

OFFICE DE LA RECHERCHE SCIENTIFIQUE
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O R S T O M

ACOUSTIC SURVEY OF THE PELAGIC RESOURCES
IN SENEGAL, GAMBIA AND MAURETANIA WATERS
IN 1980 : MAIN RESULTS FROM CRUISES
ECHOSAR 1 AND ECHOSAR 2 OF R/V CAPRICORNE

BY

E. MARCHAL, F. GERLOTTO, E. JOSSE

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Antenne ORSTOM
Centre Océanologique de Bretagne
BREST - FRANCE.

INTRODUCTION

The area between Guinea Bissau and Cape Blanc (Mauretania) is under the influence of different marine seasons. The waters in this area are cool with high salinity from January to April and warm with low salinity from August to November. Other times of the year the water has intermediate temperatures and salinities with varying degrees.

Most species of fish, and especially pelagic ones, react to the differences in salinity and temperature by either moving or migrating. Some follow water masses, others enter shallow water, others dive to deep water, and some leave the Continental Shelf.

Therefore it is necessary to gather data in many locations at different seasons to properly assess the biomass of stocks in different species.

A new event appears recently in these waters : the development of the species *Balistes carolinensis* which appears in considerable population and has been noted previously in further south areas (e.g. Guinea). The appearance of this species has an impact on viably commercial species.

Following the recommendations of CEECAF meetings the ORSTOM decided to promote a new program aimed at assessing the biomass of pelagic fish at different seasons in the area from Cape Roxo to Cape Blanc by means of acoustic survey and identification operations.

Two survey cruises were performed in 1980. One in the cold water season by ECHOSAR I and the other in warm water season by ECHOSAR II. Important facts and figures are described below however a more extensive accounting is presented in the French version.

CRUISE ECHOSAR 1

This cruise took place in February, i.e. in the real cool season, when the thermal front was situated farthest south. The cruise started by a preliminary track covering all the area from south to north to get a general picture of the distribution. The main cruise covered the continental

shelf from the 10 m depth line to the 200 m depth line. According to the results of the preliminary track, an attempt was made to adjust the grid of the main track to the density of the detections : in other words, the stronger the detections found during the preliminary track, the tighter the grid during the main cruise. This was not very successful.

For identification purpose, 32 pelagic trawling hauls were made. The senegalese R/V LAURENT AMARO performed 29 bottom trawling hauls in the mean time on the senegalese continental shelf.

For convenience the data have been put together in three big areas more or less corresponding to state boundaries. However, South Senegal and Gambia have not been split because of their geographical dependence. The estimations given below take into account the results of day and night prospection for the best.

COUNTRIES	density (tons/n.m ²)	area (n.m ²)	biomass (tons)
MAURITANIA	134,1	6211	833 000
NORTH SENEGAL	129,0	1597	206 000
SOUTH SENEGAL AND GAMBIA	104,8	5180	543 000
TOTAL	121,8	12988	1582 000

We must point out that in the south, and mainly in Gambia, many schools of fish were detected by sonar in shallow waters during day time but apparently avoided the ship and were not taken into account in the integrated values, leading to a serious under-estimation of the coastal population. In regards to species distribution, the following features have been noted : *Sardina pilchardus* has been found only in the north near Cape Blanc. From Arguin Shoals to the mouths of Senegal river the following aggregations were localized : the black horse mackerel, *Trachurus trachurus*, from north to Nouakchott. From here to south, *Brachydeuterus auritus* (the big-eyed) and a few *Balistes* in front of Nouakchott. In the coastal sector, *Sardinella maderensis*.

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From Senegal river to Cape Verde, many *Brachydeuterus auritus*, but no *Balistes*.

From Cape Verde to Gambia, large aggregations of *Sardinella sp.*, *Trachurus trecae* (horse-mackerel), *Scomber japonicus* (mackerel). Those species were scattered during night but were schooling during day time. As mentioned previously, many schools were detected in front of Gambia river. Further south, *Sardinella maderensis* and mostly *Brachydeuterus auritus* were found between the coast and 30 m depth, beyond replaced by *Balistes carolinensis* which represented 80 to 100 per cent in the catch by trawling.

CRUISE ECHOSAR 2

This cruise took place in September, in the middle of the warm season. However, the thermal front had started to move southwards and had reached south of Cape Timiris near the 20th of September. The extension of the surveyed area was the same than in February but the grid of the track was somewhat different. We chose to make a regular grid with parallel transects 5 n.m. a part, except in the northern part where the distance between transects was extended to 7.5 n.m. For identification purpose 24 pelagic hauls were given by the R/V CAPRICORNE and 51 bottom hauls by the R/V LAURENT AMARO in the same conditions as the first cruise.

A digital integrator was just installed for the cruise and used concurrently with the analog equipment.

The presentation of the data is made in the same way as was for ECHOSAR 1 :

COUNTRIES	density (tons/n.m ²)	area (n.m ²)	biomass (tons)
MAURITANIA	105,1	6211	653 000
NORTH SENEGAL	29,4	1597	47 000
SOUTH SENEGAL AND GAMBIA	58,9	5180	305 000
TOTAL	77,4	12988	1005 000

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Concerning the species distribution, the total absence of *Sardinia pilchardus* as well as *Trachurus trachurus* was pointed out. The other species of horse-mackerel, *Trachurus trecae*, was only found in the north of Cape Verde, excepted an aggregation south of Dakar. *Sardinella aurita* was found in small quantity in the total area but more dense in the coastal community between Dakar and south of Gambia. Big *Sardinella madensis* (F L : 23-27 cm) were found in the north in very shallow waters, instead of smaller specimens (F L : 16-19 cm) all along the coast from Cape Verde to Cape Roxo. The distribution of *Brachydeuterus auritus* was been found to be the same as in cold season.

Very few specimens of *Balistes* were found in almost all the hauls between Dakar and Nouakchott. South of Cape Verde, the *Balistes* seem to have a different pattern of distribution according to pelagic and bottom catch composition. The pelagic part of the stock was only found south of Gambia river between isolines 30 m and 80 m depth. However, the demersal part was spread on the total area from Dakar to Cape Roxo into the isobath 20 m and 50 m (the Gambian shelf was not surveyed by the R/V LAURENT AMARO).

CONCLUSIONS

The very important decrease in the estimated biomass from ECHOSAR 1 to ECHOSAR 2 does correspond to a real movement of populations, as it was pointed out and described elsewhere.

As an example the black horse-mackerel *Trachurus trachurus* disappeared completely from the whole area during the warm season.

The case of *Sardinella sp.* is different : one part of the population really moves over long distances, but the other part remains in coastal waters. Since those waters are partly uncovered by the survey and the fish might enter more or less into very shallow waters, then it is obvious that the biomass estimates are biased and more informations about the biology and the ecology of those species is needed.

The population of *Balistes* seems not to be extended northwards during warm season, as it was worried from previous information. However, this species must be watched carefully, since its great potential of development is well known.

X In conclusion the total biomass estimated for the whole area seems rather small, in comparison with other results found between 1973 and 1977.

Another cruise has been planned for May 1981. It should provide better knowledge of the movements of the populations, since it is scheduled between the two main seasons.