REDUCING THE INCIDENCE OF BY-CATCH THROUGH FISHING GERA MODIFICATION

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Abstract
Thee have been considerable efforts in recent tears to modify fishing gears and practices to target particular sizes and species of fish (fin and shell) and other marine organisations more efficiently. These efforts are coming on the heels of the negative impact they lead to have on the population of organisms in the aquatic ecosytem.
By catch consideration and gear modification play on important role in regulation of several consideration and gera mofificfation play an important role in regulation of several major fisheries and new by catch reduction devices and other innovative gear modification are continously being proposed and tested to mitigate against these problems among which are the turtle excluder device (TEDS) in the shrimp trawls to reduce mortality of endangered sea turtle, sorting grids and scaring device in long fisheries
Recommendation are made on effective monitoring of fishing gears to ensure that devices armed at reducing by-catch are included and fishermen use only the appropriate gears to limit by-catch and discards.

Keywords: By catch gera mofifiation, fish discords, turtle excluder

INTRODUCTION

It is now clear that the world's fisheries recourses are been subjected to explitaion at on above their capacity to produce maximum sustainable yields. At the same time as these trends are being felt, thee is a very large wastage of fisheries resources from discarding unwanted cachers at sea.

A 2004 FAO report provided an estimate discard in commercial fisheries of 27 milions of tons per year compared to 50 milion tons of direct human consumption. A more recent FAO document estimated that dscard wre in the order of above 20 millin tons in 2007. The majority of the world's fisheries are nulti species in nature and consequently it is difficult to optiise mangment measures for all the species caught. Commercial fishing involve a wide range of gera and techniques used in environment that ar also occupied by organisms that are not targeted by the fisheries. The use of fishing gear in such enviroment sometimes creates unintended impacts sufch as remoal of oranisms that for various reasons, should not be taken (e.g juvinile threated species)

The removal of non target organisms has been a cause of concern for fisheries managment for many years, the extensive capture of juvine and yong fish commercially important species has frequently been regarded as a threat to recruitment of stocks. Many fisheries harvest individuals of the target species before they reach size in terms of future yield. The use of lager mesh in the collection (cod end) was among the first technical measures imposed by fisheries mangers to prevent the capture of juvinile. A more recent concern, begining in the 1970s, was the unintended capture and killing of more charismatic animals, like marine mammals, seabirds and turtles, by

commercial fisheries in particu;ar, the incidental capture and mortality of endangered or threaten species that are long lived and have low reproducive reates has aroused growing conflict. The unseen mortality due to fishing by lost gear has recently also attracted much attention which has stimulated extensive research and development efforts by many countries to solve the many problems. As the upper limits production from capture fisheries especially marine have become more obvious, fisheries managers have introduced a variety of new controls, including regulation to limit access to fishing grounds, to limit fishing efforts and to set total allowable catches and by catch limits. Subquent technological modifications in fishing geras and their operation have proved successful in many fisheries that are facing bycatch problems. This paper reviews the successful development and applications of selective fishing techniques that have been used to achieve by catch reduction and as well assesses the incidence of by catch in Nigeria and the effects f discarding them at the sea. The paper highlights ways of ensureing effective monitoring of the modified fish gears to achieve sustainability of the resources.

INCIDENCE OF BY CATH IN NIGERIA

Past and present studies in Nigeria waters have shown the proliferation of fish by catches, their species/size compositionl, andmode of utilization.

In Nigeria, efforts have been made to ensure responsbile inshore fishing practices through promulation of sea fisheries law and (Act of parliment No 71 of 1992). But effective monitoring and enforcement of these regulations is lacking. The occurrence of small but mature fish species in penaid trawling ground makes a selection within fishing gear rather difficult, even though, trawling shrimps which attracts the highest incidental catch within the first five nautical miles of the Nigerian continetal shelf and in waters shallower than 18m are prohibited and cod end of s a shrimp trawl shold have more than 44mm mesh size, yet observation of fish landing and activieies at the sea suggest that these statutory provision of the fishing regulations are not being strictly complied with. The by catch problem has been immensely compounded by the concentration of the shrimp trawl industry presently onbrown shrimps at grounds, which appears to be nursery ground of young and juvenile fishes, apart from fin fishes, non-fish species are also caught as by catch: Crabs –protunus validus (smooth swim crab at aroung 30m depth)

And \Lobster – Pamulirus reginus (5-40m depth); brown cuttrle fish –Sepia officianlis (down to 200m) and octopus; Turtle – Eretmochlys imbriate (hawksbill). Molluses e.g snails and bivalves. Exploratory trawl haus betwen November 1980 and March 1981 of commercial boats in the Niger delta area by Ajayi and Adetayo (1982) and catch and effort data gatherd by FDF since 1970 from industrial fleet analysis reveals the major species and compsition of fidh by catch discarded as shown in Table 1.

Table One: the major groups nd components species of incidental fish catch

Fish Group	Mean Composition of Commercial landing	Component species
Sciaenidae	16.83%	*Pseudotolithus typus* *P. senegalensis* *P. elengatus*
Cynoglossidae	9.32%	*Cynoglosus canariens* *C. senegalinsis* *C. mondodi*
Aritidate	41.13%	*Arius. Haudeloti* *A. latisculatus*
Polynemidae		*Pentanemus quinquaris* *Galenodes decadactylus* *Polydactilus quadrifilis*
Pomadasydate		*Pomadasys jubelini* *P.suillus*
Salechaians		*Raja miracletus* *Dasyastic margarita* *Characterias Taurus*
Mixed		*Brachydeuterus auratus* *Illisha Africana* *Vomer setpinis* *Dprepane Africana* *Trichiurus lepturus* *Larimus peli* *Gerres melanopterus*

Source: Adebayo and Ajavi. 1982

Otobotekere (1999) recently reported evidence of sale of discards estimated about 3 metric tons daily. The species and size ranges of sampled fish cat-catch sold into Riverine local markets are shown in Table 2.

Table 2 Size ranges of fish samples of discards sold at sea by shrimp trawlers in Niger-Delta waters

Family	Species	No	Size Range (cm)
Carangidae	Hemicaranz bicolor	7	8-14
	Selene dorsalis	17	
Cynoglossidae	Cynogossus senegalensis	81	10.23
Drephanidae	Drepana Africana	92	4.11
Ephipidae	Chaetodipterus spp	1	6.12
Haemuliade	Pomadasys jubelini	26	9.14
	Galeodes decadactylus	27	10-16
Pristigateridae	Polydactylus quadrifillis	76	10.15
Sciamidae	Illisha Africana	67	5.23
	Pseudolitnus elogatus	10	11-15
	P. senegalensis	183	7-18
Spariade	P.typus	183	12-16
	Pegalus belloti	2	11-14
	Pegalus ssp	40	6-13

Sourse: Oobotekere 1999

Table three: Percentage composition of shriping operations at 10-14 meters at various fishing grounds

Fishing ground	Depth (m)	Fish(%)	Shrimp (%)	Crab (%)	By Catch
Lagos	10	50.7	4.7	0	41.6
Lagos entrace	14	28.2	0	0.1	71.6
Ibeju	10	27.5	0	0.4	72.1
Lekki	10	55	0	0	45
Escravos	13	36	1.7	4.8	57.4
Sengana	13	43	4.8	1.2	51
Opobo	10	62.8	2.8	0	34.4
Kwa Ibo	10	25.7	24	0	50.3
Calabar	10	69.0	9.1	3.6	17.3

Source: Isebor. 1999

The average adult length and size at maturity of these fishes indicate that a fairly large quantity of them are removed before reaching maturity and this is bound to have an adverse consequence on recruitment. The results of a recent study of the fish by catch problem at various depths of some popular fishing grounds in Nigeria confirm again that there is high percentage of by catch accompanying penacid shrimping in Nigeria, with catch composition varying from one fishing ground to another depending on the targeted species (Otobotekere 1999)

Take 3 indicates the percentage compostion of shrimping operation at varing depth on major fishing ground in Nigeria waters.

Table four: Catch analysis of shrimper (Kg) between 19992-1994

Month	**Prawns**	**Shrimps**	**Totals**	**Fish by catch**	**Shrimp to fish ratio**
Nov/Dec 92	3270	370	3646	5840	1:2
Jan 93	3900	544	444	10200	1:2
Feb/Mar 93	4126	990	5116	7500	1:2
May 93	3556	240	3796	7300	1:2
June/Jul 93	1956	636	2592	16420	1:6
Jul/Aug '93	3168	674	3842	6560	1:2
Sep/Oct '93	2274	2392	4666	19540	1:4
Oct/Nov '93	2412	3954	8276	30600	1:5
Dec '93	12	5004	10720	20520	1:3
Jan 94	326	10718	5868	23600	1:2
Feb/Mar '94	448	5542	13626	10080	1:2
Apr '94	1048	13178	11262	14200	1:1
May/June '94	5528	10214	10492	22000	1:2
July '94	2750	4964	9506	14960	1:2
Augst/Sept'94	456	6756	12320	21520	1:2
Total	28490	11864	116538	17880	1:2

Nothwithstanding the lower commercial species is a serious concern for biological diversity and sustainability of the shrimp trawling fisheries. The estimate based on the assumption of three and four trips per annum for while prawn an dbrown shrimps respectively is that about 3000mt/year of trash, juvinile and non-commercial species may be caught annually, by woo actively operating vessel (Olaniyi, 1999).

Akinde (1997) reported the ratio of shrimp to by catch based on the catch data of commercial vessel between 1992 and 1997

(Table 4) some naturally small sized fish species were observed to continute more than 70% of catch at some grounds, also there are indiation from the Gulf of Guinea large marine escosystem survey carried out between February and March (1999) of serve impact of shrimp trawling fisheries on the juvinile of commecial finfish resources

REASON FOR DISCARDING FISH BY-CATCH

Discard fish by-cash are based on these reasons: Management measures, Economics and **Technical reasons.**

Management measures

Managment measures in some fisheries place a legal obligation on fishermen to discard a part of their catch at sea. When the alowable catch quota is achieved for a species, landing of excess catch are probibited and the fisherman theoretically have no other alternativge but to dump the over quota volume at sea. However, in reality over quota catches are often landed illegaly and dare termed "black fish". Maximum landings size regulations protect juveniles from being landed but those that are caught by fishing gear must be discarded to ensure compliance. In some fisheries a specific small mesh size is allowed for a target species for small size but in order to protect other species being caught there is a maximum threshold allowed in the landings for commercial non-target species expressed as a percentage to the retained catch. Closed and protected fishing areas are also used to restrict the catch of some commercial species which can be caught at all or allowed to be caught in a limited proportion. Some species are protected by regulations or international conventions such as CITES list of endangered speies (marine mamma, turtles, etc) and should be immediately returned to sea when caught.

Economic measures

There is often a strong economc motivation for dicarding. Some species have no commercial value locally or sesonally due to poor conditions whilst other species are caught in unmarketable sizes. After the majority of hauls and especially during long trips, the catch is sorted to return only that part of the catch which maximzes value. This is commonly referred to as high grading and discards are made of part of the catch after storage space on board. Fish that are damaged during operations are often discard because of theri unmarktable aspects. Catch is sometimes returned to the sea even before it reaches the dock. This can occur on some pelagic trawlers if the species composition in the catch is not deeemed to be sufficient value before pumping process to bring that catch board is initiated.

The economic reasons for dumping fish by catch are summarized in the following:

- Damaged or mutilated fish
- Species with no current market
- Achievement of quota
- Undersized individuals
- Unmarketable species eg dolphins, sea turtles

- **Technical reasons**

They are usually by-catch of fishing operations which compose of juveniles and those of netting damage adult invidual. The selectivity of fishing operation varies depending on the tye of gear being used whcih often has an effect on the survival rate the fish being discard. Using the same fishing gear in different areas can induce different discard problems depending on local biodiversity and species abdundance of the fishing area.

Effects of discarding fish at sea

Economic effect

- Income that has been forgotton as a result of juvenile and adult target species discards
- Income forgone in other fisheries as a result of dicarding non-commercial species
- The cost of managing discards and measuring their quantities

Biological effects

- Survial of most discarded specdies is low. Discards therefore may be a significant part of fishing moratality.
- Reproductive activities ofsuch fishes

may be significantly affected.

- The populations of endangered species are further threatned
- Certain ecological riches are created for scavenging fish.

Social effects

- Varies between nations and sections of socty depending on ethical belief, cultural differences etc
- It affects the dynamics of the expolited stocks in terms of yields recruits
- They can affect other fisheries since they by-catch speeies in one fishery may be the target of others fiheries.

Appliation on selective fishing techniques

In recent years some technological modifications in fishing gears and their operation have proved successful in many fisheries that are facing by catch problems. For example the introduction of "Turtle exclusion device (TED) in shrimp trawl has dramatically reduced the mortality of endangered sea turtles

The spectacular decline of the by-catches and discards of finfish in many fisheries have been the result of by-catch reduction device such as sorthing grids, square mesh panel, scaring device in lognlines and nordmore grids which main feature are highlighted below.

TURTLE exclusing device (TED)

- It is a dymnamic and rigid device
- It is inserted in from of the cod end
- It allows for the escape of turtles out of the trawl.

Conclusion and recommendation

Discarding of unmarketable, retricted species and small sized individual tagged by catch is a global, economic, environmental, and political problem which can be reduced through fishing gear modification.

The technologies developed in recent years demonstrate that the impact of fishing gear on non target species and habitat can be significantly reduced without negative effect on the profitability of the fishing operation.

There are currently no universal methods of modifying gears to reduce habitant dissturbance. Solution are specific to gears, fisheries and habitat and are strongly influened by regulatory and economic considderations, understanding the capture process of fishing gear in various environment is the key element in developing modification and practices that can reduce by-catch and escosystem impact. In essessence there is a need for the government to enorce a strong policity to combat by-catch and discards reduction most especially in the wake of eco-labelling in the international market which adhere to strict fishing standard. The following are therefore recommended.

- Enforment of fishing regulations (use of correct mesh size and other devices) before going to sea, while at sea and on landing
- Economic reward should be offered for the creation of new types of gear and modification that reduce by-catch and minimize impact on habitats
- Enforcement of gear regulation for targeted fish species.

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