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SUMMARY OF THE STATUS OF DEMERSAL STOCKS IN THE SOUTHERN AREA OF THE EASTERN CENTRAL ATLANTIC (CECAF)

SUMMARY

The fourth meeting of the FAO/CECAF Working Group on the Assessment of Demersal Resources, Subgroup South met in Libreville, Gabon, from 6-15 September 2017. The Group assessed the status of the demersal resources in Southwest Africa and advise on future effort and catch levels. The advices for the stocks are given in relation to the agreed reference points $F_{0.1}$, F_{MSY}, $B_{0.1}$. A total of around 53 stocks were analyzed and when possible assessed by the group. Twenty-eight stocks could not be assessed using any of the models because the data available to the working group were not in the appropriate format and/or not sufficient to use in the assessment models. Catch and effort data were incomplete for the latter years in several of the data series. The working group also noted that catch and effort information from some countries in the region is no longer being collected. The results of the assessments show that of the fifty-three stocks analyzed: **Nine stocks were found to be overexploited:** *Galeoides decatactylus* (Guinea Bissau), *Pomadasys* spp. (Guinea Bissau), *Brachydeuterus auritus* (Côte d'Ivoire+Ghana+Togo+Benin), *Galeoides decatactylus* (Côte d'Ivoire+Ghana+Togo+Benin), *Galeoides decatactylus* (Angola+R. Congo+Gabon, *Parapeneus longirostris* (R. Congo), *Parapeneus longirostris* (Angola), *Peneus notialis* (R. Congo) and *Palinurus charlestoni* (Cabo Verde). **Eleven stocks are fully exploited:** *Muraenidae* (Cabo Verde), *Pseudotolithus* spp. (Côte d'Ivoire+Ghana+Togo+Benin), *Pseudotolithus* spp. (Nigeria+Cameroon), *Galeoides decadactylus* (Nigeria+Cameroon+São Tomé+Equatorial Guinea), *Cynoglossus* spp. (Nigeria+Cameroon+Equatorial Guinea), *Brachydeuterus auritus* (Nigeria), *Arius* spp. (Nigeria+Cameroon), *Cynoglossus* spp. (Gabon+R. Congo+Angola), *Peneus notialis* (Guinea Bissau), Coastal shrimps (Cameroon) and *Sepia* spp. (Guinea Bissau). **Five stocks are not fully exploited:** *Pagellus bellottii* (Côte d'Ivoire+Ghana+Togo+Benin), *Arius* spp. (Gabon+R. Congo), *Parapeneus longirostris* (Guinea Bissau), *Penaeus notialis* (Gabon), *Sepia* spp. (Ghana). The Working Group thus recommended that fishing effort should be reduced for the overexploited stocks or not increased for the other stocks, to avoid further depletion. When possible, recommendations on catch levels are also indicated for each stock. Given that most fisheries in the region are multi specific, an overall reduction in fishing effort is necessary. Since most of the stocks are shared by two or more countries in the region, the Working Group strongly recommends the strengthening of regional cooperation in key areas of research to support management including in relation to shared stocks. The members of the Working Group should discuss with fisheries managers of their respective countries their expectations in relation to management advice from scientists and develop strategies to improve the advice provided.

INTRODUCTION

1. The fourth meeting of the FAO/CECAF Working Group on the Assessment of Demersal Resources, Subgroup South met in Libreville, Gabon, from 6 to 15 September 2017.
2. The overall objective of the Working Group is to assess the state of demersal resources in the Southern CECAF area and make recommendations on fisheries management and exploitation options aimed at ensuring optimal and sustainable use of the resources for the benefit of coastal countries.
3. In all, 21 scientists from 17 different countries and FAO took part in the meeting.
4. Separate sections have been devoted to each of the five groups: demersal fish South 1, demersal fish South 2, demersal fish South 3, demersal fish South 4, shrimps South and cephalopods South. A total of around 53 stocks were analyzed.
5. The working area for the Working Group is defined as the waters between the southern border of Senegal and southern border of Angola, including Cape Verde and S. Tome and Principe Iles.

METHODS

6. Consistent with previous years, the main assessment model used by the Working Group was the dynamic version of the Schaefer (1954) model. When the model provided inconclusive results for a stock or when stocks could not be assessed due to limited data, the Working Group made recommendations based on previous assessments and trends in available data. For some stocks, a Length Cohort Analysis was applied in order 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 Biological Reference Points

The three assessment categories adopted by the CECAF scientific working groups include:

- **Non-fully exploited:** The stock is in good condition and fishing pressure can be increased without affecting the 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 both in terms of biomass and fishing mortality. Fishing pressure should be reduced to allow the stock to grow.

Management advice

7. The advices for the stocks are given in relation to the agreed reference points (FAO, 2006):

    - **Target Reference Points:** $F_{0.1}$ and $B_{0.1}$.
    - **Limit Reference points:** B_{MSY} and F_{MSY},

Results

8. The results of the assessments show that of the fifty-three stocks analyzed nine stocks were found to be overexploited whereas sixteen were found to be fully exploited or not fully exploited (Table 2).

Management Recommendations

9. Fishing effort should be reduced for the overexploited stocks or not increased for the other stocks, to avoid further depletion. When possible, recommendations on catch levels are also indicated for each stock. Given that most fisheries in the region are multispecific, an overall reduction in fishing effort is necessary. There was uncertainty in the assessments carried out, mostly due to deficiencies in some of the data available.

Conclusions

10. Since most of the stocks are shared by two or more countries in the region, the Working Group strongly recommends the strengthening of regional cooperation in research and management. The members of the Working Group should discuss with fisheries managers of their countries their expectations in relation to management advice from scientists and develop strategies to improve the advice provided.

OVERALL REGIONAL TRENDS

Catch

11. The total catch of demersal resources analysed in 2017 Working Group was around 216 000 tonnes in 2016 (Table 1, Figure 1).

12. Total catches of these resources for the period 1990–2016 fluctuated with an average around 211 000 tonnes. A decreasing trend has been seen since 2009 (Figure 1), with a sharp uptick in 2013 due to increased catches in Angola, Liberia, and Nigeria.

13. The average catches of demersal fish analyzed over the last five years have been estimated at around 244 000 tonnes. It should be noted that there was no new data from the Democratic Republic of Congo because the invited scientists were not present at the Working Group.

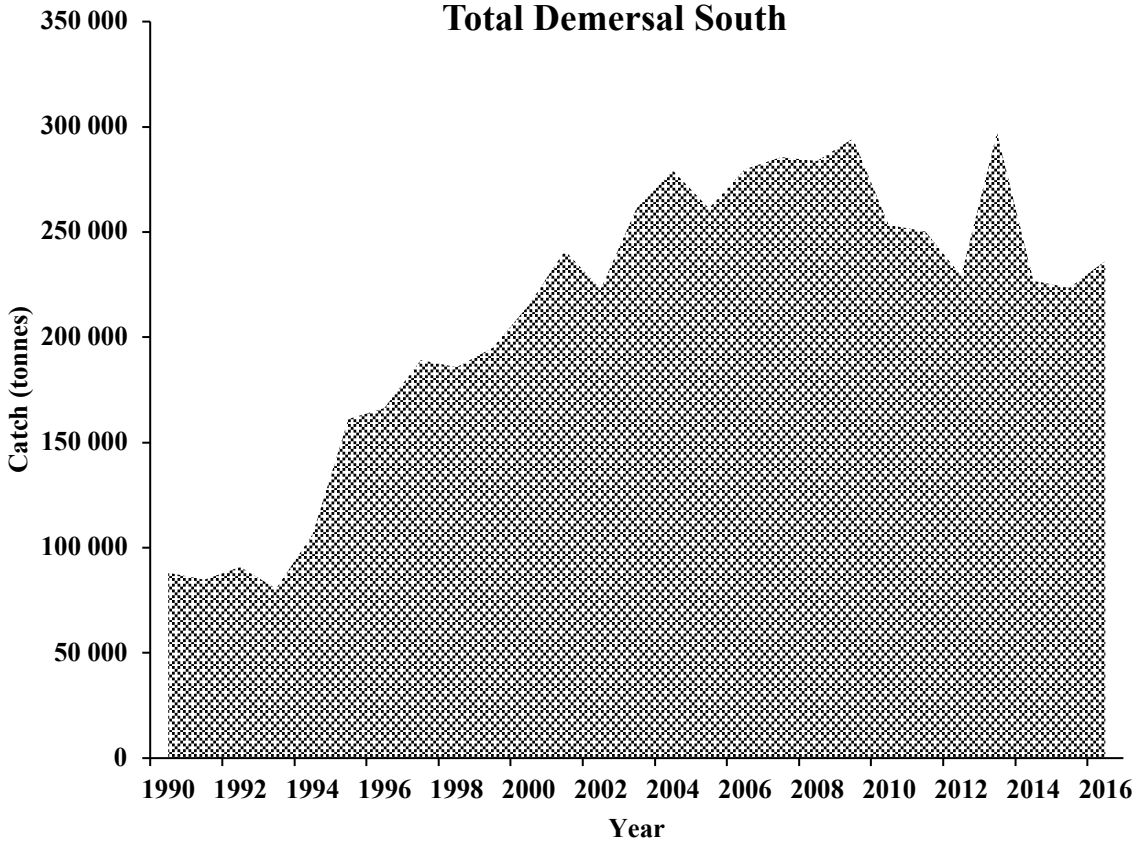

Figure. 1. Total Catch of Demersal South studied by the Demersal South Working Group

14. The most important group of species, in terms of catches, studied in the region is *Pseudotolithus* spp. (croaker) of the Sciaenidae family which makes up on average around 41 000 tonnes in the period 2011-2016 with a contribution to the total catches of the main demersal fish studied in the region of about 16 percent in 2016. *Arius* spp. (catfish) is the second most important of the species studied in the Working Group in 2017 and contributed with an average of around 37 000 tonnes in the same period (2011-2016), representing about 18 percent in 2016 of the total demersal species studied in the Working Group 2017. Also important are the groups *Dentex* spp. (Sparidae family and commonly named sea breams) and *Cynoglossus* spp. (family Cynoglossidae and commonly named sole) which are widely distributed in the West African zone representing an average of around 6 000 tonnes and 17 000 tonnes respectively in the period 2011–2016.

Table1. Total Catch of the main demersal species analysed in 2011 Demersal South WG

	Catch contribution 2015 (%)	Catch contribution 2016 (%)	2015 Catch	2016 Catch
Arius spp.	13%	18%	30 084	43 140
Pseudotolithus spp.	14%	16%	30 914	38 045
Galeoides decadactylus	12%	14%	27 805	32 341
Brachydeuterus auritus	14%	13%	30 926	29 861
Cynoglossus spp.	7%	6%	15 641	14 805
Merluccius polli	6%	5%	12 642	12 180
Pomadasys spp.	6%	5%	12 521	11 211
Dentex macrophthalmus	6%	5%	12 350	11 146
Sparidae	4%	3%	8 380	7 151
Dentex spp.	2%	3%	4 836	6 472
Sepia spp.	2%	2%	4 506	5 706
Pagellus bellottii	3%	2%	7 064	5 617
Coastal shrimps	3%	2%	5 760	5 192
Parapenaeus longirostris	2%	2%	3 354	3 580
Other shrimp species	2%	1%	3 694	3 380
Penaeus notialis	4%	1%	9 528	2 862
Octopus vulgaris	1%	1%	1 882	2 520
Pagellus quinquarius	0%	0%	598	655
Pagellus spp.	0%	0%	122	82
Pseudotolithus elongatus	0%	0%	105	77
Cephalopholis taeniops	0%	0%	197	0
Diplodus spp.	0%	0%	37	0
Loligo vulgaris	0%	0%	0	0
Muraenidae	0%	0%	119	0
Pseudopeneus prayensis	0%	0%	79	0
Seriola spp.	0%	0%	92	0
Total	**100%**	**100%**	**223 598**	**236 403**

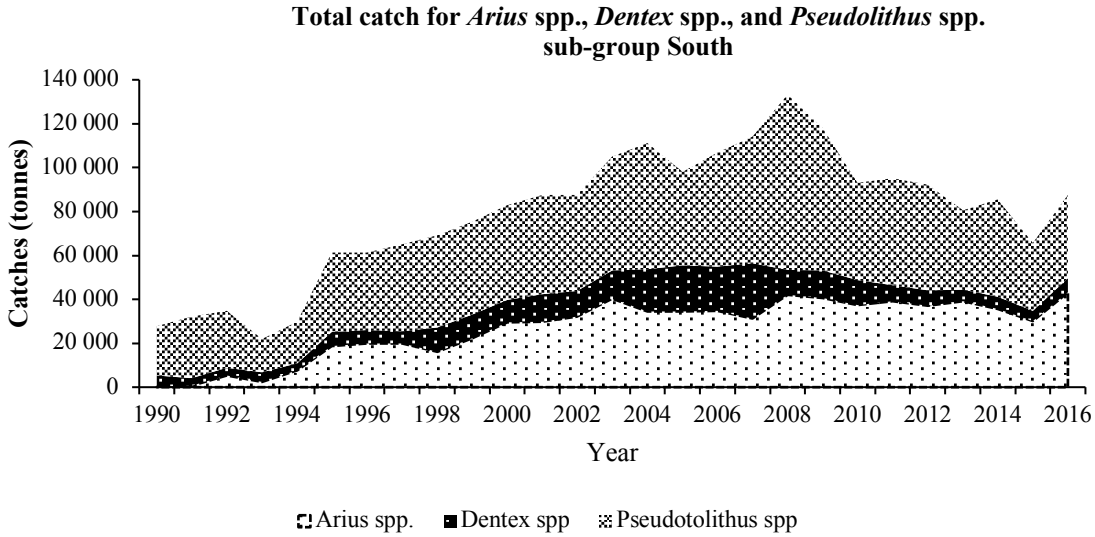

Figure 2: *Arius* spp., *Dentex* spp. and *Pseudotolithus* spp, Catch (1990-2016)

15. The deepwater rose shrimp (*Parapenaeus longirostris*) and the Southern pink shrimp (*Penaeus notialis*) are considered important in the region. The average catch over the period 2011–2016 of *Parapenaeus longirostris* is estimated at 3 000 tonnes and that of *Penaeus notialis* at around 4 120 tonnes (Figure 1). The non identified coastal shrimps from Benin, Cameroon, Democratic Republic of Congo and Nigeria yields important catches in these countries with a catch average of
3 400 tonnes in the period (2011–2016) (Figure3).

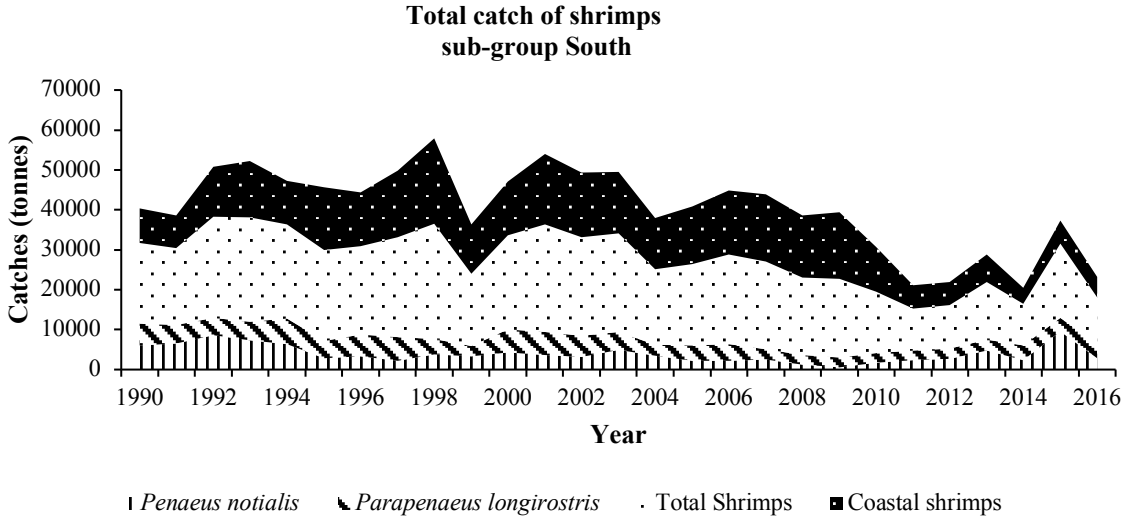

Figure 3: Catches of shrimps in CECAF South (1990-2010)

Surveys

16. Since the last Working Group in 2011, four demersal surveys have been carried out in waters off Guinea-Bissau: in December 2011 and 2014 (R/V Al Awan), April 2015 (R/V Itaf Deme) and January 2016 (R/V Al Awan). The surveys of 2014 and 2016 were conducted within the cooperation framework between Guinea-Bissau and the World Bank, thought the project PRAO-GB (Projet Regional des Peches en Afrique de l'Ouest-Guinea Bissau). Fisheries surveys were carried out also in the southern CECAF area in Guinea national surveys by the Guinean R/V Lansana Conté.

17. The main objective of these surveys was the assessment of the demersal stocks. The Norwegian R/V Dr Fridtjof Nansen carried out in the region fisheries surveys by country in Ghana (2010 and 2016) and Angola every year from 2011 to 2016, Data collected included catches by species (in weight and number), biological and oceanographic data, plankton (phyto and zoo plankton) and benthos.

Assessment results

18. A summary sheet with the complete results of the assessments and management recommendations is given in Table 2.

19. **Nine stocks were found to be overexploited:**
    - The grey grunt (*Pomadasys* spp.) in Guinea-Bissau. The assessment model result indicates that although the current biomass is close to the target biomass, the current fishing mortality is too high. As a result, the Working Group considers that this stock is overexploited. The CPUEs of recent years show a decrease since 2012 while the CPUE trends in the previous period fluctuate. The Working Group considers this group of species to be overexploited in Guinea Bissau.
    - Lesser African threadfin (*Galeoides decatacterus*).in Guinea-Bissau is overexploited. The current biomass is less than the target biomass $B_{0.1}$. The current fishing mortality is higher compared to the target fishing mortality $F_{0.1}$. Besides, the current fishing mortality is above that which would give a sustainable yield at the current biomass level.
    - The Bigeye grunt (*Brachydeuterus auritus*) stock in Côte d'Ivoire, Ghana, Togo and Benin is overexploited. Current biomass of the stock is 31 percent of that producing the maximum sustainable yield (B_{cur}/B_{MSY}) and 28 percent of that corresponding to the target reference point, $B_{0.1}$ ($B_{cur}/B_{0.1}$). Also the fishing mortality currently applied to the stock exceeds that needed to bring the stock to the biomass level of $B_{0.1}$.
    - Lesser African threadfin (*Galeoides decatacterus*) stock in Côte d'Ivoire, Ghana, Togo and Benin. The LCA results show that the stock is overexploited; even if the length frequency data was collected in industrial fisheries operating probably only on a part of the stock.
    - Lesser African threadfin (*Galeoides decatacterus*) stock in Gabon, R. Congo and Angola, is overexploited in terms of biomass, the current biomass is 34% below the target biomass $B_{0.1}$ and in terms of current fishing mortality is 39% superior to the target fishing mortality $F_{0.1}$.
    - Deepwater rose shrimps (*Parapeneus longirostris*) in Congo is overexploited in terms of biomass, the current biomass is 48% below the target biomass $B_{0.1}$ and in

terms of current fishing mortality is 34% superior than the target fishing mortality $F_{0.1}$.

- Deepwater rose shrimps (*Parapeneus longirostris*) in Angola is overexploited in terms of biomass, the current biomass is 38% below the target biomass $B_{0.1}$ and in terms of current fishing mortality is 55% superior than the target fishing mortality $F_{0.1}$.
- Southern pink shrimp (*Penaeus notialis*) in Congo is overexploited in terms of biomass, the current biomass is 28% below the target biomass $B_{0.1}$ and in terms of current fishing mortality is 67% superior to the target fishing mortality $F_{0.1}$.
- Pink lobster (*Palinurus charlestoni*) is overexploited in Cabo-Verde. The fit of the model is not good and the WG rejected the assessment but the stock is overexploited according with the information provided.

20. **Eleven stocks were found fully exploited:**
    - Moreias (*Muraenidae*) (Cabo Verde) is considered fully exploited. The current biomass of the stock is at the same level as that of the target biomass $B_{0.1}$ ($B_{cur}/B_{0.1}$), and the current fishing mortality F_{cur} is below the Fishing mortality at $F_{0.1}$.
    - Croakers (*Pseudotolithus* spp.) (Côte d´Ivoire, Ghana, Togo and Benin) is considered fully exploited. Current biomass is greater than 35 percent of the target biomass $B_{0.1}$, and the current fishing mortality F_{cur} is below the Fishing mortality at $F_{0.1}$.
    - Croakers (*Pseudotolithus* spp.) (Nigeria and Cameroon). Current biomass and fishing mortality of the stock are at the level of the target reference points $B_{0.1}$ and $F_{0.1}$.The Working Group considered that the stock is fully exploited.
    - Threadfin (*Galeoides decadactylus*) (Nigeria, Cameroon and Equatorial Guinea). No results for the assessment model. But, based on other information available the Working Group considering that the stock is fully exploited.
    - Sole (*Cynoglossus* spp.) Nigeria, Cameroon and Equatorial Guinea. No results for the assessment model. But, based on other information available the Working Group considerer that the stock is fully exploited.
    - Big-Eye Grunt (Brachydeuterus auritus) (Nigeria, Cameroon and Equartorial Guinea). The current biomass and current fishing mortality is closed to the target reference point of $B_{0.1}$ and $F_{0.1}$.
    - Sea Catfish (Arius spp.) (Nigeria, Cameroon and Equartorial Guinea). No reliable results for the assessment model based on other information available the Working Group consider the stock Fully Exploited.
    - Sole (*Cynoglossus* spp.) (Gabon, R. Congo and Angola). The current biomass of the stock is 12 percent more than the biomass corresponding to the target reference point $B_{0.1}$ ($B_{cur}/B_{0.1}$). The fishing mortality of these demersal species remains high with $F_{cur}/F_{0.1}$ equal 142 percent, but the Working Group consider this stock fully exploited, due to inconsistencies in the data available.
    - Southern pink shrimp (*Penaeus notialis*) (Guinea-Bissau). No reliable results for the assessment models applied based on other information available the Working Group consider the stock Fully Exploited.
    - Coastal shrimps (Cameroon). The current biomass B_{cur} is near the values of the target biomass $B_{0.1}$. The current fishing mortality F_{cur} is slightly higher than the fishing mortality that would produce the $B_{0.1}$.
    - Cuttlefish *(Sepia* spp.) (Guinea-Bissau). The current fishing mortality is 33% percent higher than the fishing mortality that would keep the stock at its biomass

level in 2016 (F_{cur}/F_{Sycur}), the Current Biomass is 26% higher than $B_{0.1}$.

21. **Five stocks are non- fully exploited**:
    - Red pandora (*Pagellus bellottii*) (Côte d'Ivoire+Ghana+Togo+Benin). The assessment results indicate that the stock is not fully exploited in terms of biomass and fishing mortality in relation to the target points $B_{0.1}$ and $F_{0.1}$.
    - Catfish *(Arius* spp.) (Gabon+R. Congo). The current biomass is higher than that of B0.1 and the current fishing mortality is lower than that of $F_{0.1}$.
    - Deepwater rose shrimps (*Parapeneus longirostris*) (Guinea Bissau). The current fishing mortality (F_{cur}) is below the level that can produce the target biomass ($F_{0.1}$) while the current biomass (B_{cur}) is higher than the target biomass $B_{0.1}$.
    - Southern pink shrimp (*Penaeus notialis*) (Gabon). The current biomass is higher than that of $B_{0.1}$ and the current fishing mortality is lower than that of $F_{0.1}$.
    - Cuttlefish *(Sepia* spp.) (Ghana). The current biomass is only 16 percent of the biomass reference point $B_{0.1}$. The fishing mortality is (14 percent) than the fishing mortality corresponding to the production of the biomass target ($F_{0.1}$).

22. For twenty-eight of the stocks the results of the assessments were not satisfactory because of the uncertainties in the data available, or they could not be assessed using any of the available assessment models because the data available to the working group were not in the appropriate format and/or not sufficient to use in the assessment models. When the model provided inconclusive results for a stock or when stocks could not be assessed due to limited data, the Working Group made recommendations based on previous assessments and trends in available data management recommendations.

23. The results of the assessments show that many of the stocks analyzed are fully to overexploited, and the Working Group thus recommended that fishing effort should be reduced for the overexploited stocks or not increased for the other stocks, to avoid further depletion. When possible, recommendations on catch levels are also indicated for each stock. Given that most fisheries in the region are multi-specific, an overall reduction in fishing effort is necessary.

GENERAL CONCLUSIONS

24. For most of the stocks assessed, the only series of stock abundance indices available were commercial CPUE data series. Commercial CPUE series are not random sampling of the stocks and are affected by changes in fleet size and fishing strategy. Consequently changes observed in the CPUEs do not necessarily reflect the variations in stock abundance. Several of the series analyzed by the Working Group corresponded to fleets that have undergone significant changes in the period analyzed, including the entry of new categories of vessels, or marked changes in fishing strategy, which precluded their use in the analysis. This situation can be improved by more detailed analyses of the fleets and their catches. Therefore, the Working Group recommended that these analyses should be carried out, where sufficiently detailed data is available. Any changes in fishing strategy or in the fishing efficiency should be reported and taken into consideration in subsequent work.

25. There was uncertainty in the assessments carried out, mostly due to deficiencies in some of the data available. In general, the quality and availability of fishery and biological data seem to have decreased. The main deficiency remains in the reliability of catch data for

most of the demersal finfish stocks. Catch and effort data were sometimes incomplete for the last few years, with many of the time series lacking information for even longer period. For some countries data of the artisanal fishery are not made available, or made available by gear. Effort data is often not presented in appropriated unit for the different fisheries and fleet. Since the assessments of the current states of the stocks and their exploitation depend strongly on the estimated levels of past and present catch, unreliable catch data will impact directly on the quality and reliability of the assessment and recommendations made by the Working Group.The Working Group also noted that catch and effort information from some countries in the region is no longer being collected. This is of serious concern as these basic data are required for the assessment of the stocks and the situation must be corrected in the future if the group is to be able to continue to provide useful fisheries management advice.

26. Since the assessments of the current states of the stocks and their exploitation depends strongly on the estimated levels of past and present catch, unreliable catch data will impact directly on the quality and reliability of the assessment and recommendations made by the group. Therefore these issues should be addressed with urgency and insistence. Biological sampling is almost non-existent in the region, which limits the analyses and models that can be applied by the Working Group. Although several countries supplied length frequency data to the WG, the information could only be applied in assessment in one sub region. The use and analysis of biological data need further attention.

27. In the absence of data on the size or age structure of the catch (length frequencies, individual length and weight, sex, maturity, etc.), the Working Group could not use other models (few data on biological sampling information from catches was available from the fisheries). An adequate sampling programme to improve the knowledge of the stocks and fisheries covered by the Working Group needs to be initiated.

28. One regional demersal survey was carried out in 2015 covering the region from Senegal to Benin. Surveys had been conducted in some countries such as Angola, Ghana, Guinea Bissau and Guinea. Surveys are important sources of fishery independent information and some of the stocks were analyzed using survey data as the index of abundance. The Working Group encouraged further analysis and continuation of these data series by the different research vessels in the region.

29. Finally, 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. The members of the Working Group should discuss with fisheries managers of their countries their expectations in relation to management advice from scientists and develop strategies to improve the advice provided.

FUTURE RESEARCH

30. Several recommendations were made by the 2003, 2005, 2008 and 2011 sessions of the Working Group with respect to research to be pursued. The Working Group noted that work has been started to improve the statistical and biological sampling systems in some countries of the sub-region. Studies on biological aspects of certain species analyzed within the framework of the Working Group had also been initiated. Some recommendations, for various reasons, were not taken into consideration. Biological

information is almost inexistent and sampling for biological purposes is not carried out on a regular basis in the sub-region. For most recommendations follow up activities had been initiated, although many of them require continuation to be useful for the assessments.

31. Some of the main recommendations on areas of work that require attention are summarised below:

- Inform managers of the poor state of certain demersal stocks in their countries so that they can implement the recommendations made by the CECAF Working Groups
- Highlight through appropriate channels the issues relating to the poor availability and quality of the data necessary for assessments and look for opportunities to improve data collection and analysis for priority species or species groups
- Prospect and examine the possibility of using other approaches for identified data poor stocks in the region.
- Respect the recommendation by CECAF to prepare all the data (i.e. catch, corresponding effort, abundance indices, and length composition of the catches, survey data etc) .necessary for the assessment and associated knowledge on the fisheries (qualitative and quantitative) so that they can be sent to all participants, FAO and the chairperson of the Working Group at least one month before the start of the Working Group. Working group's members are encouraged to provide annual updates on data and relevant research or studies through the working group chair for the working group database and for sharing with other members.
- Improve species identification and the system of data collection by species, carry out sampling so that the species can be better separated in catches and catch statistics in order to improve knowledge on the species composition of species groups (*Sparidae*, *Dentex* spp, *Pseudotholithus* spp, coastal shrimps etc).
- Conduct and encourage regular national and regional scientific surveys covering the entire distribution of the stocks to obtain more reliable abundance indices for each stock.
- Organize intersession training on assessment methods, biological analysis, sampling and database utilization for working group members.
- To strengthen the working group's capacity and to ensure consistency of knowledge and procedures it is recommended that member attendance is consistent from one meeting to another. Members should ensure that colleagues in national institutions are well informed about the work and the results of the working group.

Table 2 – Assessments summary sheet WG Nov. 2017 – CECAF SOUTH (Cap Verde, Guinea Bissau, Guinea, Côte d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Sao Tome & Principe, Gabon, Congo, Democratic Republic of Congo and Angola).

Group Fish 1						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Pseudotolithus elongates	Guinea + Guinea Bissau, Sierra Leone, Liberia	77 (2812)*	-	-	No results from the assessment model and no conclusion can be made based on available data	Considering the problems with the data, the Working Group is not in a position to make specific recommendations for effort and catch levels. As a precautionary measure, it is the expectation that more complete and reliable datasets are collected and available for all fisheries for the next meeting. The Working Group recommends not increasing the fishing effort.
Pseudotolithus spp.	Guinea, Sierra Leone, and Liberia	1899 (2988)	-	-	No results from the assessment model and no conclusion can be made based on available data	As a precautionary measure, and in the expectation that more complete and reliable data are collected and available for the next meeting, the Working Group recommends that the total catch for this group of species do not exceed the total capture of the species for the last year (1 900 tonnes).
Galeoides decadactylus	Guinea-Bissau	2614 (2390)	85%	130%	Overexploited	As a precaution and pending the collection and availability of more complete and reliable data sets for the next assessment, the Working Group recommends a reduction in fishing effort. But the Working Group cannot comment on the level of catches due to the lack of data from small-scale fisheries. For industrial fishing, the Working Group recommends not to exceed the average level of 2010-2013 (3 000 tonnes).
Arius spp.	Guinea, Guinea-Bissau	12232 (7179)	-	-	No results from the assessment model	As a precautionary measure, the Working Group recommends not to increase fishing effort, as a series of more complete and better-quality data are not available. Since the estimated catches in 2016 exceed the average catches of the last five years by 34 percent, the Working Group recommends the reinforced monitoring of this stock and a gradual reduction in catches.

Group Fish 1						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Pomadasys spp.	Guinea Bissau	2224 (1266)	81%	181%	Overexploited	As a precaution and in anticipation of more complete and reliable data series being collected and available for all fisheries for the next meeting, the working group recommended a reduction in effort. The working group can not comment on a new catch, lacking data from artisanal fisheries. For industrial fishing the WG recommends not to exceed the average level of catch for the last 5 years (1300 tonnes).
Cynoglossus spp.	Guinea, Sierra Leone and Liberia	1055 (2514)	-	-	The Working Group did not perform an assessment because the data available to the WG are incomplete.	Due to the lack of data for the recent period, the group is not in a position to make specific recommendations on the level of capture and effort for this group of species. Countries should make arrangements for complete and up-to-date data series to be available for the next assessment Working Group.
Dentex spp.	Guinea-Bissau Guinea, Sierra Leone, Liberia	Not available	-	-	No assessment	Due to the lack of data for the recent period, the group is not in a position to make specific recommendations on the level of capture and effort for this group of species. Countries should make arrangements for complete and up-to-date data series to be available for the next assessment Working Group.
Cephalopholis taeniops	Cape Verde	197 (251)***	-	-	No results from the assessment model	As a precautionary measure the WG recommends that the fishing effort should not exceed the current level and that total catch should not exceed the level of 2015 (200 tonnes)
Muraenidae	Cape Verde	119 (142)***	103%	79%	Fully exploited	The WG recommends that the fishing effort should not exceed the current level and that total catch should not exceed the average of the last five years (140 tonnes)
Pseudopeneus prayensis	Cape Verde	79 (65)***	-	-	No results from the assessment model	As a precautionary measure the WG recommends that the fishing effort should not exceed the current level and that total catch should not exceed

Group Fish 1						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Seriola spp.	Cape Verde	37 (31)	-	-	No results from the assessment model, but CPUE shows a general decreasing trend	As a precautionary measure the WG recommends that the fishing effort should not exceed the current level and that total catch should not exceed the average of the 3 last years (35 tonnes)
Diplodus spp.	Cape Verde	37 (31)	-	-	No results from the assessment model, but CPUE shows a general decreasing trend	As a precautionary measure the WG recommends that the fishing effort should not exceed the current level and that total catch should not exceed the average of the 3 last years (35 tonnes)

Table 2 (Group Fish2.)– Assessments summary sheet WG Nov. 2017 – CECAF SOUTH (Cap Verde, Guinea Bissau, Guinea, Côte d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Sao Tome & Principe, Gabon, Congo, Democratic Republic of Congo and Angola).

Group Fish 2						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Brachydeuterus auritus	Côte d'Ivoire, Ghana, Togo and	20225 (14183)	28%	396%	Overexploited	As a precautionary measure the WG recommends a reduction in fishing effort in order not to exceed the average catch of the last five years (14 183 tonnes)
Galeoides decadactylus	Côte d'Ivoire, Ghana,Togo and Benin	5058 (4632)	-	-	Overexploited	Given that this species was considered overfished in 2011 and the analysis of the different available CPUE shows different trends the Working Group recommends that the catch does not exceed the average of the last 5 years (4 600 tonnes)
Dentex spp.	Côte d'Ivoire, Ghana, Togo and	5704 (4978)	-	-	The Data available are not suitable to fit the models	As a precautionary measure, considering that this species was considered overfished in the WGs of 2008 and 2011 recommends that the catch of this species should not exceed the average of the last five years, ie 5 000 tonnes.
Pagellus bellottii	Côte d'Ivoire, Ghana,	5488 (5400)	136%	50%	Not fully exploited	Taking into account the results obtained in the assessments models and analysis of the CPUE trends, the WG recommends that the catch can be maintained at current levels (6 000 tonnes)
Pseudotolithus spp.	Côte d'Ivoire, Ghana, Togo and Benin	2831 (2621)	135%	70%	Fully exploited	The WG recommends not to increase the fishing effort and that the catch does not exceed the average of the last 5 years (2 600 tonnes)

Table 2 (Group Fish3)– Assessments summary sheet WG Nov. 2017 – CECAF SOUTH (Cap Verde, Guinea Bissau, Guinea, Côte d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Sao Tome & Principe, Gabon, Congo, Democratic Republic of Congo and Angola).

Group Fish 3						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Pseudotolithus spp.	Nigeria and Cameroon	15 947 (15 506)	94%	105%	Fully exploited	The Working Group recommends not to increase the fishing effort of 2016. The total catch should not exceed the last year catch of 16 000 tonnes
Galeoides decadactylus	Nigéria, Cameroon S. Tome and Guinea Equatorial	6535 (6727)	-	-	No results for the assessment model. But, based on other information available the WG considerer that the stock is fully exploited.	As a precautionary measure the Working Group recommends that the total catch should not exceed the mean catch of the last five years (7 000 tonnes)
Cynoglossus spp.	Nigeria, Cameroon and Equatorial Guinea	11802 (11997)	-	-	No results for the assessment model. But, based on other information available the WG considerer that the stock is fully exploited.	As a precautionary measure the Working Group recommends that the total catch should not exceed the mean catch of the last five years (24 000 tonnes)
Dentex spp.	S Tome & Principe and Equatorial Guinea	110 (247)	-	-	No reliable data for assessment.	As a precautionary measure the WG recommends not increase the mean catch of the last five years (250 tonnes)
Pagellus spp.	Equatorial Guinea Sao Tome	82 (134)	-	-	No reliable data for assessment.	The WG is not in position to give any recommendation in relation to catch or effort level for *Pagellus* spp.
Brachydeuterus auritus	Nigeria	2764 (2798)	85%	92%	The assessment is reasonably and the WG consider the stock Fully exploited	The Wg recommend not to increase the fishing effort of 2016. The total catch ashould not exceed the last year catch of 3 000 tonnes

Group Fish 3						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Arius spp	Nigeria and Cameroon	21167 (21483)	-	-	No reliable results for the assessment model based on other information available. Based on CPUEs the WG consider the stock Fully Exploited	The Wg recommend not to increase the fishing effort of 2016. The total catch should not exceed the average catch of the last 5 years (22 000 tonnes)
Pomadasys spp.	Nigeria and São Tome &Princioe	7280 (7635)	-	-	No reliable results for the assessment model based on other information available	As a precautionary measurde the WG recommends not increase the mean catch of the last five years (7 700 tonnes)

Table 2 (Group Fish4)– Assessments summary sheet WG Nov. 2017 – CECAF SOUTH (Cap Verde, Guinea Bissau, Guinea, Côte d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Sao Tome & Principe, Gabon, Congo, Democratic Republic of Congo and Angola).

Group Fish 4						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Pseudotolithus spp.	Angola, Congo and Gabon	17152 (16396)	-	-	Model provides unsatisfactory adjustment and assessments are rejected	As a precautionary measure and given that this group of species was considered over-exploited in the last assessment (2011) the Working Group recommends that the catch of this group of species should not exceed the average of the last five years (17 000 tonnes)
Galeoides decadactylus	Angola, Congo and Gabon	5850 (4627)	66%	139%	Overexploited	The Working Group reiterated the 2011 recommendation to reduce fishing effort and not to exceed the average of the total catch of the last five years, ie 5000 tonnes.
Cynoglossus spp.	Angola, Congo and Gabon	1948 (2001)	88%	142%	The results indicate that the stock is fully exploited. However, fishing mortality needs to be reduce to avoid the overexploitation of the stock.	The Working Group recommends that the catch should not exceed the mean level of the last five years (1 900 tonnes).
Dentex spp.	Angola, Congo and Gabon	657 (615)	-	-	The model provides an unsatisfactory fit.	The Working Group recommends a reduction in effort. In view of the fact that the highest catch volumes are observed in Angola, the Working Group recommends that special attention be given to the fishery in that country
Dentex macrophthalmus	Angola	11 146 (12 450)	-	-	The results provide by the model was not acceptable, because of the poor quality data reported, which are not consistent.	The Working Group recommends not increasing the fishing effort for the stock and the total catches should not exceed the last year catches (6 400 tonnes).
Brachydeuterus auritus	Congo and Angola	6872 (6182)	-	-	The fitting of the model is not satisfactory due to quality of the data	The WG is unable to make recommendations regarding catch and effort levels for this species. This is of concern because the last assessment in 2011 showed that this species was overexploited.

Group Fish 4						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Pomadasys spp.	Gabon, Congo and Angola	1696 (2642)	-	-	The fit of the model to the data in all the tests were inconclusive	The WG is unable to make recommendations regarding catch and effort levels for this species. The previous results of the Working Group indicate that the stock of *Pomadasys* spp. in Gabon, Congo and Angola was overexploited.
Arius spp.	Gabon+Congo	260 (526)	147%	35%	Non-fully exploited	As a precautionary and tempting measure, given that the previous Working Group had concluded overexploited, the Group will reiterate the recommendation of previous groups not to exceed a catch level of 500 tonnes.
Merluccius polli	Angola	12180 (11749)	-	-	The model doesn't fit because the data was showing too many inconsistencies.	Considering the results of last assessment in 2011, the stock was fully exploited. The Working g recommends that fishing mortality should not be increased and the stock should be well monitored.
Pentanemus quianquarias	Congo and Gabon	655 (802)			The fit of the model to the data was inconclusive	As a precautionary measure, the Working Group recommends not to increase the effort and not to exceed the 2016 catch level of this species (700 tonnes).

Table 2 (Shrimps) – Assessments summary sheet WG Nov. 2017 – CECAF SOUTH (Cap Verde, Guinea Bissau, Guinea, Côte d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Sao Tome & Principe, Gabon, Congo, Democratic Republic of Congo and Angola).

Shrimps						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Parapeneus longirostris	Guinea -Bissau	673 (807)	124%	51%	The fit of the model is good and the WG considered the stock is Non Fully Exploited	According to the assessments the WG consider the stock could sustain a controlled increase in catch adjusted to the level of the mean of the last five years (800 tonnes)
Parapeneus longirostris	Congo	501 (610)	52%	134%	The fit of the model is good and the WG considered the stock is overexploited	According to the assessments, the WG consider the fishing mortality too high in 2016 and recommends a reduction in the catch level of 2016 less than 500 tonnes.
Parapeneus longirostris	Angola	2242 (1655)	62%	255%	The fit of the model is reasonably good and the WG considered that the stock is overexploited	According to the assessments, the WG consider the fishing mortality too high in 2016 and recommends a reduction in the catch level below the TAC established for 2017 (1200 tonnes) .
Penaeus notalis	Guinea Bissau	383 (502)	-	-	No results for the assessment model based on other information available the WG considerer that the stock is fully exploited.	The WG recommends that the catch should not exceed the mean catch of the last five years, (500 tonnes)
Penaeus notalis	Sierra Leone	(6)	-	-	No assessment, as there is no information on Catch and CPUE the WG was not able to conduct any assessment	No recommendation
Penaeus notalis	Ghana	660 (2780)*	-	-	No new assessment due to lack of reliability of information.	Given the uncertainty in the data and as a precautionary measure the WG recommends not to increase catches above the 2016 level (700 tonnes) before more consistent data can be provided.

Shrimps						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Penaeus notalis	Gabon	256 (257)	143%	34%	The fit of the model is good Non Fully Exploited	According to the assessments the WG consider the stock could sustain a controlled increase in catch adjusted gradually to the effort level recommended in the National shrimp management plan
Penaeus notalis	Nigeria	878 (908)	-	-	The fit of the model to the data is not acceptable and therefore, no conclusions can be made based on the model results.	Total industrial catch and CPUE follow the same trend during the period considered, this revealing inconsistencies in the data provided. Efforts on the separation of coastal shrimp's species and effort estimation should be continued to solve this inconsistencies in next Working Group. No management recommendation.
Penaeus notalis	Congo	297 (274)	72%	167%	The fit of the model is reasonable and is considered overexploited	According to the assessments the WG recommends to decrease the effort to catch level recommended last 2011 Working Group (200 tonnes)
Coastal shrimps	Guinea	? (267)	-	-	No new assessment due to lack of information.	The shrimps fishery is closed since 2016
Coastal shrimps	Benin	0.52 (13)	-	-	No new assessment due to lack of reliable information.	The Wg was not in a position to provide specific management advice.
Coastal shrimps	Nigeria	4851 (4928)	-	-	The fit of the model was not reliable.	The Wg was not in a position to provide specific management advice.
Coastal shrimps	Cameroon	325 (318)	78%	129%	The fit of the model was good and the WG consider that the stock is in the limit of full exploited although keeping the current F level will bring the stock to overexploitation	According to the assessments the WG recommends to decrease slightly the effort to the mean level of 5 last years (300 tonnes)
Palinurus charlestoni	Cape Verde	5*(15)	-	-	The fit of the model is not good and the WG rejected the assessment but the stock is overexploited according with the information provided	The WG recommend to keep the fisheries closed until new signs of recovering of the stocks

Table 2 (Cephalopods)– Assessments summary sheet WG Nov. 2017 – CECAF SOUTH (Cap Verde, Guinea Bissau, Guinea, Côte d'Ivoire, Ghana, Togo, Benin, Nigeria, Cameroon, Equatorial Guinea, Sao Tome & Principe, Gabon, Congo, Democratic Republic of Congo and Angola).

Cephalopods						
Stock	**Region**	**Catch (tonnes) 2016 (2012–2016 avg.)**	***$B_{cur}/B_{0.1}$**	***$F_{cur}/F_{0.1}$**	**Assessment**	**Management recommendations**
Sepia spp.	Ghana	2777 (1898)	116%	14%	The results of the model obtained are satisfactory. They indicate that the stock of Sepia spp. is not-fully	The Working Group recommended that the current fishing effort can be gradually increased to a level that brings the production of the stock to the reference levels
Sepia spp.	Guinea Bissau	2929 (2131)	126%	91%	The fit of the model was reasonably good and the Working Group considered that the stock is fully exploited.	As a precautionary measure the fishing effort should not exceed the 2016 effort, and the catch should not exceed the average of the last 5 years (2 000 tonnes).
Sepia spp.	Guinea*	4721* (5786)*	-	-	The fit of the model was satisfactory for 2013 with data available.	No specific recommendation could be made by the WG because the data was until 2013.
Octopus vulgaris	Guinea-Bissau	2520 (3847)	-	-	The model did not fit the data available	The Working Group was unable to provide any management advice based on the assessment models on the octopus stock from Guinea-Bissau because only partial information on the fisheries was made available for analysis

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