
<td>Ethmalosa fimbriata</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole subregion</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*All advice is based on the results of the production model, unless otherwise indicated.

**Assessment relates to 2013 as the data available did not allow for an assessment up to 2014

*** Catches of anchovy in Mauritania before 2013 (1997-2012) is believed to include also small horse mackerel. See Chapter 6 for details