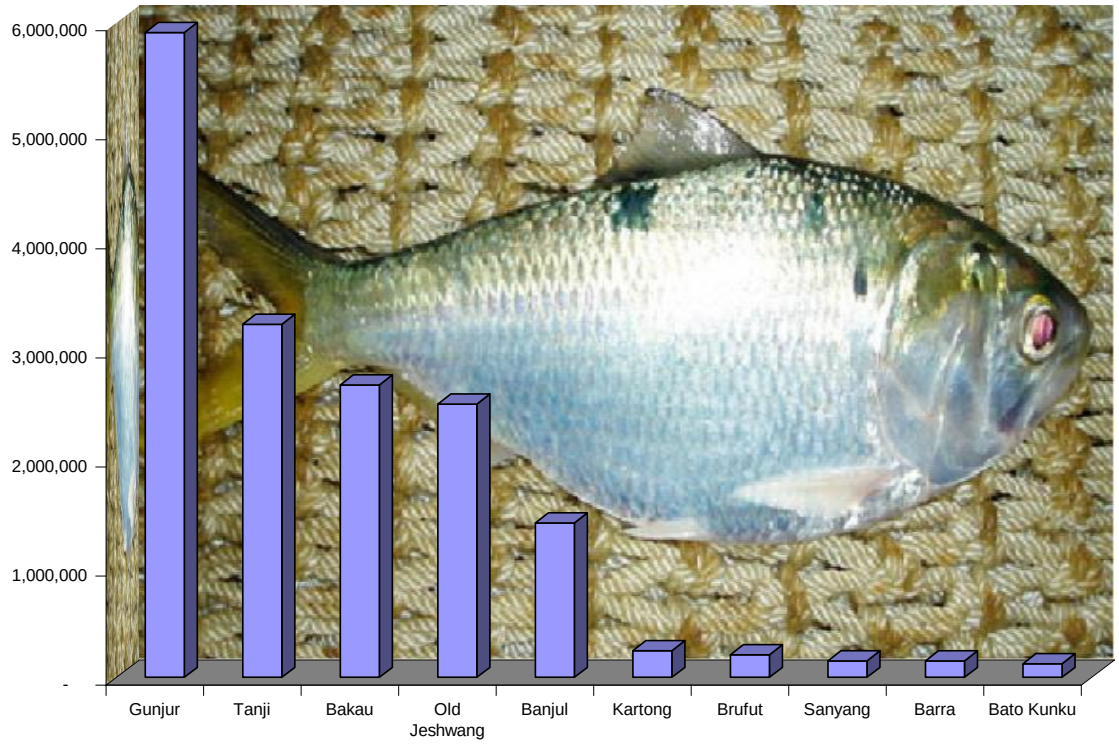
THE REPUBLIC OF THE GAMBIA

2009 CATCH ASSESSMENT SURVEY REPORT



GAMBIA ARTISANAL FISHERIES DEVELOPMENT PROJECT
DEPARTMENT OF FISHERIES
MINISTRY OF FISHERIES, WATER RESOURCES AND NAM
BANJUL, THE GAMBIA

Executive Summary

There are two fishing industries in the Gambia, both several fishing targeting one or more fish species. The country has a diverse and considerable fisheries resources; if properly managed will contribute towards social, economic and cultural advancement of the country. The contribution of the two industries varies; the artisanal fisheries is the major supplier of food fish, the main source of much needed animal protein. It is also the principal source of raw fish material for the fish processing establishments operating in the Gambia.

The artisanal sector has evolved over the years to become an important employer; 1 410 head fishermen and 4 694 fishing assistants operating from the 154 landing sites in the Gambia (2006). Artisanal fishing industry targets all species using different fishing gears. Catch and effort data are captures through catch assessment surveys (CAS), a sampled based survey. It estimates amount of fish caught and effort employed for the extraction of fish over a given period. The 11 fish landing sites in the Atlantic Coast were all covered in 2008 while 13 sample landing sites were selected and covered in the same period from the other four fisheries administrative areas due to human and technical limitations.

It was estimated that a total artisanal fishing industry has employed nearly 240 000 fishing days to catch and land about 46 000 tonnes of fish in 2009. The effort used in 2009 were distributed as follows; the Atlantic Coast, 103 000 fishing days and the Inland, 136 000 fishing days. Total national fisheries (artisanal and industrial) production in 2009 was estimated at nearly 49 000 tonnes. The coastal artisanal fisheries contributed the bulk (75%) of the total fisheries production in 2009 and inland fisheries 19 percent. *Ethmalosa frimbriata* (Bonga/Shad) constituted nearly 23 percent.

The encircling/surround gillnet and Set/bottom gillnet were the most important gears used by the artisanal fishing industry in 2009. They are responsible for most fish landings. Surround gillnet targets small pelagic fish, particularly bonga which is an inshore and estuarine species while Set/bottom gillnet target a wide range of demersal and sub-demersal fish species.

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CHAPTER 1

1.1. INTRODUCTION / BACKGROUND

The small Western State, The Gambia is bordered on three sides by the Republic of Senegal and on the west by the Atlantic Ocean. Located in the highly productive upwelling zone of the Atlantic Ocean, its coastline is about 80 km. Indications are that the Gambia has considerable marine and estuarine fisheries resources and that the exploitation and utilization of the resources can contribute significantly to national socio-economic development. Two types of fisheries operate in the Gambia; artisanal fisheries and industrial fisheries. These fisheries are distinguished by their mode of operation but target and compete for the same fish stocks.

Fisheries production is monitored through established information collection systems. Artisanal and industrial fisheries fish catches and efforts used in total production estimates for both sub-sectors are captured through a sample survey (Catch Assessment Survey [CAS]) and Fisheries Observer programme respectively. The data collected through these systems are used in the planning, development and management of our fisheries. This report focuses on artisanal fisheries production.

Policy objectives and socioeconomic importance

The fisheries policy objectives are linked. to some key national development objectives such as: increased food self-sufficiency and security; a healthy population and enhanced employment opportunities for nationals; increased revenue generation and foreign exchange earnings; and the attainment of national social and economic development. The sectoral policy objectives have basically remained unchanged over the years but the strategies for their attainment are being continually amended (and some discarded) to reflect the changing situations in fisheries at the national, sub-regional, regional and global levels.

The latest (2009) survey of the artisanal fishing units estimated about 1 785 artisanal fishing canoes operating in both the marine and the River Gambia. In the same year, it was estimated that the artisanal fisheries sub-sector provided direct employment to 1 410 head fishermen and 4 694 assistant fishermen. The sub-sector is associated with a number of ancillary workers such as boat builders, fish processors, fish retailers, etc. It is estimated that over 200 000 people were directly or indirectly dependent on artisanal fisheries and its related activities for their livelihoods. The artisanal fishing industry is the major source of raw fish materials for the fish processing establishments in the Gambia and the major supplier of food fish for the Gambian population. The bulk of fish exports from the Gambia could be traced back to the artisanal fishery.

The development of industrial fisheries has been relatively limited in the Gambia. Most industrial vessels operating are mostly foreign owned they land their catches in foreign ports where the fish is processed, packaged and labeled as products originating from those foreign ports. It is estimated that less than 2000 people are employed in the industrial sub-sector the majority of who are factory workers (mainly women).

1.2 SCOPE OF THE SURVEY

The main purpose of the catch assessment survey (CAS) is the continuous collection, processing and production of catch and effort statistics from the Artisanal Fisheries sub-sector. CAS is sample based and done in space and time covering all the landing sites in the Atlantic Coast and pre-selected landing sites or Primary Sampling Unit [PSU] in inland. It records catch and effort by gear-type (6 canoes) and species caught and landed.

1.3 ITEMS OF INFORMATION COLLECTED

The information collected through the CAS include; Information on number of canoes per gear-type that went fishing on the sampling day for each PSU and catch and effort. The types of species and crew size of six canoes (by gear-type) sampled are also recorded. Information on the number of Fishing Units operating from the selected PSUs is collected too.

1.4 CATCH ASSESSMENT SURVEY TEAMS

There are five fisheries administrative areas in the Gambia namely; the Atlantic Coast, Lower River North Bank [LRNB], Lower River South Bank [LRSB], Upper River North Bank [URNB] and Upper River South Bank [URSB]. Of these, the ACS is fully covered and in each site there is one or more field staff equipped with the necessary equipment and materials conducting the survey. Despite financial and human resources constraint, the Fisheries Department has posted staff to selected PSUs to conduct CAS among others. Field-based staff are continually trained and re-trained on biological and statistical data collection and processing. A data entry was also constituted and is based in the office.

1.5 TRAINING

Class room and on the sites training are regularly organized to refresh field staff. In 2009, three field and class room training on a wide range subjects including fish species identification, statistical methods, the use of CAS equipment, data analysis, biological parameters measurement, etc. were conducted.

1.6 QUALITY CONTROL OPERATIONS

The timely availability of accurate is paramount in effective planning and management of the fisheries sector. To ensure data quality, checks were carried out in the field by supervisors. They checked for completeness and accuracy of the data collection forms before submitting them for processing in the office. The data is verified and entered in a main frame computer for processing and analysis.

1.7 DATA PROCESSING

CSPro 3.0 software was adapted for fisheries data entry. However, data were coded prior to being input into computer. Validation rules were assigned to the variables to avoid duplication, typographical and other errors. The SPSS, Version 17.0 Software was used to produce the necessary output tables for the report.

1.8 BASIC CONCEPTS AND DEFINITIONS

In order that the reader understands and appreciates the amount and quality of data herewith provided, it is imperative that certain concepts are explained.

Artisanal fisheries

Traditional or artisanal fishing is a low capital investment activity with fishers operating from fish landing sites throughout the country. Primitive to simple fish capturing techniques were being used as it was purely to provide food fish to members of the fishermen households. This has since evolved into commercial enterprises supplying raw material fish to fish processing plants and market centres in the municipalities and up country.

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Fishery

Refers to the economic activities of capture or culture of aquatic animals and plants.

Capture

Refers to the catching or gathering of aquatic animals and plants. Normally, capture involves living aquatic animals and plants, although gathering of shells, corals, etc., which is already dead, is also considered as capture.

Catch refers to total fish hauled during fishing operations. The catch may not all necessarily be landed as some unwanted fish may be discarded at sea. Landings refers to those fish that are kept and landed at home ports or landing sites for consumption and sale.

Fisherman

Fisherman refers to a person who engages in fishing at sea or on inland open water. A person who works on land for net repairing, loading fishing material, unloading catch, etc. is excluded.

Landing Site

The site or village from which fishing units operate

Fishing Unit:

A Fishing Economic Unit (FEU) consists of fishing canoe, fishing gears and fishermen. Fishing units are classified in categories according to the type of fishing gear employed. Hence, when the same fishing canoe employs two different types of gear or uses more than one type of gear at different times of a year, the number of fishing units is counted for each gear employed separately, although the same fishing canoe is used.

1.9 SAMPLE SURVEY DESIGN

a. Sampling in space

Sampling was done in accordance with the stratified fishing areas as given table 1.

Apart from the ACS where all landing sites are covered for CAS, in the rest of the fisheries administration areas, a number of fishing sites (Primary Sampling Units) were selected for further sub-sampling (secondary sampling units). The rationale behind the concepts of PSU and SSU could be found in the previous reports.

b. Sampling in time

Catch Assessment Survey used a predetermined reference period (normally 10 days per month); five days in the first half and five day in the second half of the month.

The data collected during the survey period were used to produce monthly catch estimates by gear/boat and by species for the artisanal sub-sector.

1.10. Selected PSU

All fish landing sites along the coast (Atlantic Coast Stratum) were all selected for catch and effort data collection. For the inland fisheries, attempts were made to select representative landing sites in each fishery administrative area. However due to human and technical limitations, some constraints were imposed on the selection of sample landing sites. Fishing sites with no resident enumerators were withdrawn.

Table 1. Sample Description of the 2008 Catch Assessment Survey (2008)

Stratum/Landing Sites Selected	Landing Sites	
	Population	Sample
	Number	Number
Atlantic Coast*	**10**	**10**
Kartong		
Gunjur		
Sanyang		
Bato Kunku		
Tanji		
Brufut		
Bakau		
Old Jeshwang		
Banjul		
Barra		
Lower River North Bank	**30**	**4**
Albreda		
Salikene		
Tuba Kolong		
Farafeni		
Lower River South Bank	**45**	**5**
Mandinary		
Bintang		
Kemoto		
Jappineh		
Pirang		
Upper River North Bank		
Kuntaur	**26**	**1**
Upper River South Bank		
Jarreng	**43**	**3**
Bansang		
Basse		
TOTAL	**154**	**23**

1.11 Sample Days

Sampling of landings by gear type is carried out 10 days in a month; 5 days in the first 15 days and the other 5 in the last 15 days but consecutively for each period. The catches and effort employed are then raised to account for the days that sampling was not done.

1.12 Estimating Process

Catch and effort data for each PSU was summed for each gear type surveyed. The sample totals for each gear type were then raised to reflect the number of days fished in the month by multiplying them by the ratio of days fished to days sampled in the reference period (R2). In this manner, the monthly total estimates of catch and effort by gear type

for each PSU were obtained. Total production for each PSU in a Stratum are summed and raised to give an overall catch in that stratum. The raising factor used here was the ratio for each gear type in the stratum to boats in the PSUs (R3). Each PSU therefore, produced a different estimate of effort and production for any given gear type within the stratum.

1.13 The Estimations

The same process expressed in a mathematical way will be as follows:

Assuming that,

h = stratum (1, 2,)
i = selected PSU
j = boat sampled
k = gear used
M = number of days in the calendar month
D = number of days in the reference period
d = number of actual fishing days sampled
n = number of boat in the PSU
l = number of boats sampled
N = number of boats in the stratum
Y = catch (effort)
S = number of sampled villages in the h stratum
L = number of boats landed

$$k^{Y}hi = \sum_{1}^{d}[\frac{L}{l} * \sum_{j=1}^{l} k^{Y}hidj]$$

Gives the total catch (sample date) landed in PSU "i" in stratum "h" by boats using gear "k" during the days sampled.

(monthly) $$k^{Y}hi = k^{Y}hi(d) * \frac{M}{D}$$

Gives the monthly total catch (sample date) landed in PSU "i" in stratum "h" by boats using gear "k" during the month.

(stratum) $$k^{Y}(i)h = k^{Y}hi * \frac{N_{kh}}{n_{khi}}$$

Gives the monthly total catch landed in stratum "h" by boats using gear "k" estimated using sample data from PSU "i". The final estimated monthly total catch landed in stratum "h" by boats using gear "k" is obtained by taking the average of the different

stratum estimates calculated form the sample date of the PSUs weighted by the number of landings in each PSU.

1.14. POSSIBLE SOURCE OF ERROR

a) Non sampling errors

The following were identified as possible source of non sampling errors.

i) The field staff does not collect the information or complete forms correctly.

ii) The field staff is not present at the beach when the fishing boats are landing and collects data by enquiry.

iii) The field staff cannot weigh the catches because he does not have proper weighing scales and estimates the landings.

iv) The field staff incorrectly identifies fish species.

For case (i) and (ii) the only solution is to increase supervision.

The supervisor will be able to check the work done by the field staff and correct possible mistakes at the source.

Case (iii) has one possible solution, the purchase of appropriate weighing scales and buying whatever material is needed to keep them in good working condition.

Case (iv) becomes a very important source of error when catch estimates by species groups are produced. A possible solution is to organize local training courses for the fish recorders. These training courses could be useful also to present to and discuss with the enumerators how to solve problems arising in particular situations.

It should be mentioned that all enumerators have been adequately trained to conduct catch and effort data collection. Also put in place, a system for supervising the fieldstaff and to monitor their activities by carrying out spot checks.

b) Sampling Errors

Sampling errors may arise from the following:

i) The underestimation of the various fishing units operating from a PSU in a stratum. The number and distribution of units are used to calculate the raising factors which result in the estimation of total catch and effort for the strata. An error in the number of boats per stratum or in the gear distribution would therefore affect the estimates.

ii) The sampling Frame no longer reflects the reality on the ground; there are changes in the number and distribution of fishing units per gear-type (movement/migration) especially in the inland fisheries.

iii) Boats changing fishing gears/changes in the fishing pattern and the fishery structure may affect the final estimates.

c) Other sources of error

Geographic boundaries and national borders do not mean much to the fishermen. It is well known that, along the Coast, groups of fishermen migrate in pursuit of fish and changes in general economic conditions in the different countries or areas along the coast. These movements would greatly affect the stratum estimates unless they were limited to the boundaries of one stratum.

Nevertheless, seasonal fluctuation in number of boats operating could be obtained by studying the migratory pattern fisheries units operating in the PSUs to update the sampling frame. This pattern could be established by the supervisor collecting data movement of fishermen in the PSUs

CHAPTER 2

GENERAL FINDINGS

2.1 Catch Assessment Survey (Artisanal Fishing Industry)

Wise decisions in fisheries management are normally based information/data. Catch assessment survey estimates amount of fish caught and the effort used in the extraction/harvesting of the fish by the artisanal fisheries operators. Annual artisanal fish production is the sum of all estimates of landings (production) by the artisanal fisheries sub-sector.

2.2 Fisheries Production (Trends)

Total annual artisanal fisheries product is composed of landings from the Atlantic coast and inland. Annual landings from the artisanal and industrial sub-sectors are presented in Table 2, figure 1 shows total catch by sub-sector. Overall, fisheries production increased by just over 7 percent in 2009 compared to 2008; 6.3% increase in ACS, 10.3% inland and 7.1% industrial. All fishing landing sites along the coast registered increase in landings in 2009 (Table 2).

Table 2: Total Catches for 2006, 2007 and 2008 for the Atlantic Stratum*

Stratums	Total Catches (Kilogram)			
	2006	2007	2008	2009
Atlantic	**32,975,896**	**33,575,249**	**34,464,659**	**36,639,976.2**
Gunjur	9,402,964	9,589,588	10,641,383	11,492,694.1
Tanji	7,334,273	7,466,895	8,835,340	9,683,532.2
Brufut	4,957,713	4,991,776	4,211,604	4,380,067.7
Bakau	3,226,383	3,078,562	2,924,232	2,997,337.4
Banjul	2,728,956	2,972,728	2,815,055	2,851,651.1
New/Old Jeshwang	2,505,354	2,803,174	2,727,828	2,793,295.6
Sanyang	1,648,426	1,678,212	1,477,607	1,551,487.7
Kartong	548,853	512,991	480,518	501,180.2
T/batokunku	308,607	293,450	231,719	250,256.3
Barra	314,367	187,182	119,374	138,473.9
Inland	**8,904,796**	**9,432,137**	**8,376,605**	**9,241,458.3**
Upper R. South Bank	4,310,689	4,566,185	4,142,060	4,651,532.9
Lower R. South Bank	3,610,712	3,824,270	3,214,866	3,529,922.4
Lower R. North Bank	721,613	764,383	756,637	779,335.6
Upper R. North Bank	261,783	277,299	263,043	280,667.4
Industrial	**2,829,518**	**3,891,361**	**2,973,907**	**3,179,000.0**
TOTAL	**44,710,210**	**46,898,747**	**45,815,171**	**49,060,434.5**

In 2009, total national fisheries production was estimated at just over 49 000 tonnes (Table 2) this represented a 7.1 percent net decrease in fish landings over 2008. Of this total catch, 70 percent came from the most productive area (ACS), 20 percent inland and 10 percent industrial (Figure 1). The most important fishing industry in the country is the artisanal fisheries contributing about 94 percent to the overall catches in 2009.

Figure 1 : Total Catches by Atlantic, Inland and Industrial Stratums (2009)

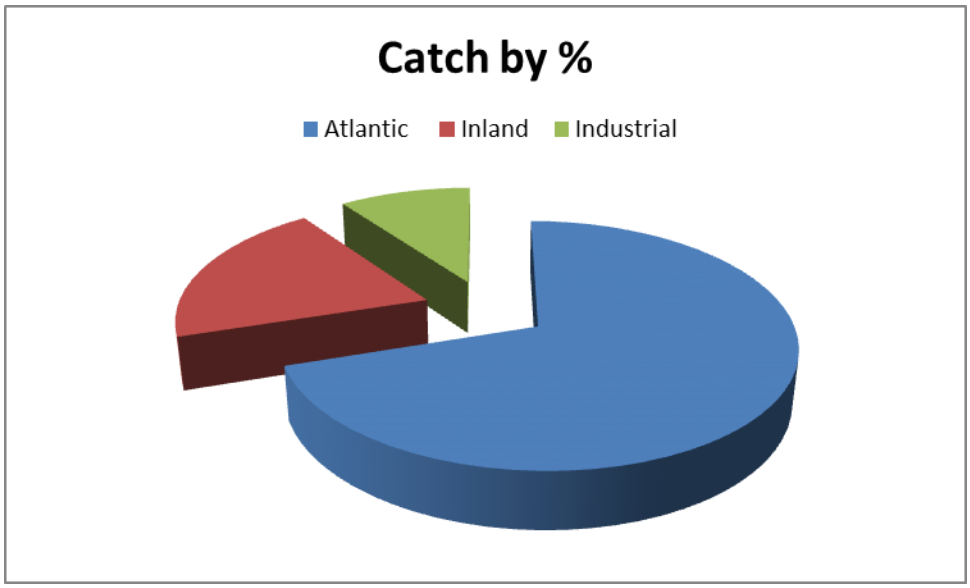
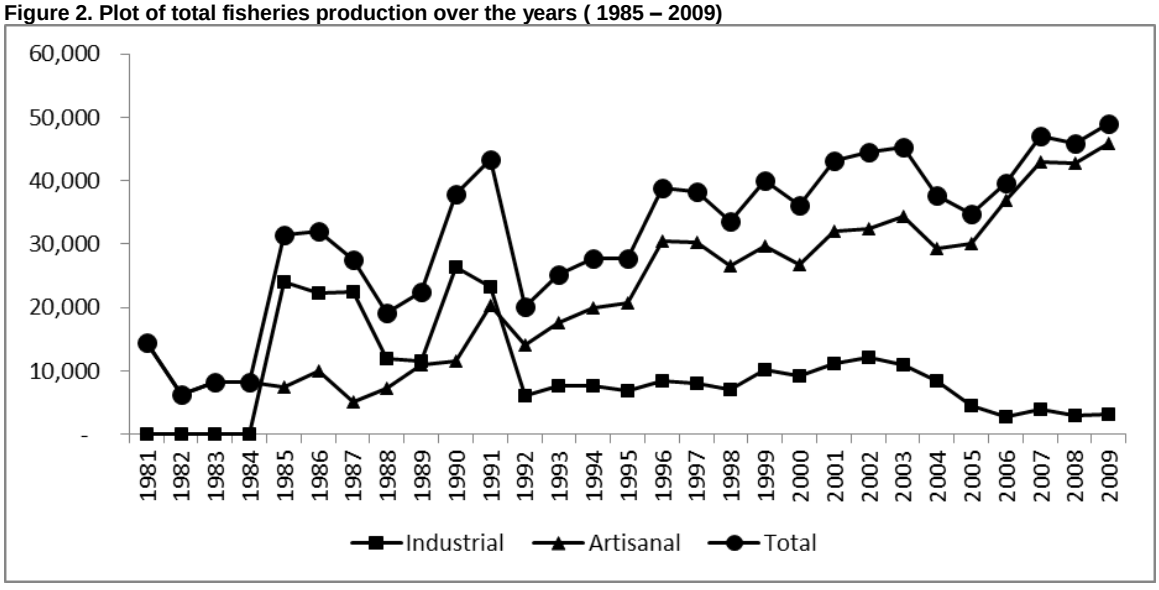


Figure 2 below presents total annual fisheries production (artisanal and industrial). Despite the fluctuating total production, the overall trend is an upward one. A similar trend could be observed for the artisanal fisheries production; this fishing industry being responsible for the bulk of fish landings dictates the overall trend (Figure 2). An increasing trend was observed since 2006 despite a slight downward notch registered in 2008 for the artisanal fisheries. The industrial production which has been declining in the recent years was observed to have picked up in 2007 and nearly stabled in two recent years.

Time series of total annual landings by species for both the artisanal and industrial fisheries sub-sectors are given Annex 1.

Figure 2. Plot of total fisheries production over the years (1985 – 2009)



2.3 Fishing Effort

Fishing effort estimates indicate the amount of effort put to produce number of kilogramme of fish at a given period; change in catch rates points to how the fishery reacts to fishing pressure being exerted. In artisanal fisheries, effort is given as number of fishing trips undertaken at a given period. In 2009, about 238 453 fishing trips were undertaken producing nearly 46 000 tonnes of fish. A total of 102 640 fishing trips were used in producing about 37 000 tonnes of fish in the Atlantic coast while 135 813 trips caught just over 9 200 tonnes of fish inland (Table 3). The rate of catch (Kg/fishing trip) varies according to the fishing method and the target species. Gunjur and Tanji registered the highest catch rate (648 and 448 respectively), this is due to the fact that these sites target mainly small pelagics; the most abundant species (Figure 3). Although Brufut had employed more effort, the catch rate was low because they were targeting so called white fish which are scarce.

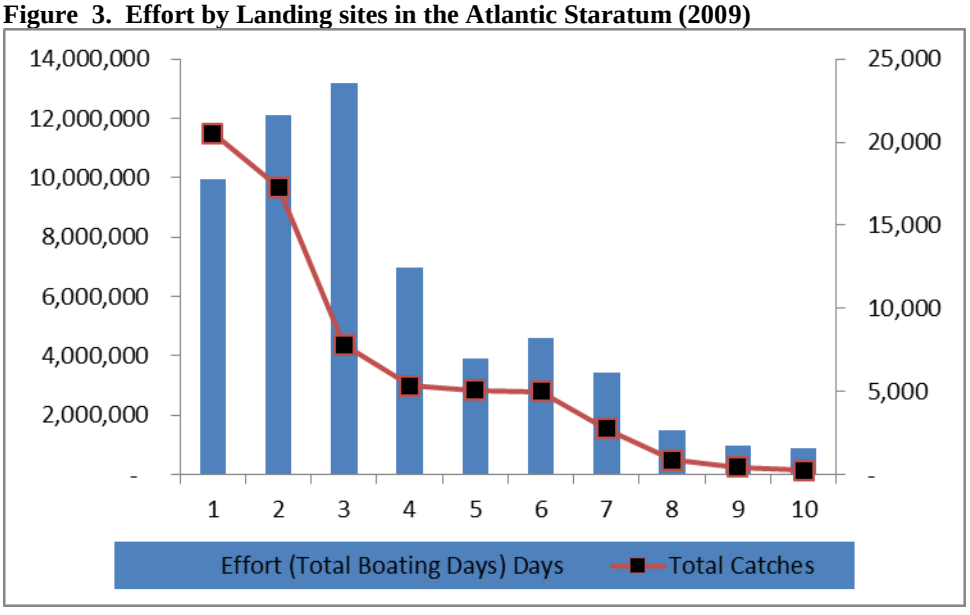
Table 3. Total Catches and Number of Boating Days (Trips) by Landing Sites (2009)

Startum/Landing Sites	Total Catches Kilogram	% of Total Catches %	Effort (Total Boating Days) Days	% of Total Effort %	Catch Per Unit Effort Kilogram
Atlantic Coast	**36,639,976**	**79.9**	**102,640**	**43.0**	**357**
Gunjur	11,492,694	25.0	17,733	7.4	648
Tanji	9,683,532	21.1	21,593	9.1	448
Brufut	4,380,068	9.5	23,558	9.9	186
Bakau	2,997,337	6.5	12,424	5.2	241
Banjul	2,851,651	6.2	6,949	2.9	410
New/Old Jeshwang	2,793,296	6.1	8,225	3.4	340
Sanyang	1,551,488	3.4	6,146	2.6	252
Kartong	501,180	1.1	2,648	1.1	189
T/batokunku	250,256	0.5	1,748	0.7	143

Barra	138,474	0.3	1,615	0.7	86
Inland Startum	**9,241,458**	**20.1**	**135,813**	**57.0**	**68**
Upper R. South Bank	4,651,533	10.1	33,118	13.9	140
Lower R. South Bank	3,529,922	7.7	70,346	29.5	50
Lower R. North Bank	779,336	1.7	29,130	12.2	27
Upper R. North Bank	280,667	0.6	3,218	1.3	87
Total All Startums	**45,881,434**	**100.0**	**238,453**	**100.0**	**192**

Inland fisheries production was estimated at about 9 240 tonnes in 2009; it took an estimated 135 813 fishing trips to land this catch compared to more the productive ACS with 102 640 trips to land nearly 37 000 tonnes of fish. The difference in landings per unit effort is partly due to the efficiency of FEU being employed in fishing operations and the availability of fish. The efficiency of FEU is greater in the ACS than inland as they employ larger and better fishing gears.

Figure 3. Effort by Landing sites in the Atlantic Staratum (2009)



2.4 Catch by species

The Gambia has rich and diverse fisheries resources which is a subject of extraction by multi-gear fishing industries. The artisanal fishing industry targets all fish stocks in all the four fish groups: demersals, small pelagics, cephalopods and crustaceans, table 4. *Ethmalosa fimbriata* (Bonga/Shad), an estuarine species constitutes the bulk (nearly 13 000 tonnes) of total fish landed in 2009. Individually, the flat and more coastal sardinella (*Sardinella* madeirensis) and rough head sea catfish featured prominently in landings the same year. Table 4 below gives total catches by species. The Atlantic continues to dominate total artisanal fisheries production contributing 80 percent in 2009. The sardinella fishery has become very important in terms of landing and usage in the country. Catfish is highly sought due to its lucrative market in Europe and the USA.

Table 4: Gives total catch by species

Species	Total Catches Kilogram
Shad/Bonga	12,576,930
Long Neck Croaker	78,266
Madeiran Sardinella	5,096,798
Cassava Croaker	2,356,195
Bobo Croaker	424,585
Meagre	13,672
Canary drum	535
Rubberlip Grunt	206,313
Sompat Grunt	1,650,363
Round Sardinella	2,479,700
Bastard grunt	2,151
Pigsnout grunt	1,844
Gorean Snapper	10,193

African Red Snapper	563,568
African forktail Snapper	485
Golden african Snapper	68,495
White Grouper	79,669
Dusky Grouper	80,455
Dog tooth grouper	861
Royal Threadfin	163,148
Giant African threadfins	1,109,728
Lesser African Threadfins	455,091
Rough head sea catfish	3,628,517
Smooth mouth sea catfish	144,571
Atlantic Horse Mackerel	348,684
Cuene Horse Mackerel	885
Alexandria pompano	455,073
Pompano	1,923
Leerfish	2,973
Blue runner	283,492
Cravelle jack	402,108
False scad	432,964
Guinean Barracuda	4,608
Great Barracuda	337,522
Guachanche Barracuda	15,595
Grooved mullet	13,116
Banana mullet	4,023
Leaping African mullet	568,805
Curema mullet	23,047
Wahoo	2,677
Club mackerel	20,492
West African Spanish Mackerel	82,608
Africana sicklefish	275,102

Table 4: Continued

Species	**Total Catches Kilogram**
Butterfish	390,704
West African ladyfish	981,439
Senegalese ladyfish	25,999
Senegal seabream	11,709
Common two- banded seabream	1,223
Nigerian touquesole	4,212
senegalese tonquesole	180,270
Wedge sole	43,211
Bastard sole	107
Senegalese sole	699,093

Bluespotted triggerfish	450
Bonefish	28,213
Largehead hairtail	610,188
Guinean parrotfish	1
West African goatfish	104
Prickly puffer	65,675
Smooth puffer	111,609
Atlantic Lizardfish	4,732
Bluntnose lizardfish	887
Guinean stripped mojarra	543
John dory	109,327
Pink shrimp (Southern)	1,748,456
Striped shrimp	8
African spider shrimp	46,132
Pink spiny lobster	29,656
Royal spiny lobster	11,035
Common cuttlefish	587,124
Common cuttlefish	53
Elegant Cuttlefish	58,921
Blacktip shark	112,704
Milk shark	122,400
Nurse shark	1,374
Scalloped hammerhead	31
Great hammerhead	23
Gulper shark	16,633
Lowfin gulper shark	21,099
Kitefin shark	236
Daisy stingray	63,840
Marbled stingray	27,169
Common stringray	38
White skate	27,966
Whitespotted guitarfish	53,358
Blackchin guitarfish	1,565

Table 4: Continued

Species	**Total Catches Kilogram**
Lsuitanian cownose ray	55,769
Sea Snail	633,235
Captain Fish	57
Tilapia	1,153,379
Kono Kono	680,964
Trippo	19,046
Kokolibo	4,403
Lamba Ceesay	7,026

Nalo	91,082
Kosso	907,988
Sanko	39,476
Kokriko	80,028
Taro	162,286
Kulundomo	8,600
Sokoro	15,440
Sayewo	170,401
Walinyaba	775,401
Tingo	333,122
Fantango	13,307
Ribon Fish	282
Doctor Fish	14,376
Gonda	1,680
Lagoon land crab	355
Spinous spider	1,032
Swim crabs	30,535
Red swim crabs	11,809
Wrinkle swim crab	3,009
Total	**45,881,434**

2.5 Catch distribution (monthly)

Distribution of catch over the 12 months period shows a fluctuation in catch rates, figure 4. Total production was highest in the second half of 2009 as in the previous year (2008), the highest peak was attained in June followed by October. It could also be observed from the figure below that effort used in extracting fisheries resources did not commensurate with the catch; effort exceeded catch except for June and October where there was good return on effort. The amount of fish caught depends on several factors including the physical environment, abundance and distribution of fish. Until an exhaustive study on abundance and distribution is conducted, it will be speculative to attribute the variation in fish catch to any factor.

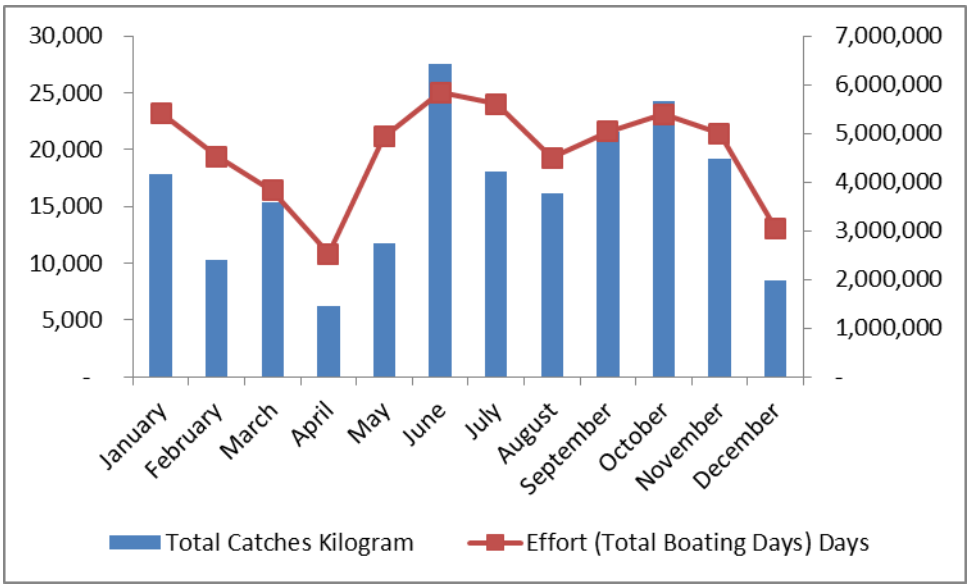


Figure 4: Shows monthly catches

2.6 Artisanal fishing gears

Artisanal fishing industry uses several fishing gears in its operations, targeting different fishery segments. The gears used depend mainly on the target species. The manner in which a fishing gear is set and operated usually indicates the type of species being targeted. A description of the gears is contained in previous reports. In terms of contribution to total fish landings, the two most important fishing gears in 2009 were Set/bottom gillnet and encircling/surround gillnet (Table 6 and Figure 5). The two fishing gears have contributed nearly 28 000 tonnes of fish to the total national artisanal production. Three gears (encircling/surround gillnet, traps and purse seines) were found to be the most efficient with an average of 480Kg/trip.

Surround gillnet is one of the most efficient fishing gears. Its operators landed nearly 10 000 tonnes of bonga in 2009 with a high catch rate (490 Kg/fishing trip); followed by traps and purse seines. It should be noted that the amount of fish caught depends on several factors including, abundance and availability of target fish species and these may have some bearing with seasons.

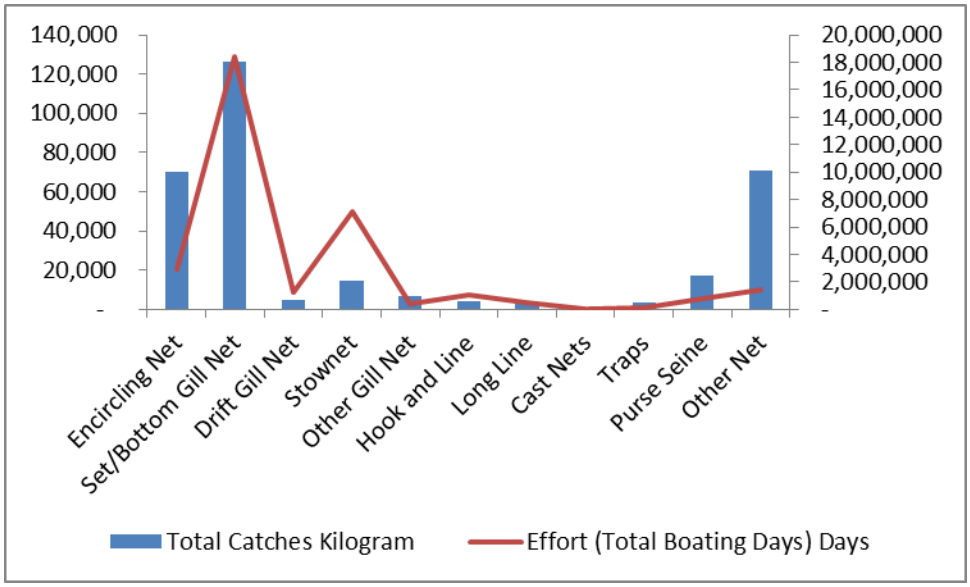


Figure 5: shows catches and effort by gear type

In the Gambia, specialization in the use certain fishing methods/operations targeting specific fish species are not uncommon. For example, Gunjur, Tanji, Old Jeshwang and Bakau were more or less specialized in the bonga fishery (Table 7) hence the bulk of landings in these sites. In 2007, Gunjur recorded the highest bonga catch, approximately 5 000 tonnes followed by Tanji with just over 3 000 tonnes. It most be noted that all landing sites in the coast land all species either as target species or as incidental catches.

Table 7 : Total Catches by Species and Landing Sites for the Atlantic Coast Stratum (2008)

Species	Total Catches by Landing Sites (Kilogram)										
	Brufut	Kartong	New/Old Jeshwang	Sanyang	Bakau	Tanji	Banjul	Barra	T/batokunku	Gunjur	Total
Shad/Bonga	11,437	210,994	2,803,174	548,244	1,500,143	3,117,620	489,399			5,056,145	**13,737,157**
Round Sardinella				5,880	10,858	1,603,666	15,874			1,140,792	**2,777,070**
Long Neck Croaker	22,074	3,795		2,158	4,463	312	9,612			1,707	**44,122**
Madeiran Sardinella		740		5,941	18,375	1,121,131	23,583			437,293	**1,607,063**
Cassava Croaker	614,052	3,679		17,552	267,287	2,798	163,267	8,754		116,650	**1,194,041**
Bobo Croaker	531,663			15,885	12,764	41,955	-	10,114		8,554	**620,935**
Rubberlip Grunt	24,450			49,049	1,457		103,879			7,745	**186,581**
Sompat Grunt	68,531	7,626		94,493	4,576	430,000	294,869	25,455	312	252,901	**1,178,764**
Round Sardinella				1,008	449		-			1,844	**3,301**
Bigeye grunt						303	-				**303**
Gorean Snapper				508			-				**508**
African Red Snapper	20,724	59		8,786			91,382			4,501	**125,452**
White Grouper	6,084	1,215		3,415	117	88	-	5,259	195	336	**16,709**
Dusky Grouper	89,078			762	4,697		-	13,940		2,869	**111,346**
Golden Grouper		1,066					-			172	**1,238**
Royal Threadfin				1,394			-				**1,394**
Giant African threadfins	38,011	1,605			111,596	24,458	37,695	8,143	688	26,308	**248,504**
Lesser African Threadfins	33,337	2,421		159,552	132,431	69,590	156,412	5,359		31,777	**590,878**
Rough head sea catfish	680,164	37,325		124,891	199,737	154,685	295,176	8,568	32,269	1,030,344	**2,563,160**
Smooth mouth sea catfish	3,147						-				**3,147**
Atlantic Horse Mackerel		296		2,507	14,793	24,821	-			163,389	**205,806**

Contd…..

Table 7 : Total Catches by Species and Landing Sites for the Atlantic Coast Stratum (2008)

Species	Total Catches by Landing Sites (Kilogram)										
	Brufut	Kartong	New/Old Jeshwang	Anyang	Bakau	Tanji	Banjul	Barra	T/batokunku	Gunjur	Total
Alexandria pompano					262	10,681	-				10,942
Leerfish	818						-				818
Blue runner	4,140			10,593	16,836	21,038	2,829			2,093	57,529
Cravelle jack	133,829			4,954		256,835	-		351	136,837	532,806
False scad					18	1,831	116,612				118,461
Guinean Barracuda		161		363			-				523
Great Barracuda	92,651			3,648	18,658	211,579	33,164	10,434	557	245,898	616,588
Guachanche Barracuda	5,700						-				5,700
Leaping African mullet		5,048		941	11,866	2,533	763,427			2,360	786,175
West African Spanish Mackerel	30,205	192		85,353	45,933	87,065	3,103			154,995	406,846
Africana sicklefish	23,650			8,308	147,292	5,645	34,394	53,619	273	41,932	315,113
Butterfish		7,271		323	143,211	216,818	52,273	32,089	585	4,472	457,042
West African ladyfish	474,711	50,879		8,018	189,239	2,781	-	5,736		175,404	906,767
Canary dentex				6,558			-				6,558
Wedge sole		18,563			4,540		192		5,011		28,307
Senegalese sole	599,611	74,533		260,369	149,851		3,015		31,584	111,162	1,230,124
Bonefish	9,632					10,470	-				20,101
Largehead hairtail					7,172		-				7,172
Prickly puffer	10,506						-	402			10,907
Smooth puffer	634,715	171			25,559	1,557	14,431				676,433
Bluntnose lizardfish	33,379						-				33,379

Contd…..

Table 7: Total Catches by Species and Landing Sites for the Atlantic Coast Stratum (2008)

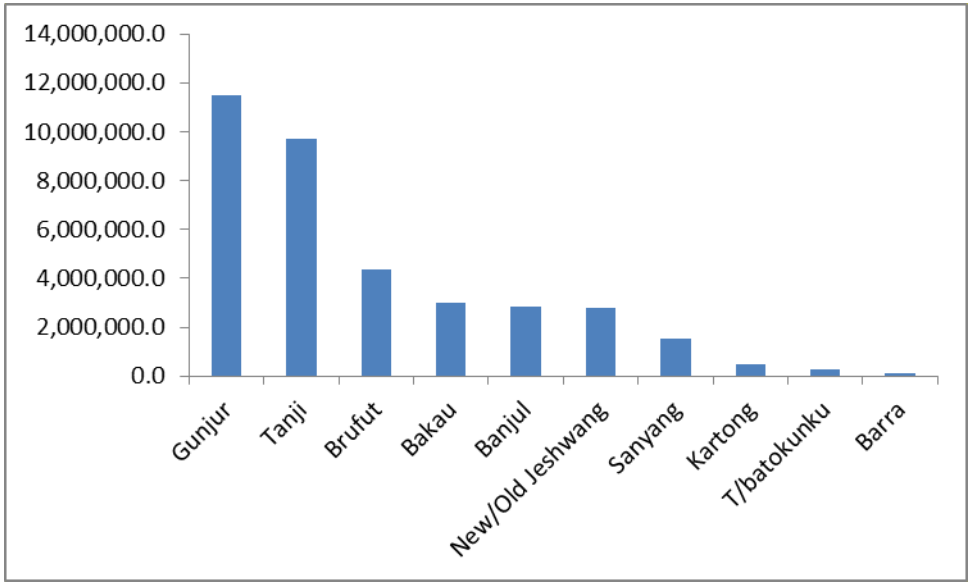
Species	Total Catches by Landing Sites (Kilogram)										
	Brufut	Kartong	New/Old Jeshwang	anyang	Bakau	Tanji	Banjul	Barra	T/batokunku	Gunjur	Total
Pink shrimp (Southern)							65,268		302		**65,570**
Striped shrimp							12,018				**12,018**
Pink spiny lobster							-			242	**242**
Royal spiny lobster	1,641	1,061					-			1,529	**4,232**
Mediterranean locust lobster						6,136	-				**6,136**
Common cuttlefish	241,849	25,553		212,161	7,754		-		131,918	94,104	**713,340**
Common cuttlefish				6,774			-				**6,774**
Blacktip shark	3,046					42	-			9,982	**13,070**
Milk shark		1,495					-			442	**1,937**
Lowfin gulper shark	6,584	3,190		4,962		326	-		2,325	174,133	**191,520**
Daisy stingray	6,352				69		-				**6,421**
Common stringray		445			28		-		1,769		**2,243**
White skate						101	-			15,805	**15,906**
Whitespotted guitarfish		2,674					-				**2,674**
Blackchin guitarfish	610	33,784					-				**34,394**
Lsuitanian cownose ray		7,407					-		5,774	686	**13,868**
Sea Snail	317,094	6,302		21,205	2,635	230	108,232		79,538	133,884	**669,121**
Captain Fish		3,439					-				**3,439**
Tilapia				979	21,723		82,466				**105,168**
Trippo	32,245						-				**32,245**

Contd…..

Table7 : Total Catches by Species and Landing Sites for the Atlantic Coast Stratum (2008)

Species	Total Catches by Landing Sites (Kilogram)										
	Brufut	Kartong	New/Old Jeshwang	anyang	Bakau	Tanji	Banjul	Barra	T/batokunku	Gunjur	Total
Ribon Fish						31,926	-				31,926
Doctor Fish	3,842				35		-				3,876
Spinous spider					2,137		-				2,137
Swim crabs	112,479			676			157			300	113,613
Total	4,991,776	512,991	2,803,174	1,678,212	3,078,562	7,466,895	2,972,728	187,872	293,450	9,589,588	33,575,249
Mormyrus						4,849	-				4,849
Sayewo						1,831	-				1,831
Ribon Fish						31,926	-				31,926
Doctor Fish	3,842				35		-				3,876
Spinous spider					2,137		-				2,137
Swim crabs	112,479			676			157			300	113,613
Others	69,734					7,876					77,610
Total	4,991,776	512,991	2,803,174	1,678,212	3,078,562	7,466,895	2,972,728	187,872	293,450	9,589,588	33,575,249

The Atlantic coast is the most productive fishery stratum in the Gambia. In the case of the inland fisheries, the South Bank of the river was the most productive in 2008. Total catch for the Upper River South Bank and Lower River South Bank were estimated at 4 500 tonnes (mainly fresh water species) and 4 000 tonnes respectively (Table 8).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T/batokunku
Barra

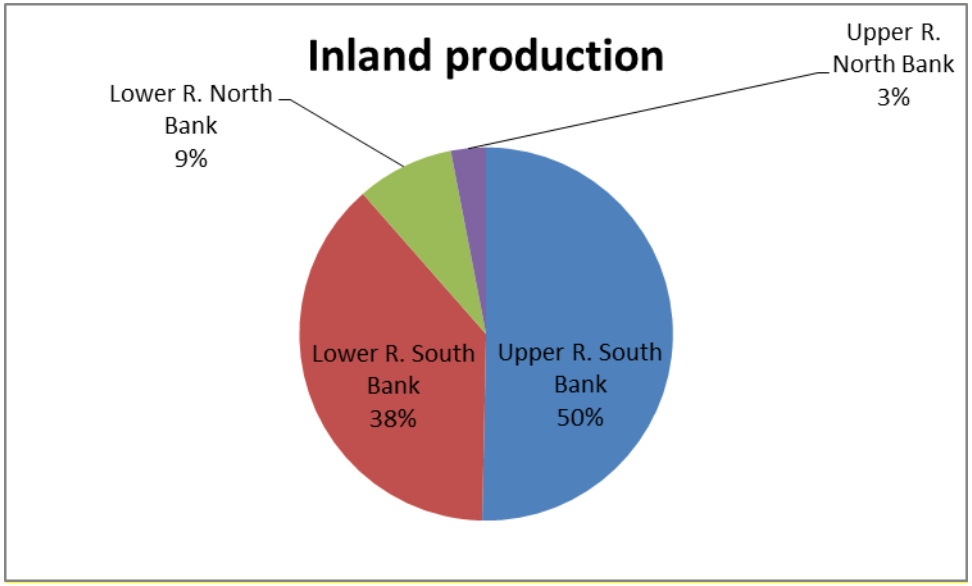
Inland production
Upper R. North Bank 3%
Lower R. North Bank 9%
Lower R. South Bank 38%
Upper R. South Bank 50%

Table 8 : Total Catches by Species and Landing Sites for the Inland Stratum (2008)

Species	Total Catches by Fishery Regions (Kilogram)				
	Lower R. North Bank	Upper R. North Bank	Lower R. South Bank	Upper R. South Bank	Total
Shad/Bonga	133,202		1,960	3,604	**138,766**
Round Sardinella	49				**49**
Long Neck Croaker	3,079		916		**3,995**
Madeiran Sardinella	29,169				**29,169**
Cassava Croaker	57,572		139,254		**196,826**
Bobo Croaker	68,685	69,080	73,133	28,522	**239,420**
Meagre	323				**323**
Rubberlip Grunt	2,470			119	**2,589**
Sompat Grunt	10,855				**10,855**
African Red Snapper	727				**727**
African browm Snapper		6,447			**6,447**
Royal Threadfin	26,927		740,433		**767,360**
Giant African threadfins	60,600		390,882	17,122	**468,604**
Lesser African Threadfins	16,906		293		**17,199**
Rough head sea catfish	89,821	149,546	767,899	475,131	**1,482,396**
Smooth mouth sea catfish			370		**370**
Atlantic Horse Mackerel	229				**229**
Blue runner	3,331		91	346	**3,767**
Cravelle jack	896				**896**
Guinean Barracuda	805				**805**

Great Barracuda	2,945		109,557	2,534	**115,036**

Contd…….

Table 8 : Total Catches by Species and Landing Sites for the Inland Stratum (2008)

Species	Total Catches by Fishery Regions (Kilogram)				
	Lower R. North Bank	Upper R. North Bank	Lower R. South Bank	Upper R. South Bank	Total
Guachanche Barracuda	519		31,083		**31,602**
Banana mullet	274				**274**
Leaping African mullet	32,070		31,416	398	**63,883**
Wahoo	53				**53**
Africana sicklefish	6,450		24,793		**31,243**
Butterfish	3,300		4,128		**7,428**
West African ladyfish	25,054		28,243		**53,296**
Wedge sole	268		270	2,773	**3,311**
Thickback sole			349		**349**
Senegalese sole	9,391		7,546	14,189	**31,126**
Bonefish	1,556				**1,556**
Smooth puffer	157				**157**
Pink shrimp (Southern)	114,877		1,341,198		**1,456,076**
Caramote Brown	902				**902**
Striped shrimp	13,771				**13,771**
Common cuttlefish	17,836				**17,836**
Elegant Cuttlefish				23,474	**23,474**
Blacktip shark	485		30,690		**31,175**
Milk shark	822				**822**
Brown ray					

	178				178
Whitespotted guiterfish	196				196

Contd…….

Table 8 : Total Catches by Species and Landing Sites for the Inland Stratum (2008)

Species	Total Catches by Fishery Regions (Kilogram)				
	Lower R. North Bank	Upper R. North Bank	Lower R. South Bank	Upper R. South Bank	Total
Blackchin guiterfish	503				503
Lsuitanian cownose ray	8,905		1,929		10,833
Sea Snail	875		8,997	5,659	15,531
Captain Fish	529			160	688
Tilapia	16,165	6,278	83,307	508,315	614,065
Kono Kono	102			276,719	276,821
Trippo				10,564	10,564
Lamba Ceesay				689	689
Mormyrus				74,805	74,805
Kosso	214			533,904	534,118
Sanko	341			14,588	14,929
Kokriko		43,974		922	44,896
Taro				1,051,808	1,051,808
Kululdomo				1,534	1,534
Sokoro				15,980	15,980
Sayewo				230,209	230,209
Walinyaba				405,030	405,030
Tingo				857,448	857,448
Fantango		1,974		9,641	11,615

Swim crabs			5,265		**5,265**
Red swim crabs			269		**269**
Total	**764,383**	**277,299**	**3,824,270**	**4,566,185**	**9,432,137**

2.8 Industrial Fisheries

The industrial fisheries operates in the coastal and offshore waters and is normally capital intensive. There is almost no national industrial fleet, all fishing or fish processing establishments in the Gambia have no sea-going fishing vessels. Most of fishing vessels operating in our waters came through joint venture or through fishing agreements such as the Reciprocal Maritime Fishing Agreement between the Gambia and Senegal or compensatory agreement. These foreign operated vessels do not land their catches in the country but in foreign ports. Fish production by the sub-sector was recorded by the Fisheries Observer Programme (each vessels carries an observer). Annual industrial productions were on the decline in recent years, slightly increasing in 2007 then decreasing to nearly the same level in 2006 (Figure 6). Annex 1a and 1c gives time series production figures for the industrial fisheries.

Figure 6: Total annual industrial fisheries production in metric tonnes

In 2008, industrial fisheries production was estimated at about 3 000 tonnes with the bulk of nearly 2 000 tonnes attributed to the demersal fishery including crustaceans, table 9 below. The most productive period was during the raining season (between June and

September). January was the least productive and this may be due to licensing as all fishing licenses in the year issued expire in December.

Table 9: Total Industrial Catches by Months and Species (2009)

Species Group	Monthly Catches (Kg)												
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Total**
Shrimps	1,801	435	142	49	805	1,428	14,865	48,354	43,319	47,515	1,888	878	161,479
Solefish	22,440	10,706	3,101	1,220	6,151	1,199	16,113	9,433	3,805	16,613	4,741	1,941	97,463
Demersals	167,365	146,066	82,389	52,365	199,975	150,502	225,520	165,893	153,887	479,591	148,959	64,273	2,036,785
Cuttlefish	10,921	9,363	4,339	4,665	10,023	21,166	21,465	10,965	14,305	38,706	6,196	3,159	155,273
Octopus	817	711	2,031	884	67,502	98,507	35,661	15,746	40,511	15,298	1,394	133	279,195
Squids													
Pelagics	13,903	15,752	12,117	16,400	24,870	7,291	18,003	10,344	10,842	35,385	10,992	3,312	179,211
Tuna										2,678	35,616	18,412	56,706
Others	8,327	4,380	2,175	865	13,239	9,967	5,675	19,329	27,040	67,390	23,702	30,377	212,466
Total	**225,574**	**187,413**	**106,294**	**76,448**	**322,565**	**290,060**	**337,302**	**280,064**	**293,709**	**703,176**	**233,488**	**122,485**	**3,178,578**

Industrial fishing effort is captured as fishing days or vessel days. Table 10 below gives a summary of industrial fisheries effort and catches in 2007 and 2008. This is to show changes in fishing effort over the 12 months period. In 2008, the annual average catch per unit effort was estimated at 1 698 Kg/day, slightly higher than in 2007 (1 630 Kg/day).The period with the highest catch rates was between June and September which was the most productive fishing period.

Table 10: Industrial Catches, Efforts and Catch Per Unit

Months	2007			2008			% change		
	Total Cathes Kg	Effort Days	CPUE Kg/Day	Total Cathes Kg	Effort Days	CPUE Kg/Day	Total Cathes Kg	Effort Days	CPUE Kg/Day
January	253,266	115	2,202	47,444	30	1,581	-81	-74	-28
February	326,564	157	2,080	235,886	134	1,760	-28	-15	-15
March	197,471	140	1,411	208,514	98	2,128	6	-30	51
April	193,293	111	1,741	223,991	129	1,736	16	16	0
May	211,846	119	1,780	248,951	159	1,566	18	34	-12
June	348,094	149	2,336	348,621	218	1,599	0	46	-32
July	308,328	174	1,772	348,517	213	1,636	13	22	-8
August	449,290	281	1,599	390,009	259	1,506	-13	-8	-6
September	373,313	315	1,185	393,771	208	1,893	5	-34	60
October	570,802	463	1,233	275,584	187	1,474	-52	-60	20
November	189,353	142	1,333	101,849	51	1,997	-46	-64	50
December	469,739	222	2,116	150,770	65	2,320	-68	-71	10
Total	**3,891,361**	**2,388**	**1,630**	**2,973,907**	**1,751**	**1,698**	**-24**	**-27**	**4**

2.9 Exports of Fish and Fishery Products

Exports of fish and fishery products are not stable and they constitute a small percentage of total production (artisanal plus industrial). The main supplier of export fish raw material is the artisanal fisheries. Although industrial catches are landed in foreign ports and sold as exported fish they are not reflected in trade figures as exports from the Gambia. Exports rose from 625 tonnes in 2006 to 1 480 tonnes in 2007 and 1 102 tonnes in 2008. Only 2.4 percent of total fish production was exported in 2008. Exports has been

erratic and showed irregular fluctuations punctuated by nose-dived trend after 1987 in terms of volume with the tendency to stabilizing around 2000 metric tonnes over a 12 year period, Table 11.

Table 11: Exports of Fish and Fishery Products (1984 - 2008)

Year	Production (MT)	Quantity Exported (MT)	Ratio of Export to total Production Percent	Val. (GMD)
1984	8,170	4,775	58.4*	3,525,848
1985	31,411	4,352	13.9	5,040,848
1986	32,134	5,563	17.3	6,695,965
1987	27,560	5,452	19.8	11,363,179
1988	19,088	1,068	5.6	16,028,437
1989	22,476	1,069	4.8	17,154,146
1990	37,975	1,449	3.8	31,117,402
1991	43,445	1,544	3.6	32,470,440
1992	20,094	1,061	5.3	17,602,622
1993	25,296	1,598	6.3	24,625,442
1994	27,668	1,950	7.0	30,621,122
1995	27,736	1,817	6.6	27,149,996
1996	38,882	1,543	4.0	27,271,831
1997	38,231	2,063	5.4	44,427,355
1998	33,545	1,666	5.0	33,293,225
1999	39,993	1,677	4.2	36,563,649
2000	36,104	901	2.5	32,779,477
2001	43,214	949	2.2	35,726,199
2002	44,496	932	2.1	21,334,062
2003	45,370	445	1.0	11,629,895
2004	37,692	405	1.1	7,694.241
2005	36,845	751	2.0	9,956,837
2006	39,728	625	1.6	22,837,330
2007	47,000	1,480	3.2	67,432,811
2008	45,814	1,102	2.4	46,892,582.39

CHAPTER 3
APPENDIX TABLES

Annex 1a Total Fish Catches by Artisanal and Industrial Sub-Sectors (1981-2008)

Production (MT)			
Year	**Industrial**	**Artisanal**	**Total**
1981	-	14,579	14,579
1982	-	6,209	6,209
1983	-	8,333	8,333
1984	-	8,170	8,170
1985	23,985	7,426	31,411
1986	22,225	9,909	32,134
1987	22,421	5,139	27,560
1988	11,864	7,224	19,088
1989	11,534	10,942	22,476
1990	26,401	11,573	37,975
1991	23,175	20,270	43,445
1992	6,060	14,035	20,094
1993	7,736	17,560	25,296
1994	7,752	19,917	27,668
1995	6,937	20,799	27,736
1996	8,372	30,510	38,882
1997	7,988	30,243	38,231
1998	7,012	26,533	33,545
1999	10,249	29,743	39,993
2000	9,237	26,867	36,104
2001	11,198	32,016	43,214
2002	12,160	32,336	44,496
2003	11,005	34,365	45,370
2004	8,375	29,317	37,692
2005	4,600	30,169	36,845
2006*	2,830	36,898	39,728
2007	3,891	43,007	46,898
2008	2,973	42,841	45,814

- ***Note: From 2006 the Artisanal Sector include both Marine and Inland Fishing***
- ***Industrial Fishing exclude 15 percent Discard.***