Senegal pole-and-line FIP

Livebait fishery: Information, data gaps and proposed FIP actions

Report by Jo Gascoigne, Massal Fall, Mor Guèye and Youssef Jaridi, November 2019

1. Summary

Although Senegalese law strictly states that tuna pole-and-line vessels should catch their own live bait, in practice the purchase of live bait from pirogue fisheries is permitted under regulated conditions – it must be based on a subcontracting agreement and use gear provided by the tuna company.

Various attempts have been made to estimate the quantity of live bait used by the tuna pole-and-line fleet in Senegal, based on different methodologies such as the capacity of the live bait tanks on board the tuna vessels, the quantity purchased from pirogue owners per trip, data from reports of Senegalese observers on board the EU tuna vessels and data provided to FAO/CECAF. None of these estimates are particularly robust, but we can hypothesise that live bait might represent somewhere in the range of 4% of the weight of tuna caught. This estimate, however, needs to be refined. The MSC cut-off level for 'main' bycatch species is 5%, so if this estimate is confirmed by better data, the use of bait would not represent a barrier to MSC certification for this fishery.

In terms of bait composition, various lines of evidence point to sardinella (mainly *Sardinella aurita*) as the main component of the live bait. This stock is not in good shape according to CECAF, the regional FAO scientific working group; it is overfished and depleted.

It is recommended that the FIP continue work to improve the estimates of live bait use and species composition by the pole-and-line fleet, such that a reasonable estimate of bait use by species as a percentage of total tuna landings (or to be more precise, tuna+bait). If this can be shown to be consistently <5% for all the species concerned, then from the MSC point of view there is no issue. Otherwise, if there is a risk that *S. aurita* (or another species) might meet MSC's criteria for a 'main' bycatch species, the following actions are recommended:

- FIP vessels should provide more information on their capacity for live bait (i.e. number and maximum fish capacity of their viviers), quantity of bait purchased each trip, number of trips per year over the last few years, preferred bait species and the frequency of catching bait at sea, along with the species and quantities involved.
- FIP vessels should report systematically the quantity and species composition of their live bait purchases, and the data made available to Senegalese scientists (CRODT).
- Engage with scientists working on small pelagics (i.e. CRODT CECAF participants) to evaluate whether data can be provided by the FIP which is useful for stock assessment purposes.
- Encourage the Senegal authorities to focus on improving management of the live bait fishery.
- Encourage the Senegal authorities to focus on improving information and management of the sardinella fishery.

2. Introduction

This report summarises the available information on the use of bait fish by the tuna pole-and-line fishery in Senegal. It evaluates gaps in data in relation to evaluating the fishery against the MSC standard, and makes some recommendations for how the tuna pole-and-line FIP should proceed in relation to the issue of bait. The information in the report is based largely on the information provided by Fall and Guèye (2019), and this report should be read in conjunction with their report, which includes more details on the operation of the bait fishery, as well as on the methodologies used to evaluate bait quantity and species composition.

3. Management and operation of the live bait fishery for tuna pole-and-line vessels

According to Senegalese fisheries regulation (Article 51 of Décret 2016-1804 of 22 November 2016), fishing for live bait is only permitted by the tuna pole-and-line vessels themselves, in possession of a valid licence. In practice the fishery is conducted by artisanal fishing vessels (pirogues) but under arrêté 7225 of 30 March 2018 this activity is legal for pirogues as long as the vessels used gear belonging to the pole-and-line company, and operate under a valid subcontracting agreement. They fish the bait with a seine net ('bolinche'), or more rarely with a beach seine. Several pirogues share one bolinche with is provided by the tuna company, who also provide money for fuel and supplies.

The fishery is centred on the Baie de Hann, but vessels may search further south if bait is scarce, as far as Djiffère. A pirogue owner suggested that baitfish are becoming harder to find, as would be expected given the trends in stock status of the main species (see Section 9 below) (Fall and Guèye 2019).

Note that live bait may also be fished at sea by the pole-and-line vessel: it is not known how common this is[1].

4. Data on live bait use by the pole-and-line fishery

The sources of data available for a preliminary analysis of the quantity of livebait used by the pole-and-line vessels were largely anecdotal, as follows (Fall and Guèye 2019):

- discussion with a Senegalese pole-and-line vessel owner;
- discussion with two pirogue owners who supply bait to the EU pole-and-line vessels under contract;
- observer reports from 108 trips on the EU-flagged vessels (the Senegalese-flagged vessels reportedly refuse scientific observers on board);
- expertise of CRODT scientists who have worked on this fishery / these stocks, and information provided to CECAF by CRODT.

The pole-and-line vessels themselves do not record (or may record internally but do not report) the quantity or species composition of live bait they buy or use.

5. Quantity of live bait used by the pole-and-line fishery

Estimates from observer data from the EU vessels

[1] See https://www.youtube.com/watch?v=w2EpgYVpfNA

The data from observers covers 108 trips on the EU pole-and-line vessels between 2015 and 2018. The Senegalese vessels reportedly do not allow scientific observers on board.

The relationship between the quantity of live bait on board at the start of the trip, and the quantity of tuna on board at the end of the trip is very variable (which is not surprising: vessels will do better some trips than others, vessels are different sizes and fish in different ways, additional bait may or may not be fished at sea). In total across all the trips, the data report that for the 108 trips, 943 t of live bait was purchased, for 24,893 t tuna landed: a ratio of 26.4 t tuna for each tonne of live bait (Fall and Guèye 2019). Although information is limited, this seems on the high side relative to other pole-and-line fisheries; e.g. the Maldives reports a tuna:bait ratio in the range 7:1 to 11:1, while in Japan it is reported as 9.7:1 on average (Gillett 2012). This may be because the vessels are very efficient, or because additional bait is caught at sea, or because of high uncertainty in the data – we cannot know.

Calculating the figures required by MSC from these data, live bait makes up 3.65 % of the total of live bait plus tuna (see Section 11 below).

Estimates from pirogue owners

Based on the information provided by the pirogue owners, the quantity of bait purchased by a given pole-and-line vessel depends on the size of their viviers (obviously) but also by season (cold vs hot). This is because the baitfish survive less well in warmer water, so viviers cannot be filled so densely. The live bait is transferred from the pirogue to the tuna vessel using a large net called a 'salabarde' which also serves as a unit of measurement. The problem with the salabarde as a unit of measurement, however, is that its capacity can vary enormously – each individual pirogue/tuna vessel team will have its own salabarde and will know the capacity. Furthermore, some salabardes are made of net and hence transfer only fish, while others are watertight and hence transfer fish plus water. Based on sampling by Fall and Guèye (2019), the salabardes used by these pirogues / tuna vessels can be estimated to hold approximately 50 kg of fish.

The pirogue owners estimate as follows (Fall and Guèye 2019):

- Large vivier: up to 8 salabardes in the cold season, up to 4 in the hot season
- Small vivier: up to 5 salabardes in the cold season, up to 2 in the hot season

Taking as an example the vessels with six large and six small viviers, this would mean a maximum of 72 salabardes or 3.6 t bait in the cold season, and a maximum of 42 salabardes or 2.1 t bait in the hot season. Taking an average figure of 2.85 t, this would represent 34.2 t bait per year, assuming 12 trips. The estimate seems somewhat low, however, given the estimate from the observers of an average of 8.7 t bait per trip (i.e. 943 t total divided by 108 trips).

Estimates from pole-and-line vessel

The vessel Pdt Magatte Aya Diack-2 (PMAD2) is a Senegalese-flagged pole-and-line vessel which is one of the smaller vessels in the fleet. The vessel has 8 viviers the same size, with a capacity of ~650 kg of live bait on average – i.e. a total capacity of 5.2 t of live bait per trip, or 62.4 t per year assuming 12 trips per year – i.e. intermediate between the other two estimates.

Information from CECAF reports

Annual CECAF reports provide estimates of live bait used by the EU pole-and-line fleet in Senegal as follows (figures provided in Fall and Guèye 2019):

- 2015: 454 t
- 2016: 287 t
- 2017: 333 t

This can be scaled up to an estimate of the bait use of the entire fleet by dividing by the proportion of vessels which are EU-flagged each year (8 out of 14; 57%) or (better) by the percentage of the total tonnage which is EU-flagged (61%).

Summary

The various approximate estimates of bait use by the pole-and-line fleet are summarised in Table 1 below. For MSC purposes the analysis should be based on the largest (i.e. most precautionary) estimate rather than an average. Furthermore, this estimate (from observers) seems likely to be the most accurate (least inaccurate), since the others suffer i) from assumptions about the capacity of a salabarde and the viviers, and ii) from extrapolate of the features of one or a small number of tuna vessels to the entire fleet (although the observer data is not free from these uncertainties either).

Table 1. Summary of estimates of bait use as described above

	Estimate from observer data (t)	Estimate from pirogue owners (t)		Estimate from PMAD2 (t)	Estimate from CECAF (t)		
		hot season	cold season		2015	2016	2017
Bait use per trip	8.7	2.1	3.6	5.2			
Bait use per year per vessel assuming 12 trips / year	104.4	34.2		62.4			
Bait use for fleet*	1357	445		811	711	470	546

*fleet size: 14 in 2015-17, 13 in 2018

6. Live bait species composition

The preferred species to be used as live bait are sardinellas (round sardinella *Sardinella aurita* and flat sardinella *S. maderensis*), sardines (*Sardina pilchardus*), anchovy (*Engraulis encrasicolus*) and horse mackerel (*Trachurus trachurus* and *T. trecae*). Other species can be taken such as juvenile mullet (*Mugil* spp.; 'guiss') and Atlantic bumpfish (*Chloroscombrus chrysurus*; 'plat-plat') but they are not appreciated by the pole-and-line vessels as bait; too high a proportion of these species in the catch and the livebait fishermen may have to provide additional catch in compensation (Fall and Guèye 2019).

A sample of livebait catch taken in October 2019 (Fall and Guèye 2019) showed that the catch was 95% round sardinella, with 2% juvenile grunt (*Brachyeuterus auritus*) and a small percentage of 7 other species, including flat sardinella, plat-plat, half-beak and juvenile jacks and breams. Obviously this sampling is too limited in scope (a single fishing operation) to draw any conclusions about the overall composition of the live bait catch, but it does agree with the information from both pirogue and pole-and-line owners that sardinella and related small pelagic species (sardine, anchovy) are the preferred live bait (noting that the two sardinella species are more abundant in Senegalese waters than either sardine or anchovy).

According to the observer reports from the EU tuna vessels, round sardinella is the main species which is preferred and used as live bait (mentioned in 87% of reports). The other species commonly mentioned (sardine: 6%, flat sardinella: 4%, mackerel and anchovy: 3%) are much less popular (Fall and Guèye 2019).

Senegal is also mentioned in a general report about baitfish fisheries in the pole-and-line sector globally (Gillett 2012). This report also suggests that the two sardinella species are the most commonly used as bait, and also mentions the false scad (chinchard jaune; *Caranx rhonchos*) which did not turn up in the October 2019 sampling. Reportedly, this species occurs in Senegalese waters mainly in the hot season (hence why it was not reported in October sampling) and is not considered to be a significant component of live bait even at that season, according to informants.

7. Institutional analysis of the live bait fishery

Fall and Guèye provide a useful summary of the organisations involved in the management of the live bait fishery in some way. In summary, these are as per

Organisation	**Role in relation to the live bait fishery**
Ministère de la Pêche et de l'Economie Maritime (Ministry of Fisheries and the Maritime Economy; MPEM)	Ministry in charge of fisheries and aquaculture policy and management; development of maritime areas; port infrastructure; maritime transport
Ministère de l'Agriculture et de l'Equipement Rural (Ministry of Agriculture and Rural Infrastructure; MAER) - Centre de Recherches Océanographiques de Dakar-Thiaroye (CRODT)	CRODT, which is an agency of MAER, is responsible for research into fisheries, aquaculture, oceanography and marine ecology
Ministère de l'Environnement et du Développement Durable (Ministry of the Environment and Sustainable Development) - Direction des Parcs Nationaux et Direction de Aires Marines Protégées et Communautaires (Divisions for National Parks and Protected and Community Marine Areas)	Responsible for the management of protected marine areas, including some nursery areas for juveniles including the species targeted by the live bait fishery
Institut Universitaire de Pêche et d'Aquaculture (IUPA/UCAD, Dakar), Unité de Formation et de Recherches Gestion des Ressources Halieutiques Pêche et Aquaculture (UFR GRHPA/USSEIN, Fatick), Laboratoire de Biologie et d'Ecologie des Poissons en Afrique de l'Ouest (LABEP-AO/IFAN/UCAD, Dakar), UFR des Sciences Agronomiques, de l'Aquaculture et des Technologies Alimentaires (UFR S2ATA/UGB, Saint-Louis), Ecole Inter-Etats des Sciences et Médecines Vétérinaires (EISMV/UCAD, Dakar),	Various research organisations who undertake fisheries-related research
Groupement des Armateurs et Industriels de la Pêche au Sénégal (GAIPES), Conseils Locaux de Pêche Artisanale (CLPA), Collectif National des Pêcheurs artisanaux du Sénégal (CNPS), Conseil national interprofessionnel de la Pêche artisanale au Sénégal (CONIPAS), Fédération nationale des Femmes Transformatrices (FENATRAMS), Fédération Nationale des Groupements d'Intérêt Economique des Pêcheurs (FENAGIE-PÊCHE), Fédération Nationale des Groupements d'Intérêt Economique de Mareyeurs du Sénégal (FENAMS), Union Nationale des GIE de Mareyeurs du Sénégal (UNAGIEMS),	Fisheries professional and producer organisations
Gendarmerie de l'environnement, Police and Customs	Monitoring, control and surveillance of fisheries and the marine environment

8. Live bait species in relation to an MSC assessment of the pole-and-line fishery

Under Principle 2 (impact on bycatch), MSC defines 'main' species as those making up 5% of the total catch (including bait) or more, except for vulnerable species where the threshold is 2%. In MSC scoring up to SG80, only 'main' species are taken into account – i.e. the fishery can score an unconditional pass for this element of the standard without taking into account any other bycatch species.

If we take at face value the estimate from the observers that bait makes up ~3-4% of the total 'catch' of bait plus tuna, then no bait species would be main unless they are considered vulnerable. The life history of the most important bait species (round sardinella, *Sardinella aurita*), however, does not put it in the 'vulnerable' category – it has a typical 'small pelagic' life history, being short-lived, early maturing and able to take opportunistic advantage of patchy resources via migratory behaviour. The same is true of the other bait species most commonly mentioned above, i.e. *S. maderensis*, sardine, anchovy and mackerel.

Having said that, the estimates of total bait consumption by the pole-and-line vessels are to be treated with caution, for various reasons:

- discrepencies between estimates made by different means;
- ratio of tuna:bait which appears high (not enough bait for too much tuna) in comparison to other pole-and-line fisheries;
- the possibility of vessels replenishing bait supplies at sea during trips.

Given these issues, it is probably safer to assume that there is the possibility that the most popular bait species (round sardinella) might be considered 'main' in an MSC assessment.

Below we discuss the stock status, information and management for the round sardinella stock in Senegal. Some provisional MSC scoring for *Sardinella aurita* as a main bait species in this fishery is provided in Appendix 1.

9. Round sardinella: stock status and data gaps

Round sardinella, and the other small pelagic stocks (sardinellas, sardines, anchovy, mackerel, horse mackerel etc.) are shared across the waters of several countries in NW Africa, from Morocco down to Guinea Bissau. The species are migratory, moving between jurisdictions seasonally, but also move opportunistically in response to concentrations of food (e.g. intermittent upwelling) and may be present in some waters more in some years than others, for reasons which are not fully explained. This makes their assessment and management difficult.

There is a regional scientific working group, convened by FAO, which brings together scientists from Morocco, Mauritania, Senegal, Gambia and the Canary Islands each year to analyse information (surveys, fisheries data, biological data) and assess the status of these stocks. The working group focuses on some of the stocks each year and in 2018 (the most recent report available; CECAF 2018) there was a stock assessment of *S. aurita*.

In 2018, the CECAF working group noted that the data provided by Mauritania and Senegal (the two key fishing nations for sardinella) were inadequate to attempt a formal stock assessment using a production model (see Section 10 below). The working group tried a length-based assessment (LCA) despite concerns about the length sampling from both Senegal and Mauritania, as well as a method

called SPiCT which tries to make use of a range of incomplete data sets. The results as reported by CECAF are given in Table 2.

Table 2. Summary of stock status indicators for *S. aurita* from CECAF 2018

Table 3.6.1: Summary of stock indicators for sardinella

Type of data	Indicators
Acoustic surveys	Acoustic estimate R/V *Dr Fridtjof Nansen* in June-July 2017 for sub-region is lowest in history for both species of Sardinella.
CPUE	- Sharp drop in CPUE Sardinella *spp*. Russian-type trawlers in Mauritania in 2017. Value for 2017 is lowest in history. - Further decline CPUE artisanal fleet in Mauritania in 2017 for both species of Sardinella. - Decreasing trend CPUE for *S. aurita* in Senegal during last 8 years.
Catches	- In Mauritania catches of *S. aurita* decreased by 41 percent in 2017. - In sub-region catches of *S. aurita* reduced by 21 percent in 2017
Length data	Modal length of *S. aurita* in Mauritanian artisanal catches in 2016-17 decreased by 3 cm since 2012. Catches now consist of young fish.
Test SPICT assessment	*S. aurita* heavily over exploited; biomass below MSY level, fishing mortality well above F_{MSY}.

In other words, although a quantitative estimate of stock status in relation to reference points is not possible based on the data available, the various methods and indicators all point the same way: the stock is badly overfished.

Based on this analysis, CECAF makes the following recommendations:

- A reduction in fishing effort on *S. aurita* of at least 50% across the region, which should focus on the reduction fishery sector in particular;
- National governments should strongly improve their national sampling systems to allow better estimates of stock size and fishing mortality; the lack of adequate data is an added risk to the fishery.

10. Data gaps for the livebait fishery with implications for MSC

Data on use of live bait in the pole-and-line fishery

As is evident above, although there are some data on live bait use in the pole-and-line fishery, most notably from observers on board the EU vessels, the data are inadequate to estimate total bait use by the fleet with any confidence, although an approximation can be made. The vessels themselves do not report live bait purchases (quantity or species composition) nor do they report live bait catch at sea. It is also reported (Fall and Guèye 2019) that the Senegalese-flagged vessels do not allow scientific observers on board, which is presumably in contravention of Senegalese regulations.

Data on the sardinella stock in general

CECAF was highly critical of the data available for assessment of the two sardinella stocks. They note (CECAF 2018 p31): *The problems with data quality, identified in previous reports, persisted in 2017. It is extremely worrying that the two countries with the largest interests in the sardinella fishery, Mauritania and Senegal, do not seem to be able to provide adequate data on catches, fishing effort and length composition to the Working Group*. In relation to Senegal specifically they note:

- landings direct to fishmeal plants are not reported to CRODT;
- inadequate length sampling of the catch (number of individuals per sample ‘minimal’);

- artisanal fishery CPUE time series not corrected / standardised for fishing power;
- data not reported to the working group in sufficient detail to be usable.

11. Proposed FIP actions in relation to the live bait fishery

The logical course of action for the FIP in relation to the live bait fishery, from the perspective of the MSC standard is as follows:

Firstly, work to improve the estimates of live bait use and species composition by the pole-and-line fleet, such that a reasonable estimate of bait use by species as a percentage of total tuna landings (or to be more precise, tuna+bait). If this can be shown to be consistently <5% for all the species concerned, then from the MSC point of view there is no issue and the FIP can move on to other activities. Note that a doctoral candidate (M. Guèye) is soon to complete his research on this fishery, and this may be of considerable usefulness to the FIP.

If, on the other hand, it is shown that there is one or several live bait species where the proportion is 5% or more of tuna landings plus bait, then the FIP needs to continue to work to improve the sustainability of this activity. Fall and Diata (2014) provide a range of general recommendations to reduce the impact of the fishery for juvenile fish as live bait (or as bait in general), and it is recommended that the FIP consult them or other local expert scientists.

In terms of activities tailored to the MSC scoring (Appendix 1), in the event that there are 'main' bait species, it is recommended to proceed along the following lines:

- For pole-and-line vessels participating in the FIP ('FIP vessels'), gather more information on their capacity for live bait (i.e. number and maximum fish capacity of their viviers), quantity of bait purchased each trip, number of trips per year over the last few years, preferred bait species and the frequency of catching bait at sea, along with the species and quantities involved. This may be via a questionnaire to the FIP vessels, or the recruitment of one or a few vessels to provide information to the FIP over a period of time or by working with pirogue owners contracted to particular vessels, or any other suitable means.
- Ask FIP vessels to start reporting systematically quantity and species composition of their live bait purchases, e.g. via a supplement to the logbook. It is recognised that these data will be estimates but nevertheless it will be an improvement on the current data available. It would be helpful for the long-term management of the fishery if vessels could make these data available to Senegalese scientists (CRODT).
- Engage with scientists working on small pelagics (i.e. CRODT CECAF participants) to evaluate whether data can be provided by the FIP which is useful for stock assessment purposes (e.g. length samples, live bait pirogue catch per unit effort), and if so, how these data can best be gathered.
- Encourage the Senegal authorities to focus on improving management of the live bait fishery, perhaps along the lines proposed by Fall and Diatta (2014; see summary in Fall and Guèye 2019) , e.g. via formal position statements or other engagement opportunities.
- Encourage the Senegal authorities to focus on improving information and management of the sardinella fishery, e.g. via formal position statements or other engagement opportunities.

References

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Appendix 1: MSC scoring for *Sardinella aurita* as a 'main' live bait species in this fishery

The scoring of 'main' bait species can be either under 2.1.1-2.1.3 (primary species) or 2.2.1-2.2.3 (secondary species). The definition of a primary species according to MSC is: *Species where management tools and measures are in place, intended to achieve stock management objectives reflected in either limit or target reference points* (FCRG version SA3.1.3.3); species not meeting this definition are classified as secondary. MSC also states (same paragraph): *In cases where a species would be classified as primary due to the management measures of one jurisdiction but not another that overlaps with the UoA, that species shall still be considered as primary.*

The problem here is that it is not clear whether the definition of primary species is met for *S. aurita*. The stock is shared between several jurisdictions (Mauritania, Senegal and Gambia notably). Reference points for the stock are defined by CECAF (2018) but data limitations mean that the status of the stock in relation to these reference points cannot be defined with confidence. Various management measures are in place in the various jurisdictions, but not, as far as we know, linked directly to the reference points defined by CECAF; however, these jurisdictions are members of CECAF and have therefore accepted the reference points as suitable objectives – therefore management in these jurisdictions could be said to 'intend' to achieve these objectives.

Since this cannot be resolved, below *S. aurita* is scored both as a primary and as a secondary species. The requirements are in any case very similar. Note that the scoring below is precautionary since this is more prudent for a FIP.

Evaluation Table for PI 2.1.1 – Primary species outcome: *Sardinella aurita* as a 'main' bait species in the Senegal pole-and-line fishery

PI 2.1.1		**The UoA aims to maintain primary species above the PRI and does not hinder recovery of primary species if they are below the PRI.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Main primary species stock status			
	Guidepost	Main primary species are **likely** to be above the PRI OR If the species is below the PRI, the UoA has measures in place that are **expected** to ensure that the UoA does not hinder recovery and rebuilding.	Main primary species are **highly likely** to be above the PRI OR If the species is below the PRI, there is either **evidence of recovery** or a demonstrably effective strategy in place **between all MSC UoAs which categorise this species as main**, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main primary species are above the PRI **and are** fluctuating around a level consistent with MSY.
	Met?	Y	N	N
	Justification	The stock is overfished, but the extent of the overfishing is unclear. The PRI is likely to be low for this type of species (recruitment decoupled from spawner biomass except at very low biomass) and the evidence suggests that there continues to be juvenile fish around (Table 2). We can therefore consider that the stock is 'likely' but not 'highly likely' to be above the PRI. Senegal reported to ICCAT a total catch of tuna (all species) by the Senegal-flagged pole-and-line fleet (6 vessels out of 14 total) of 3349 t in 2017 and 1542 t in 2018. The Senegalese-flagged vessels make up 39% of the total tonnage of the fleet; scaling this catch up by tonnage gives an estimate of the total tuna catch of the pole-and-line fleet of ~8600 t in 2017 (using 2017 data to get a maximum estimate). The estimate of bait use as ~4% of tuna catch (see above) would give a corresponding estimate of total bait at 344 t. As noted above, this percentage is possibly too low, but it points to a maximum bait use of maybe 1000 t per year of *S. aurita* by the pole-and-line fleet. The total catch of *S. aurita* in Senegal in 2017, as reported to CECAF, was 191,500 t, meaning that the live bait fishery represents 0.5% at most of the total national catch from this stock in 2017.		

		On this basis, even if the species is not above the PRI, the low impact of the UoA (i.e. the pole-and-line vessels use of live bait) is expected to ensure that the UoA does not hinder recovery and rebuilding. SG60 is met. Since there is neither evidence of recovery nor a demonstrably effective strategy, SG80 is not met.		
b	Minor primary species stock status			
	Guidepost			Minor primary species are highly likely to be above the PRI. OR If below the PRI, there is evidence that the UoA does not hinder the recovery and rebuilding of minor primary species.
	Met?			NA
	Justification			
References		Fall and Guèye 2019, CECAF 2018		
OVERALL PERFORMANCE INDICATOR SCORE:				**60**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.1.2 – Primary species management strategy: *Sardinella aurita* as a 'main' bait species in the Senegal pole-and-line fishery

PI 2.1.2		**There is a strategy in place that is designed to maintain or to not hinder rebuilding of primary species, and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.**		
Scoring Issue		SG 60	SG 80	SG 100
a	Management strategy in place			
	Guidepost	There are **measures** in place for the UoA, if necessary, that are expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are likely to above the point where recruitment would be impaired.	There is a **partial strategy** in place for the UoA, if necessary, that is expected to maintain or to not hinder rebuilding of the main primary species at/to levels which are highly likely to be above the point where recruitment would be impaired.	There is a **strategy** in place for the UoA for managing main and minor primary species.
	Met?	Y	Y	N
	Justification	The low level of catch / use of *S. aurita* by the UoA in relation to the large catches from the stock overall (in Senegal and also in Mauritania which reported a catch in 2017 of 172,000 t) can be considered to constitute 'measures' which ensure that the UoA is not hinder rebuilding of the stock. SG60 is met. There are also some measures in place in Senegal which are designed to control the fishery for live bait and make sure that it does not expand to other markets: i.e. under arrêté 7225 of March 2018, pirogues may only fish live bait under a valid contract with a tuna vessel, and using gear provided by the tuna vessel. This could be considered a 'partial strategy' to avoid the live bait fishery having an impact on these stocks. SG80 is met. Lacking a formal strategy to manage the sardinella stock (which would have to be at a regional level), SG100 is not met.		
b	Management strategy evaluation			
	Guidepost	The measures are considered **likely** to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some **objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the fishery and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the fishery and/or species involved.

	Met?	Y	N	N
	Justification	Based on the figures provided above, a plausible argument can be made that these measures are likely to work; SG60 is met. However, the figures are fairly sketchy and lacking better data on live bait use by the tuna vessels, and more information about the operation of the live bait fishery (does it conform to the requirements of arrêté 7225?) this cannot go as far as 'an objective basis for confidence. SG80 is not met.		
c	Management strategy implementation			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its overall objective as set out in scoring issue (a).
	Met?		N	N
	Justification	We do not know at present		
d	Shark finning			
	Guidepost	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	NA	NA	NA
	Justification	*S. aurita* is not a shark		
e	Review of alternative measures			
	Guidepost	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of main primary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of unwanted catch of all primary species, and they are implemented, as appropriate.

	Met?	NA	NA	NA
	Justification	Unwanted catch is defined by MSC as: *the part of the catch that a fisher did not intend to catch but could not avoid, and did not want or chose not to use*. Some live bait may die on board the tuna vessel during the trip but this does not meet the definition. The piroguiers may catch some bait that the tuna vessel does not want (e.g. wrong species), but this does not apply to *S. aurita* which is the most desirable species for live bait. Not applicable.		
References		Fall and Guèye 2019, CECAF 2018 Arrêté 7225 of 30 March 2018 fixant les conditions de prélèvement de l'appât vivant par les navires thoniers canneurs dans les eaux sous juridiction sénégalese		
OVERALL PERFORMANCE INDICATOR SCORE:				**65**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.1.3 – Primary species information: *Sardinella aurita* as a 'main' bait species in the Senegal pole-and-line fishery

PI 2.1.3		Information on the nature and extent of primary species is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage primary species		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impact on main species			
	Guidepost	Qualitative information is **adequate to estimate** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Qualitative information is adequate to estimate productivity and susceptibility attributes for main primary species.	Some quantitative information is available and is **adequate to assess** the impact of the UoA on the main primary species with respect to status. OR If RBF is used to score PI 2.1.1 for the UoA: Some quantitative information is adequate to assess productivity and susceptibility attributes for main primary species.	Quantitative information is available and is **adequate to assess with a high degree of certainty** the impact of the UoA on main primary species with respect to status.
	Met?	Y	N	N
	Justification	As attempted above, there is qualitative (or semi-quantitative) information with which we can attempt to estimate the impact of the UoA on the stock of *S. aurita*. SG60 is met. Estimates of both bait use by the tuna vessels, and the total catch (and other data) of *S. aurita* are largely inadequate, however (as underlined by CECAF). The Senegalese pole-and-line vessels refuse to have scientific observers on board. SG80 is not met.		
b	Information adequacy for assessment of impact on minor species			
	Guidepost			Some quantitative information is adequate to estimate the impact of the UoA on minor primary species with respect to status.
	Met?			NA

	Justification			
c	Information adequacy for management strategy			
	Guidepost	Information is adequate to support **measures** to manage **main** primary species.	Information is adequate to support a **partial strategy** to manage **main** Primary species.	Information is adequate to support a **strategy** to manage **all** primary species, and evaluate with a **high degree of certainty** whether the strategy is achieving its objective.
	Met?	Y	N	N
	Justification	Information is adequate to conclude that there is most likely little impact from the UoA on *S. aurita* – SG60 is met. As noted in 2.1.2, there are measures in place which could comprise a 'partial strategy' but lacking good data on the sardinella fishery in general (according to CECAF) as well as the use of sardinella and other species in the pole-and-line fishery, the information is not really sufficient to evaluate robustly whether it is working. SG80 is not met.		
References		Fall and Guèye 2019, CECAF 2018		
OVERALL PERFORMANCE INDICATOR SCORE:				**60**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.2.1 – Secondary species outcome

PI 2.2.1		The UoA aims to maintain secondary species above a biological based limit and does not hinder recovery of secondary species if they are below a biological based limit.		
Scoring Issue		SG 60	SG 80	SG 100
a	Main secondary species stock status			
	Guidepost	Main Secondary species are **likely** to be within biologically based limits. OR If below biologically based limits, there are measures in place expected to ensure that the UoA does not hinder recovery and rebuilding.	Main secondary species are **highly likely** to be above biologically based limits OR If below biologically based limits, there is either **evidence of recovery** or a **demonstrably effective partial strategy** in place such that the UoA does not hinder recovery and rebuilding. AND Where catches of a main secondary species outside of biological limits are considerable, there is either evidence of recovery or a, demonstrably effective strategy in place between those MSC UoAs that also have considerable catches of the species, to ensure that they collectively do not hinder recovery and rebuilding.	There is a **high degree of certainty** that main secondary species are within biologically based limits.
	Met?	Y	N	N
	Justification	The stock is overfished, but the extent of the overfishing is unclear. The PRI is likely to be low for this type of species (recruitment decoupled from spawner biomass except at very low biomass) and the evidence suggests that there continues to be juvenile fish around (Table 2). We can therefore consider that the stock is 'likely' but not 'highly likely' to be above biologically-based limits (defined by MSC as the PRI or some appropriate proxy).		

		Senegal reported to ICCAT a total catch of tuna (all species) by the Senegal-flagged pole-and-line fleet (6 vessels out of 14 total) of 3349 t in 2017 and 1542 t in 2018. The Senegalese-flagged vessels make up 39% of the total tonnage of the fleet; scaling this catch up by tonnage gives an estimate of the total tuna catch of the pole-and-line fleet of ~8600 t in 2017 (using 2017 data to get a maximum estimate). The estimate of bait use as ~4% of tuna catch (see above) would give a corresponding estimate of total bait at 344 t. As noted above, this is possibly too low, but it points to a maximum bait use of maybe 1000 t per year of *S. aurita* by the pole-and-line fleet. The total catch of *S. aurita* in Senegal n 2017, as reported to CECAF, was 191,500 t, meaning that the live bait fishery represents 0.5% at most of the total national catch from this stock in 2017. On this basis, even if the species is not above the PRI, the low impact of the UoA (i.e. the pole-and-line vessels use of live bait) is expected to ensure that the UoA does not hinder recovery and rebuilding. SG60 is met. Since there is neither evidence of recovery nor a demonstrably effective strategy, SG80 is not met.		
b	**Minor secondary species stock status**			
	Guidepost			For minor species that are below biologically based limits', there is evidence that the UoA does not hinder the recovery and rebuilding of secondary species
	Met?			NA
	Justification			
References		Fall and Guèye 2019, CECAF 2018		
OVERALL PERFORMANCE INDICATOR SCORE:				**60**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.2.2 – Secondary species management strategy

PI 2.2.2		There is a strategy in place for managing secondary species that is designed to maintain or to not hinder rebuilding of secondary species and the UoA regularly reviews and implements measures, as appropriate, to minimise the mortality of unwanted catch.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Management strategy in place**			
	Guidepost	There are **measures** in place, if necessary, which are expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **partial strategy** in place, if necessary, for the UoA that is expected to maintain or not hinder rebuilding of main secondary species at/to levels which are highly likely to be within biologically based limits or to ensure that the UoA does not hinder their recovery.	There is a **strategy** in place for the UoA for managing main and minor secondary species.
	Met?	Y	Y	N
	Justification	The low level of catch / use of *S. aurita* by the UoA in relation to the large catches from the stock overall (in Senegal and also in Mauritania which reported a catch in 2017 of 172,000 t) can be considered to constitute 'measures' which ensure that the UoA is not hinder rebuilding of the stock. SG60 is met. There are also some measures in place in Senegal which are designed to control the fishery for live bait and make sure that it does not expand to other markets: i.e. under arrêté 7225 of March 2018, pirogues may only fish live bait under a valid contract with a tuna vessel, and using gear provided by the tuna vessel. This could be considered a 'partial strategy' to avoid the live bait fishery having an impact on these stocks. SG80 is met. Lacking a formal strategy to manage the sardinella stock (which would have to be at a regional level), SG100 is not met.		
b	Management strategy evaluation			
	Guidepost	The measures are considered **likely** to work, based on plausible argument (e.g. general experience, theory or comparison with similar UoAs/species).	There is **some objective basis for confidence** that the measures/partial strategy will work, based on some information directly about the UoA and/or species involved.	**Testing** supports **high confidence** that the partial strategy/strategy will work, based on information directly about the UoA and/or species involved.

	Met?	Y	N	N
	Justification	Based on the figures provided above, a plausible argument can be made that these measures are likely to work; SG60 is met. However, the figures are fairly sketchy and lacking better data on live bait use by the tuna vessels, and more information about the operation of the live bait fishery (does it conform to the requirements of arrêté 7225?) this cannot go as far as 'an objective basis for confidence. SG80 is not met.		
c	Management strategy implementation			
	Guidepost		There is **some evidence** that the measures/partial strategy is being **implemented successfully**.	There is clear evidence that the partial strategy/strategy is being implemented successfully and is achieving its objective as set out in scoring issue (a).
	Met?		N	N
	Justification	We do not know at present		
d	Shark finning			
	Guidepost	It is **likely** that shark finning is not taking place.	It is **highly likely** that shark finning is not taking place.	There is a **high degree of certainty** that shark finning is not taking place.
	Met?	NA	NA	NA
	Justification	*S. aurita* is not a shark		
e	Review of alternative measures to minimise mortality of unwanted catch			

	Guidepost	There is a review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species.	There is a **regular** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of main secondary species and they are implemented as appropriate.	There is a **biennial** review of the potential effectiveness and practicality of alternative measures to minimise UoA-related mortality of **unwanted** catch of all secondary species, and they are implemented, as appropriate.
	Met?	NA	NA	NA
	Justification	See 2.1.2e		
References		Fall and Guèye 2019, CECAF 2018 Arrêté 7225 of 30 March 2018 fixant les conditions de prélèvement de l'appât vivant par les navires thoniers canneurs dans les eaux sous juridiction sénégalese		
OVERALL PERFORMANCE INDICATOR SCORE:				**65**
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 2.2.3 – Secondary species information

PI 2.2.3		Information on the nature and amount of secondary species taken is adequate to determine the risk posed by the UoA and the effectiveness of the strategy to manage secondary species.		
Scoring Issue		SG 60	SG 80	SG 100
a	Information adequacy for assessment of impacts on main secondary species			
	Guidepost	Qualitative information is **adequate to estimate** the impact of the UoA on the main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Qualitative information is adequate to estimate productivity and susceptibility attributes for main secondary species.	Some quantitative information is available and **adequate to assess** the impact of the UoA on main secondary species with respect to status. OR **If RBF is used to score PI 2.2.1 for the UoA:** Some quantitative information is adequate to assess productivity and susceptibility attributes for main secondary species.	Quantitative information is available and **adequate to assess with a high degree of certainty** the impact of the UoA on main secondary species with respect to status.
	Met?	Y	N	N
	Justification	As attempted above, there is qualitative (or semi-quantitative) information with which we can attempt to estimate the impact of the UoA on the stock of *S. aurita*. SG60 is met. Estimates of both bait use by the tuna vessels, and the total catch (and other data) of *S. aurita* are largely inadequate, however (as underlined by CECAF). The Senegalese pole-and-line vessels refuse to have scientific observers on board. SG80 is not met.		
b	**Information adequacy for assessment of impacts on minor secondary species**			
	Guidepost			Some quantitative information is adequate to estimate the impact of the UoA on minor secondary species with respect to status.
	Met?			NA

	Justification			
c	Information adequacy for management strategy			
	Guidepost	Information is adequate to support **measures** to manage **main** secondary species.	Information is adequate to support a **partial strategy** to manage **main** secondary species.	Information is adequate to support a **strategy** to manage **all** secondary species, and **evaluate** with a **high degree of certainty** whether the strategy is **achieving its objective**.
	Met?	Y	N	N
	Justification	Information is adequate to conclude that there is most likely little impact from the UoA on *S. aurita* – SG60 is met. As noted in 2.2.2, there are measures in place which could comprise a 'partial strategy' but lacking good data on the sardinella fishery in general (according to CECAF) as well as the use of sardinella and other species in the pole-and-line fishery, the information is not really sufficient to evaluate robustly whether it is working. SG80 is not met.		
References		Fall and Guèye 2019, CECAF 2018		
				60
CONDITION NUMBER (if relevant):				