



WWF - Pakistan



**STUDY ON VALUE ADDED TO THE CATCH
OF FISHER FOLK (FISHERIES
DEVELOPMENT FOR SUSTAINABLE
LIVELIHOOD**

Final Report

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1. INTRODUCTION

Fishing is one of the most important economic activities along the coastal areas of Pakistan. Some coastal communities especially those in remote areas of Sindh creek system and along the Balochistan coast are entirely dependant on the fishing or fisheries related businesses. Despite their hard work in catching the fish from close to coast to far away places in the open sea, fishermen are believed not to be receiving the right prices for their produce; therefore, their socio-economic conditions are considered to be much below the desired level. It is generally believed that middlemen who finance the fishing operations or those involved in procurement of fish from the fishermen extract major share in the income from the fish catch. In the present study an attempt has been made to document the practices being used by fishermen and marketing structure, as well as the role of middlemen in the fishermen's economy. The study also takes into consideration strategies which can be adopted to increase income of fishermen, improve their access to better market and capacity building of fishermen, especially in remote coastal areas.

It is generally believed that livelihood of the fishermen in the coastal areas is seriously affected by a number of factors; the most important among them are:

- over-exploitation of the fisheries resources
- poor handling techniques
- use of traditional gears
- inefficient marketing system
- inaccessibility to market

The scope of this study included collection of baseline information on indebtedness, marketing and value addition to the fish catch of the coastal communities, especially in Sonmiani and Kalamat Khor areas along Balochistan and Keti Bundar and Sandspit along Sindh coast. The study also included an analysis of viability of fish cold stores and other income generating and marketing activities in these communities. The study encompasses recommendations for alleviation of the poverty, empowerment of the coastal communities, improvement of fish handling and preservation practices, capacity building in gear technology, development of linkage with financial institutions, training of coastal communities in micro-enterprising, diversification of fishing activities and income generation for womenfolk.

The review of the literature indicated that no comprehensive study on the subject matter had previously been done on these aspects except for casual references to some aspects of the subject has been made. A number of reports that review fisheries sector of Pakistan such as, those made by Asian Development Bank (1987) and SMEDA (2000) have reviewed various aspects pertaining to indebtedness, role of money lenders and training of fishermen etc. However, these studies did not propose any workable solution for various problems being faced by the fishermen communities.

For this study, information on various aspects of coastal and offshore fisheries, resources, mode of disposition, processing and export available in the government statistical bulletins and other publications was reviewed, besides collection of primary data. The primary data was collected from various stakeholders, especially in the coastal villages and settlement on different aspects of fisheries, more specifically related to catch composition and volume, auctioning and disposal mechanisms, income proceeds, annual income and expenditure patterns and other related aspects of income and expenditure.

The marketing channels and disposal of the catch were studied specially with a view to determine the role of money lenders. The information collected from coastal villages and settlements was used to determine quantum of catch which was used to figure out any alternate disposal mechanisms which may help fishermen get rid of perpetual indebtedness.

Based on the availability of the catch, seasonality and existing channels of disposition, an alternate strategy for disposal of catch has been suggested. The design of storage facilities and transportation facilities at community level has also be provided alongwith cost estimates for examining the possibilities of pre-processing or processing at community level so as to add value to the harvested products. This may help the fishermen communities in finding alternate disposal mechanisms and enhancing their income.

Possibility of utilizing alternate resources such as seaweeds, shells, other terrestrial resources available to local communities was also examined which can be exploited at community level or at individual level for supplementing the income of fishermen including the women folk.

2. PRESENT FISHERIES PRACTICES

It is estimated that there are more than 300,000 fishermen engaged directly in the fisheries sector. Along the coast of Sindh majority of the fishermen are based in Karachi and the villages surrounding it. Karachi Fish Harbour is the main hub of fishing activity in the country. It is estimated that more than 60% of the fishing fleet is based in Karachi Harbour whereas, about 20 % of the fleet is based in Ibrahim Hyderi and adjacent area. Thus, a total of about 80% of the fishing fleet is based in and around Karachi. The remaining 20% of the fishing fleet is spread over coastal villages and towns located along Sindh and Balochistan coast. Along the coast of Balochistan there are five major towns and more than 27 fishing villages spreading along more than 700 km long coastline. Along the coast of Sindh, there is one major city i.e. Karachi and more than 38 villages located within the creek system and along coastline (Table-I)

Table 1: Towns and villages along Sindh and Balochistan coasts

S. NO.	NAME OF AREA/ TOWN	FISHING VILLAGE	S. NO.	NAME OF AREA/ TOWN	FISHING VILLAGE
SINDH COAST			BALUCHISTAN COAST		
1.	Cape Monz Area	1. Manjhar	1.	Sonmiani Area	1. Bundewari
		2. Bunglow			2. Gaddani
		3. Buleji/Somar			3. Damb
		4. Mubbarak Goth			4. Bera
2.	Karachi Area	5. Fish Harbour			5. Sapat
		6. Bhit Island			6. Hingol
		7. Baba Island			7. Waad Bundar
		8. Shamspir			8. Malan
		9. Salehabad	2	Ormara Area	9. Balera
		10. Bhutta Village			10. Hud
4.	Korangi Area	11. Ibrahim Hydri			11. Ormara
		12. Salt factory			12. Taq
		13. Chasma Goth			13. Bal
		14. Rehri			14. Basul Sakoni

		15. Lat Basti			15. Sirki
5.	Garho Area	16. Garho			16. Koari
		17. Sakro	3	Pasni Area	17. Makula
		18. Deh Pat Maro			18. Chandi
		19. Bhoara			19. Guresunt
6.	Garho Area	20. Mohal/Solani			20. Ishphaq
		21. Jat			21. Pasni
		22. Malak Shah			22. Chur
		23. Pitiani			23. Shumal Bundar
		24. Dabbo			24. Darag Kappar
7.	Keti Bundar Area	25. Keti Bundar			25. Karela Kappar
		26. Kangri	4	Gwadar Area	26. Sur
		27. Baharim			27. Gwadar
		28. Hajamro			28. Phusukan
		29. Chan	5.	Jiwani Area	29. Ganz
		30. Ghora			30. Jiwani
		31. Khobbar			31. Bandri
		32. Rajwari			32. Marine Base
8.	Karo Chan Area	33. Kharo Chan			
		34. Jangi Sir			
9.	Shah Bundar Area	35. Shah Bundar			
		36. Bam Bhatia			
		37. Kodari			
		38. Kun			
		39. Jatan Goth			

Source: Marine Fisheries Department/Population Census Department, 2004.

Fishing activities are primarily concentrated along the shallow coastal waters, however, about 25 % of the fishing fleet operates in offshore waters. Those operating in offshore waters include large gill-netter engaged in catching large pelagics (tuna, mackerels, sharks and billfishes). Majority of the large gillnetters land their catch at Karachi whereas those based in large coastal towns along Balochistan coast mainly land their catch at Pasni, Gwader or Ormara.

Shrimp harvesting is carried out by wooden trawlers based in Karachi and adjacent villages. Their operating area is mainly confined to shallow coastal waters (upto 40 m depth contours). However, in the past two years, the shrimp fleet has experienced changes; it has extended their area of operation and is now fishing in comparatively deeper waters, mainly targeting finfish species. The main reasons for increase in operational area are installation of the winches and decreasing catch rates in shallow waters, which have compelled fishermen to look for deeper fishing grounds. Gill-netters engaged in catching fish consumed in local market or for export operate in the neretic waters along the coastline. There are a large number of small fishing boats which operate in creeks and in the shallow waters along the coast of Pakistan. These are primarily engaged in catching small pelagic, benthopelagic and demersal species.

2.1 Types of Fishing Gears

Most of the gears being used by the fishermen in the coastal areas are of artisanal types. Gillnet seems to be the main fishing gear. Cast nets, trawl nets and lines are other popular gears being used by the fishermen. A description of major fishing gears used in Pakistan is given in Khan (1996).

2.1.1 Trawl nets: Shrimp trawl net was not an indigenous gear but, was introduced in late 1950's by Marine Fisheries Department (then Central Fisheries Department). This gear got popularity during 1960's and 1970's when a shrimp export industry was established in the country. The shrimp resources started showing signs of depletion in 1970's but trawling continued to grow. A census of the fishing gears was conducted in 1985 which indicated that trawling is the most popular gear being used by the fishing boats based in the Karachi Fish Harbour whereas, it is also popular in Ibrahim Hyderi area. There is no trawling legally allowed to operate along Balochistan coast, however; the Government of Balochistan permitted operation of limited numbers of Karachi based shrimp trawlers to operate in some specific areas along Balochistan coast. Owing to protest from fishermen no shrimp trawlers are allowed to operate in Balochistan waters, although poaching is still being continued.

Prior to year 2001, all trawl nets were operating manually. However, winches have now been introduced and it is estimated that about 90 % of the shrimp fleet, now have winches which have effectively increased the area of operation of the fishing boats. At present, all shrimp trawlers are also involved in trawling of fish, especially from November to March.

2.1.2 Cast nets: are popular gear in coastal villages where it is used for catching fish along shallow waters. Cast net is also used for catching shrimp in Kalamat, Pasni, Sonmiani, Gwader and other areas of Balochistan. In addition, cast nets are used for catching a variety of fish and shell fish species. It is primarily used for catching fish for subsistence purposes; however, it is the main gear for catching shrimp in some areas, especially along Mekran coast. It is also used for catching bait for handline and longline fisheries.

2.1.3 Gillnets: Various types of gillnets are used which may include bottom-set gillnets being used in shallow waters such as '*Thukri*' and '*Rach*'. '*Thukri*' is a small gillnet which is used in coastal waters for catching small pelagic, shrimp and other species. A modification of '*Thukri*' called "Plastic net" has got popularity and is used nowadays for catching Indian mackerel. Various other types of gillnets are used in coastal and offshore waters of Pakistan. These can be categorized into two types i.e. surface gillnet which are used in coastal and neritic waters for catching a variety of food fishes such as croakers, groupers, barracuda, catfishes, mullets, threadfins, eels, pomfrets etc. Surface gillnets are called "*Chirapi*" in Balochi and "*Ohjo*" in Sindhi. Bottom-set gillnet is used for demersal species such as croakers, groupers, lobsters, sharks, rays and other bottom dwelling fishes. Bottom-set gillnets are called "*Sirapi*" in Balochi and "*Bodo*" in Sindhi.

Additionally, very long gillnets, sometime reaching 8 to 9 km, are operated in offshore waters for catching large pelagic such as tuna, mackerels, billfishes and sharks. Other modifications of gillnets are also in use which includes "*Darband*" gillnet arranged in such a manner that only one side of it is opened to allow fish to enter inside it. The fish gets entrapped when the 'door' is closed, hence, the net is known as *Darband* (meaning closed door). A similar type of modification is used in case of catching large spawning schools of catfish and croakers which is known as "*Aaranga*" in Balochi and "*Pinn*" in Sindhi.

2.1.4 Stake nets: locally known as "*Aar*" used to be a common gear in creek areas of Sindh but, the current scale of its use in creeks is limited. These nets are placed in the inter-tidal areas in such a way that large fish gets entrapped when tides recede. Along the

coast of Balochistan, a smaller version of it called ‘*Paadi*’ is used in some areas for catching migrating schools of large croakers and other species.

2.1.5 Katra: For catching small pelagic, modified purse seine is being used which is locally known as ‘*Katra*’. *Katra* net differs from basic purse seine in its mode of operation. Instead of closing the net from the bottom by bunt line, the lower part of the net is retrieved achieving a bag which is ultimately heaved. This exotic gear was introduced in late 1970’s. Almost entire fishing fleet of ‘*Katra*’ using boats is based in Sindh; however, a few such boats have managed to get themselves based in Dam, Sonmiani area of Balochistan, where they operate in connivance with the local influential.

2.1.6 Bhoola: Estuarine-set bag net is also an exotic gear which was introduced in late 1970’s. It is used in creek areas for catching fishes and crustacean from inter-tidal zone. This net is considered to be harmful for the resource, as small juveniles even larval fish and crustacean get caught in this net.

2.1.7 Bhan: This is beach seine which is predominantly used in creek areas for catching mullets, small pelagic fishes and other species. This gear is also used along open coastline, especially at Clifton.

2.1.8 Line gears: Both handlines and longlines are used along the coastline through a variety of fishing boats. Handlines are called ‘*Kundi*’ in Sindhi and ‘*Chirdan*’ or ‘*Chirdani*’ in Balochi. These are used mainly by small fishing boats including ‘*horas*’ and ‘*rachins*’. For bait a variety of fish and shrimps are used. Sardinellas and squids are preferred bait for catching croakers and groupers whereas, shrimp is mainly used for catching seabreams and other demersal fish. For catching large sharks live baits are used for which saddle grunt is preferred. These grunts are caught by cast net and carried in live car (‘*Jal*’) which is tied along the boat. Live baits (sardinellas) are used for catching king fish using trolling lines. Handline is used for catching a variety of species including, croakers, catfishes, barracuda, carangids, ribbonfish, groupers, snappers, kingfish, sharks, rays and seabreams. Longlines locally called ‘*Sangal*’ are used for catching eels, ribbonfish, rays and a variety of demersal species. Shrimp, squid and chunks of rays, eels and catfish are used as baits in longline.

Data for the gears being used in various fishing villages or towns are not recorded; however, in 1985, Marine Fisheries Department conducted a survey of the gears being used along coastal area. Data for the four fishing village/communities under this study is presented in Table-II.

Table-II Fishing gear in used in four coastal communities in 1985.

Fishing Area	Tukri	Rach	Gujji	Jalla	Kundi	Katra	Total
Sandspit	3		16			3	22
Keti Bundar	18	56	42			92	206
Sonmiani/Dam	16	37	20	41	9		123
Kalimat		19	19	18	15	13	84

Source: Marine Fisheries Department, 1985

In the four fishermen communities small scale gears are being used. In Sandspit area mainly gillnets are being used. Majority of the gillnet fishing boats are engaged in fishing for small pelagic. Indian mackerel (*Rastrelliger kanagurta*) is main target species in the area. Additionally other shallow water species such as mullets and sardinellas is caught in this area. Some boats in the area are engaged in gillnetting and use of line gears along the rocky out crops. Lobster, kingfish, groupers and other bottom lining fishes are other important species caught by fishermen of the Sandspit area.

In Keti Bundar area gillnets are the main gear which is used in creek system mainly targeting mullets, sardinellas, anchovies, mullets and other small pelagics. Gillnets are also used for catching river shads, barramundi, threadfins and other diadromous fishes. Beach seines, 'katra' nets and estuarine set bag nets are also popular gears in the Keti Bundar area which mainly target small fishes especially small pelagics. Trawling is also used for catching shrimp and other bottom dwelling fishes.

In Sonmiani and Dam, the major fishing gear used is 'Thukri' gillnet which is used for catching a variety of demersal fish and shell fish. Cast nets are used for catching shrimp. Other gillnets are also used for catching small pelagics. A number of 'Katra' fishing boats are based in Dam which are used for catching small pelagics. Lines gears are also used for catching croakers, groupers and eels etc. A few estuarine set bag nets are also being used in creeks in Miani Hor.

In Kalmat area, gillnetting and cast netting are main methods of catching fishes and shellfishes. Shrimp is mainly caught with cast nets and 'Thukri' nets which are main produce of the area.

2.2 Types of Boats

Almost entire fishing fleet of Pakistan consists of wooden boats except a small number of fiberglass life boats which are converted into small gillnet boats. There are various sizes and types of fishing boats used in Pakistan.

Smallest category of boat is called "Katti" in Balochistan and "Toni" in Sindh. These boats (usually smaller than 5 meters) are used in shallow coastal waters for catching fishes with handlines or small gillnets. These boats are used for catching crabs in creek areas and also for harvesting the catch of 'Bhoola' net installed in creek system. The boats are fitted with outboard or long-tail engines. It is maximally operated by 2 to 3 persons. Smaller boats of these categories are used by a single person.

Medium sized boats are called "Rachins" in Balochistan and "Hora" in Sindh. These boats have a size range between 6m to 15m and have a maximum beam of about 3 m. These boats are powered by outboard or long-tail engines (a few such boats have inboard engines) and are used in shallow coastal waters for catching a variety of fish and shellfish species. Gillnet is most popular gear used by these boats, however, handlines, longlines, castnets, traps for crabs and ivory-shell are also harvested with these boats. Presently these boats are mainly used for catching Indian mackerel using monofilament surface gillnets along the shallow coastal waters and in the bays along Balochistan coast.

Modified versions of "Hora" which are beamier (upto 4 m) are called "Katra" boats. These boats are powered with one to four longtail engines and are used for catching small

pelagics in shallow coastal waters. These boats are mainly based in Sindh, however, a few such boats are now illegally operating in waters of Balochistan.



Fig. 1 'Katra boats' – Ibrahim Hyderi

There are two categories of large fishing boats. Trawlers which are based in Sindh are usually 14 to 25m in overall lengths. These boats are fitted with inboard engines of various capacities of even upto 600 hp. Most of these boats now have deckhouses and also winches have been installed. The winches are powered by a separate engine placed on the deck. Trawlers are primarily employed in shrimp harvesting, however, since 1995 all trawlers keep two types of nets i.e. shrimp and fish trawler nets. In shrimp harvesting season i.e. July to November and January to February shrimp trawling is mainly done whereas in the remainder of the year fish trawling is being done. Most of the trawlers are operated in shallow coastal waters which are main shrimp grounds; however, with installation of winches and improved navigational equipments these trawlers now operate in comparatively deeper waters.

Large gill-netters are usually 15 to 30m in length is powered by inboard engines. These boats are used for catching large pelagic and demersal fishes in shallow and offshore waters. Some of these boats undertake very long fishing voyages even venturing in waters off Somalia and Yemen especially targeting tuna and other large pelagics.

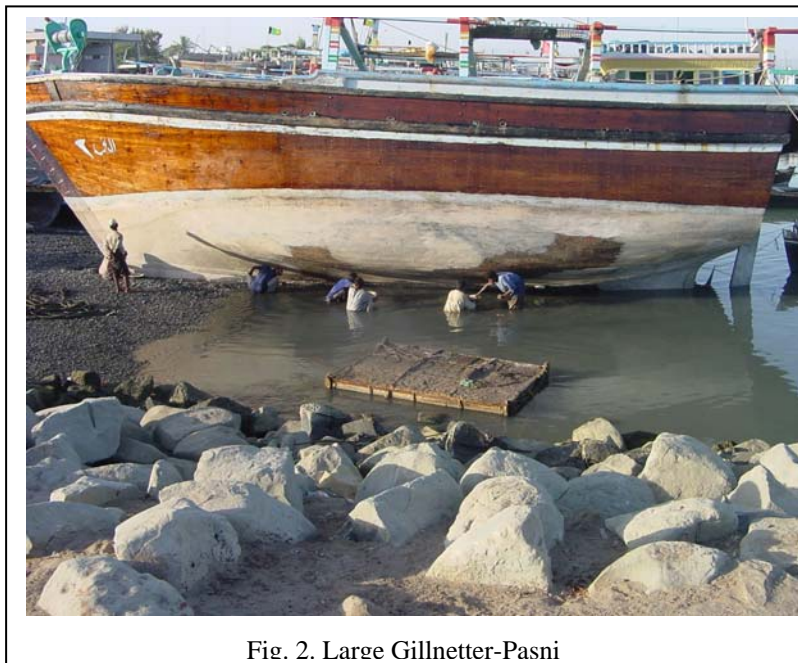


Fig. 2. Large Gillnetter-Pasni

‘Doonda’ boats are life boats obtained from ship breaking industry based in Gaddani. In most cases a small fish hold is made in the middle of the life boat. These boats are mainly used for line gears or gillnets.

According to the official statistics there were 16,000 operational fishing boats in year 2003 in Pakistan whereas, total number of registered boats is 24,000.

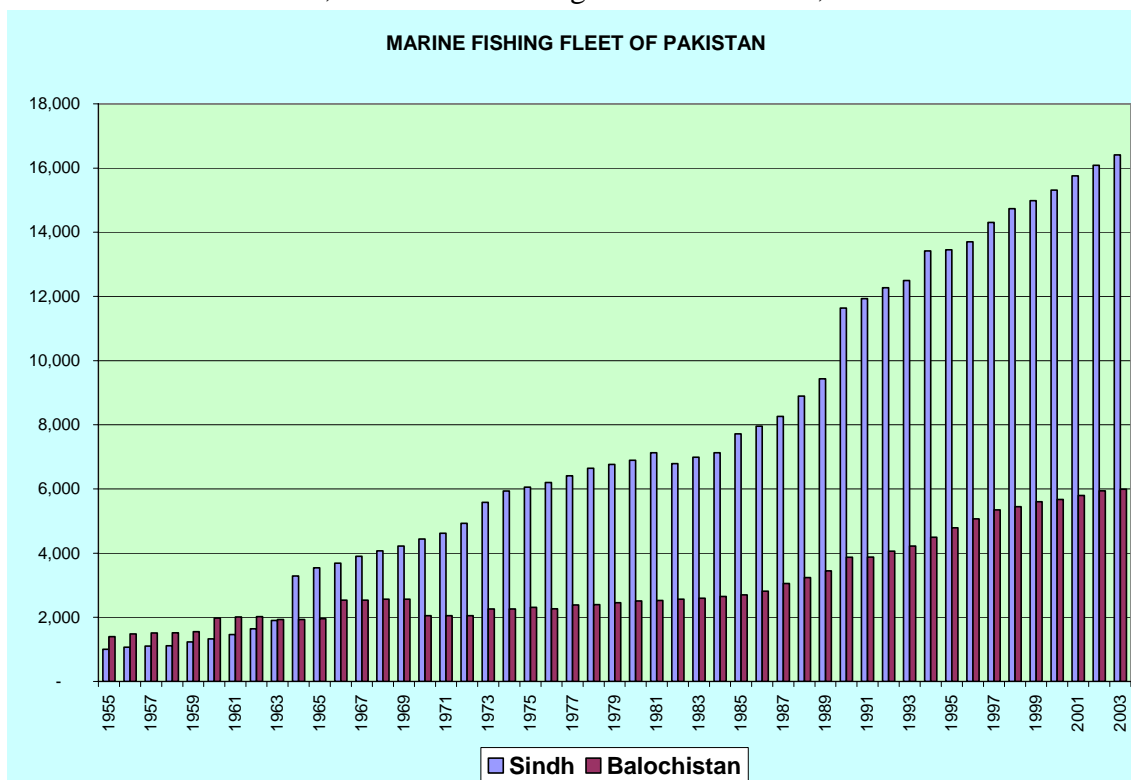


Fig. 3 Fishing Fleet of Sindh and Balochistan

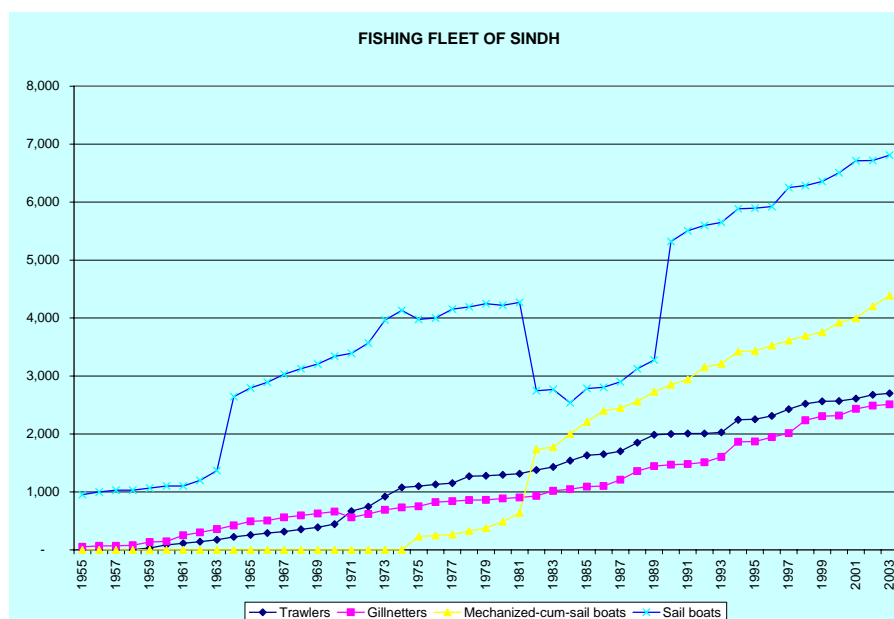
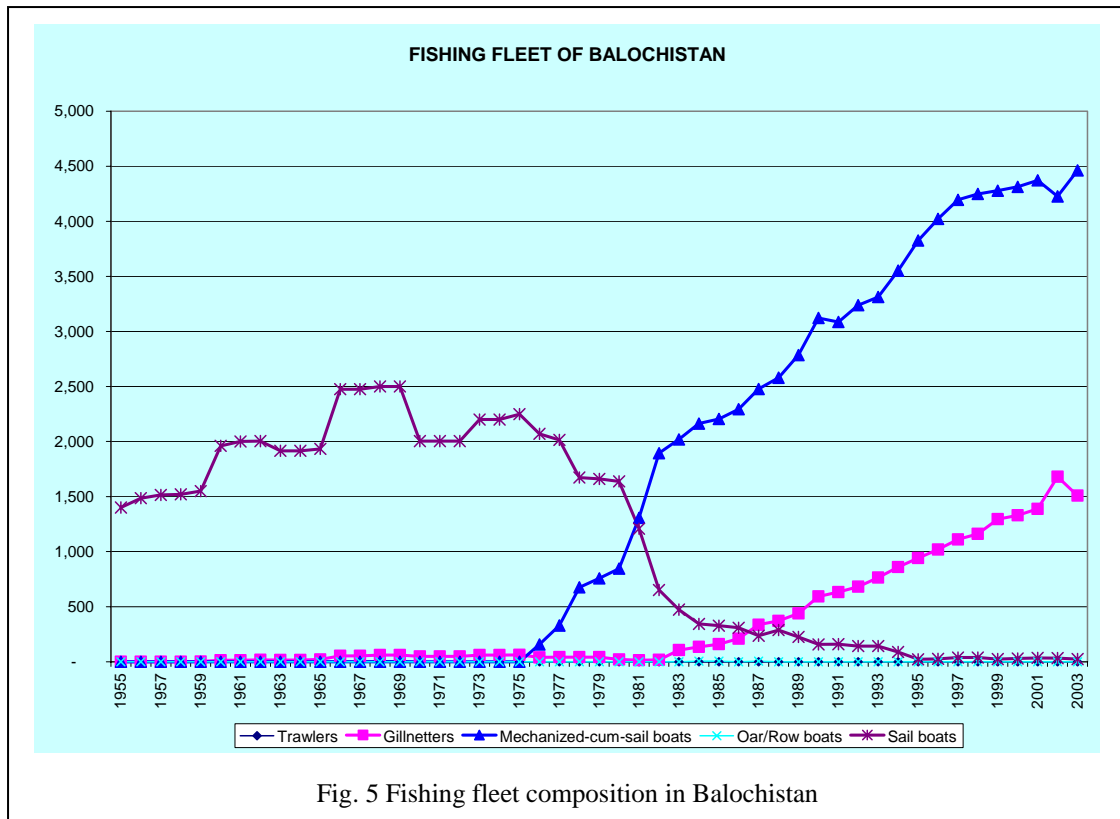


Fig. 4 Fishing fleet composition in Sindh



In the past fifty eight years only one census of the fishing boats was carried out in 1985 which included fishing boats of all villages, towns and cities along the coast of Pakistan. This census provided accurate data of the operational fishing boats along Pakistan coast. The data of this survey is presented in Table-III.

Table-III Data of census of fishing boats done along the coast of Pakistan by Marine Fisheries Department and FAO in 1985.

Fishing Area	Trawlers	Gillnetters	Lifeboats	Outboard Horas	Sailboats	Total
Cape Monz Area						
1. Manjhar				17	8	25
2. Bunglow	1			65		66
3. Buleji/Somar		1		18	4	23
4. Mubbarak Goth				13		13
Karachi Area						
5. Fish Harbour	772	173	15	150	20	1,130
6. Bhit Island	107	11	4	51	6	179
7. Baba Island	83	5	8	84	2	182
8. Shamspir	16	13	9	186	29	253
9. Salehabad	18	1	2	73	15	109
10. Bhutta Village	2			1		3
Korangi Area						
11. Ibrahim Hydri	64	12	9	789	14	888
12. Salt factory				50	14	64
13. Chasma Goth	4	1	1	66	7	79
14. Rehri	11	32	9	473	56	581
15. Lat Basti	8	2		229	21	260
Gharo Area						
16. Gharo				2		2
17. Sakro	5			14	2	21
18. Deh Pat Maro	1			44	2	47
19. Bhoara				1		1
Garho Area						
20. Mohal/Solani				4		4

21. Jat				5		5
22. Malak Shah				5	3	8
23. Pitiani				5		5
24. Dabbo				11		11
Keti Bundar Area						
25. Keti Bundar	6	5		16	13	40
26. Kangri		1		16		17
27. Baharim		1		15	10	26
28. Hajamro				17	7	24
29. Chan				36	11	47
30. Ghora				21		21
31. Khobbar				18	26	44
32. Rajwari			1	1		2
Kharo Chan Area						
33. Kharo Chan	1	6		18		25
34. Jangi Sir				23		23
Shah Bundar Area						
35. Shah Bundar				18		18
36. Bam Bhatia				8		8
37. Kodari				1		1
38. Kun	1			30	13	44
39. Jatan Goth				54	2	56
Sonmiani Area						
1. Bundewari	27	1		38	10	76
2. Gaddani	25	8		123		156
3. Damb	24			117	6	147
4. Bera				11		11
5. Sapat				16		16
6. Hingol				67	7	74
7. Waad Bundar				6		6
8. Malan				22		22
Ormara Area						
9. Balera				14		14
10. Hud	1			22		23
11. Ormara	7			247		254
12. Taq				4		4
13. Bal				16		16
14. Basul Sakoni				12		12
15. Sirki				28		28
16. Koari				15		15
Pasni Area						
17. Makula				17		17
18. Chandi				31		31
19. Guresunt				36		36
20. Ishphaq				8		8
21. Pasni	1	3		291	1	296
22. Chur				40		40
23. Shumal Bundar				10		10
24. Darag Kappar				15		15
25. Karela Kappar				14		14
Gwader Area						
26. Sur		1		152		153
27. Gwadar	6	6	1	277	43	333
28. Phusukan		4		120	6	130
Jiwani Area						
29. Ganz				51		51
30. Jiwani	7	4		94		105
31. Bandri				11		11
32. Marine Base	6			3		9
Grand Total	1204	291	59	4,576	358	6,488

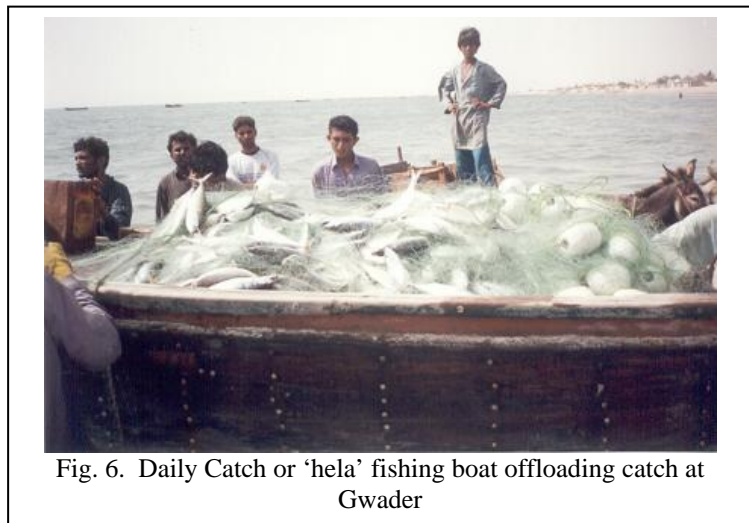
(Trawlers mentioned in Balochistan are mainly based in Karachi but operated from Balochistan)
After van Zalinge (1987)

From the data of the census and the field visits it is evident that 'horas' seems to be the major fishing boat being used in coastal communities at Sandspit and Keti Bundar in Sindh whereas 'Rachin' type boats are dominating in Sonmiani and Kalmat. Increasing 'Doonda' boats can be seen in the all four locations.

2.3 Fishing Operations

Fishing operations along Sindh and Balochistan coast depends primarily on type of boat, type of fishing, base of fishing operation, period of the year, target species, market access and demand etc. Most of smaller fishing boats such as 'Kati' or 'Toni' or small 'Hora' or 'Rachin' under take usually one day fishing trips. Most fishing boats along Sindh creeks and along the coastal village undertake daily trip starting early in morning and returning back in the evening or departing in the evening and returning early morning.

The other category includes those boats which take a few days trip. These boats are mainly based in towns along the coastline and mainly engaged in gillnet and line fishing. 'Katra' boats based in Sindh used to undertake fishing trips of one day. Now with the dwindling resources, the area of operation is increased and now some 'Katra' boats undertake fishing trips lasting more than three to seven days.



Trawlers and majority large gillnetters undertake fishing trips last many days. The duration of such trips depends on fishing season. Usually fishing trips of shrimp boats lasts between 6 to 20 days depending on season, fishing ground location and catch rate. The large gillnetters operating in offshore Pakistani, Omani, Yemeni and Somali waters undertake fishing trips lasting upto 1 ½ months. Adequate facilities on fishing vessels are not available; therefore, life on fishing boats seems to be unpleasant, thus major fishing trips are culminated before schedule.



Fishing operation in four communities under consideration is mainly concentrated on daily fishing ('hela') operation. In fact in some cases the operation is completed in few hours. Only a few fishing boats, those which operate in deep waters and take ice with them are involved longer fishing trips. 'Katra' boats based in Sonmiani usually undertake more than one day fishing trips and catch is not preserved on board, therefore, the catch, if of more than one day, is usually putrefied. Operation involving 'Thukri' net which is the most popular gear in four communities usually take only a few hours. Nets in most cases are laid early in the morning and retrieved in the afternoon. In case of gillnets the fishing operation is completed in few hours (average 4 to 6 hours). Because of the short duration operation being used in four coastal communities i.e. Sandspit, Kalmat, Sonmiani and Ketu Bunder, the landed catch is usually of very high quality but owing to poor handling and delays in transportation and improper storage the quality of catch deteriorates rapidly.

2.4 Input Supply

Major inputs required for fishing operation are daily ration, fuel, ice or salt and water whereas other supplies includes fishing gears, ropes, other fishing implements etc. which in most cases are procured by fishermen from middlemen on credit before onset of fishing trips. Water is one of the commodities which are not procured in coastal villages and fishermen arrange themselves. They carry small quantity of water for drinking and cooking purposes when the fishing trips is usually for one days or at the most three days, therefore, only one can of water is enough for such trips. Major expenses involved in smaller fishing trip include fuel and ration and for longer trips fuel, ice and ration. The amount incurred on the supplies is noted by the middleman and after the sale of fish catch it is deducted. In case of failed fishing trips or in case where credit taken for supplies exceeds the sale value of the catch the balance is brought forward and deducted from subsequent fishing trip.

2.5 Catch Handling

Majority of the fishing boats based in the villages and coastal towns do not have facility for preservation of fish on board. Fish is placed on the deck, in wicker baskets or below the deck (usually there is no compartment) to prevent it from exposure to sun. Thus, in most cases proper care of the catch is not done. No evisceration, bleeding or beheading is done on board fishing vessels. In case of larger vessels which undertake fishing trips of more than one



Fig. 8 A good catch of daily fishing boat

day, usually ice is taken on-board. Usually no sorting of fish catch is done on fishing vessels, however, in some cases, the priced fish such as pomfret, groupers, soles,

croakers, shrimp, lobsters and other food fishes are separated and placed in wicker baskets and ice is applied.

The larger fishing boats such as trawlers and gill-netters have 6 to 8 separate compartments which is called '*Gala*' while removable insulated boxes are fixed in the some fishing boats called '*Tanki*'. The fish is kept in compartments with ice. Fish with ice is placed above each other which results in deterioration of the fish placed at the bottom due to pressure. Presently, there is a new trend in which trash fish and bycatch is placed at the bottom layers without ice and food fishes are placed above it with ice. This method is not suitable as fish on the upper layer gets foul smell due to presence of trash and putrefied fish at the bottom. In some fishing boats a separate fish hold is made where trash fish is kept away from the food fishes. Priced fishes and shellfishes are kept separately in most fishing operations.

With the exception of Karachi, Ibrahim Hyderi, Korangi, Pasni and Gwader there are no fish landing jetties along the coast of Pakistan. At Korangi a new fish harbour was constructed in 1993 but it is not being used by the local fishing boats and only sparingly used by deep sea trawlers. Karachi Fish harbour is



Fig. 9 Fish handling and storage on board-Gwader

the biggest and the oldest fish harbour of the country which is being used by all categories of the fishing boats. However, major fishing fleet being engaged in shrimp and fish trawling and large gill-netters primarily operates from this fish harbour. The harbour is designed to cater about 1000 fishing boats, however, it is estimated that more than 4,000 fishing boats are based at this harbour, making it heavily congested. Despite the properly designed facilities at the landing centers the process of landing and auction seems to be not in order. There is no hygienic handling of fish during offloading and placement for auction. A major part of the fish catch is placed on the floor. The fish catch is usually placed without ice resulting in deterioration of fish quality due to rise in temperature and making it unfit for processing and sale.



Fig. 10 Korangi Fish Harbour

Although fish boxes have been introduced, however, these are

not available in required quantities; therefore, bulk of the catch is still handled in wicker baskets. The fish is mainly carried in open trolleys to the processing facilities or taken in open vehicles. A few insulated and covered vehicles have also been introduced recently. Similarly a few processors have started using insulated fishing boxes for transporting fish.

The conditions in other fish harbour are not different from Karachi Fish harbour. At Ibrahim Hyderi local government has constructed a landing jetty which is ill designed and ill equipped. Landing is made at this harbour in extremely unhygienic condition. There are inadequate facilities for berthing and there seems to be no concept of cleaning at this landing center. There are no landing facilities at other places along Sindh coast and at most of the places, fish is landed on ground and auctioned. In some places fish is placed on wicker mat for sale, auction or packing etc.



Fig. 11 Pasni Fish Harbour

Along the Balochistan coast there are two landing centers i.e. one at Pasni and other at Gwader. The conditions in these two landing centers are different. Fish is placed on floor for auction and sale. There is no concept of hygiene. Pasni Harbour is now heavily silted, thus only limited portion is available for berthing and offloading. In places where there are no landing centers either catch is landed



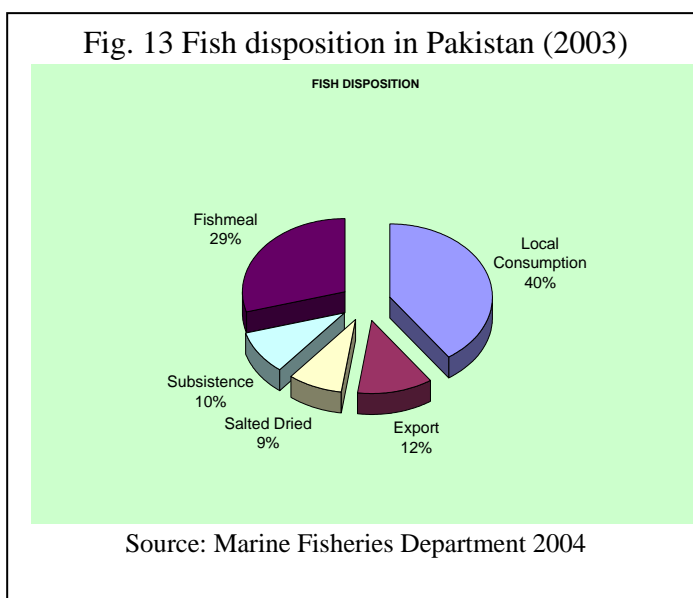
Fig. 12. Landing area at Ormara

on the beach or at most transferred directly to disposal place (either to processing facilities or to a transportation vehicle). In almost all the landing centers along the coast of Pakistan fish is not kept with ice during auction, sale or display

2.6 Catch Disposal

A major fraction of fish is consumed locally in the coastal villages, towns and cities. Karachi being the biggest city of Pakistan, is the major market for most of the products.

About 40% of the fish catch is locally consumed whereas, 10% is used for subsistence purposes by fishermen thus making total local consumption to about 50%. A total of 12% is exported in frozen form and 9% in the form of salted dried products making a total of 21% which is exported whereas, remaining 29% is processed and converted into fish meal and utilized by poultry industry. The fish catch in coastal villages is mainly salted dried or transported to Karachi for processing or for market consumption.



2.7 Marketing Channels

Almost the entire catch is handled by middle man or auctioneers except for those which is consumed by the fishermen families. In smaller villages fish is directly sold to the moneylenders which in most cases are processor, representatives of the processor or transporters. In some cases, the fish catch is procured directly from fishermen by transporter who transports the fish through van or truck to Karachi Fish Harbour for sale.



Fig. 14 Transportation of fish from landing center to processing plant at Gwader

In small towns and villages where loans and gratification/retention money are extended to the fishing boats, the catch is directly delivered to the representatives of the money lender. In Karachi Fish Harbour the catch is open auctioned and various suppliers and representatives of the fish

processor procure the fish. In addition, fish is also procured by some traders who sort them out and sell again by lots to the fish mongers and also for domestic consumption. Major mode of sale still remains to be from boat owners to middlemen to processor fish mongers.

2.8 Price Structure

Like in open markets, the prices are determined by demand and supply in major fish landing centers and markets of Pakistan. The prices of fish usually shoot during the winter months due to increased demand in the local markets especially in the upcountry area. Another major factor which determines the price is the demand of a particular species in the international markets. Usually the fish is auctioned on unit rate based i.e. rates are determined on per kg basis.



Fig. 15 Transportation of fish from landing center at Gwadar to Karachi Fish Harbour

The prices in small villages are usually set prior to fishing seasons and it is always much lower than Karachi market which in most cases is final destination of the products. In Karachi and other large fishing towns the auction is open thus prices are determined on the basis of quality and also on the basis of supply and demand, thus fishermen gets comparatively better return for their produced.

In other towns the traders (*'Beopari'*) usually set the prices of various species depending on its demand, transportation cost to Karachi and also on the price structure in other coastal villages. It is generally



Fig. 16 Fish displayed for auction at Gawadar

believed that these traders and middlemen usually take a major part of the profit; however, a close analysis of the marketing system reveals that middlemen's being a key

player in marketing system plays its role. Their role, in no case, was observed to indicate them to be the major earners of the whole marketing structure. As shown in Table IV, the middleman supplier mostly deduct between 6.25 to 10 % from the income of fishermen. Considering the present scenario in the fisheries sector, it seems difficult to eliminate the role of the middlemen or auctioneer because these not only are involve in fish trading but also in most cases are fleet mangers, and sponsors of the fishing operations. Although, this conclusion seems to be in contradiction of the project assumption, but the information sought during the course of the studies does not support this. With weak banking system in coastal villages and towns and documentary and legal requirements will continue to compel the fishermen to seek financial assistance from money lenders and traders.

TABLE IV: Price Difference

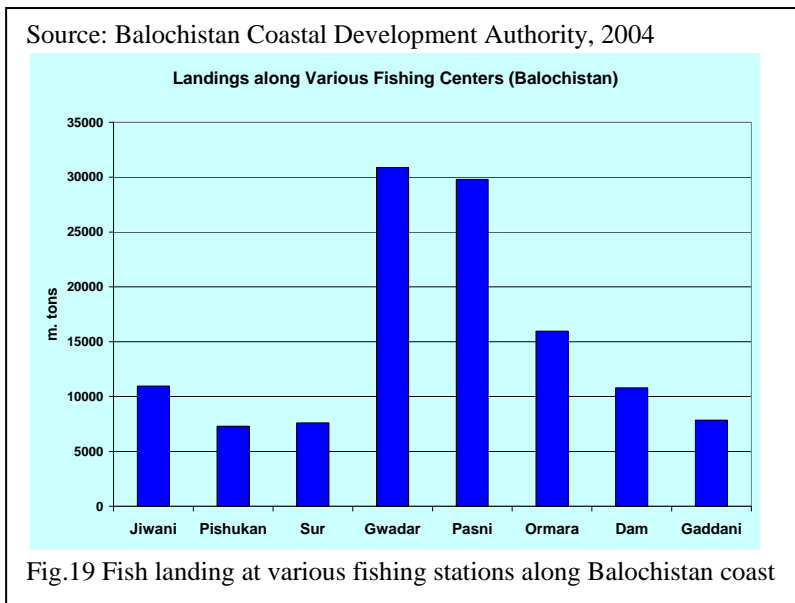
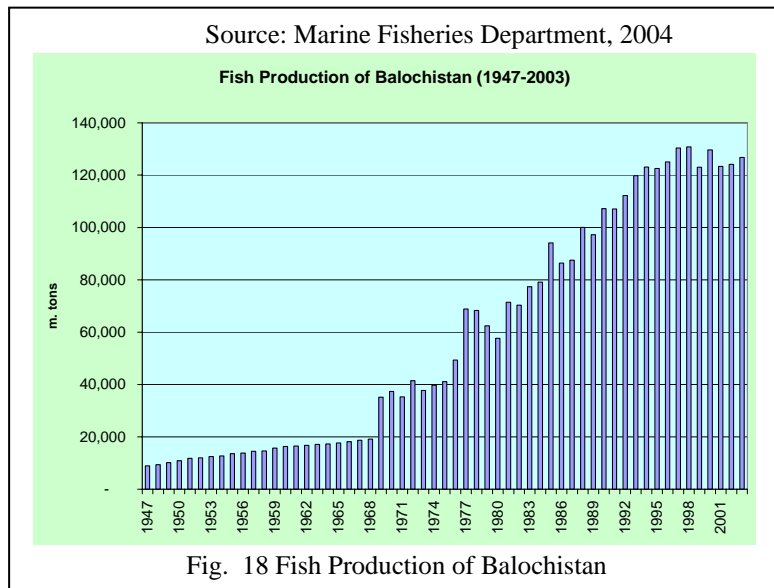
S. No.	Species	Price Paid to Fishermen	Prices to Supplier	Differences (% age)	Remarks
1.	Shrimp (Jaira & Kalri)	93.75 %	6.25 %	-	No deduction
2.	Shrimp (Kiddi)	50 %	10 %	40 %	Processor deduct 40 % on account of ice present in the lots
3.	Ribbonfish (ice fisheries)	50 %	10 %	40 %	Processor deduct 40 % on account of ice present in the lots
4.	Ribbonfish ('hela' fisheries)	75 %	10 %	15 %	Processor deduct 40 % on account of ice present in the lots
5.	Pomfret	75 %	10 %	15 %	Processor deduct 15 % on account of ice present in the lots
6.	Kingfish	92 %	8 %	-	
7.	Croakers	90 %	10 %	-	
8.	Snappers	75 %	10 %	15 %	Processor deduct 15 % on account of ice present in the lots

3. FISH CATCH

The total fish catch of both marine and inland fish during the period from 1996 to 2002 showed that total production increased from 589,731 metric tons in 1997 to 654,530 metric tons in 1999 thereafter it is decreasing. It decreased upto 522,207 metric tons during 2003. The productions from marine and inland have similar trends as that of total

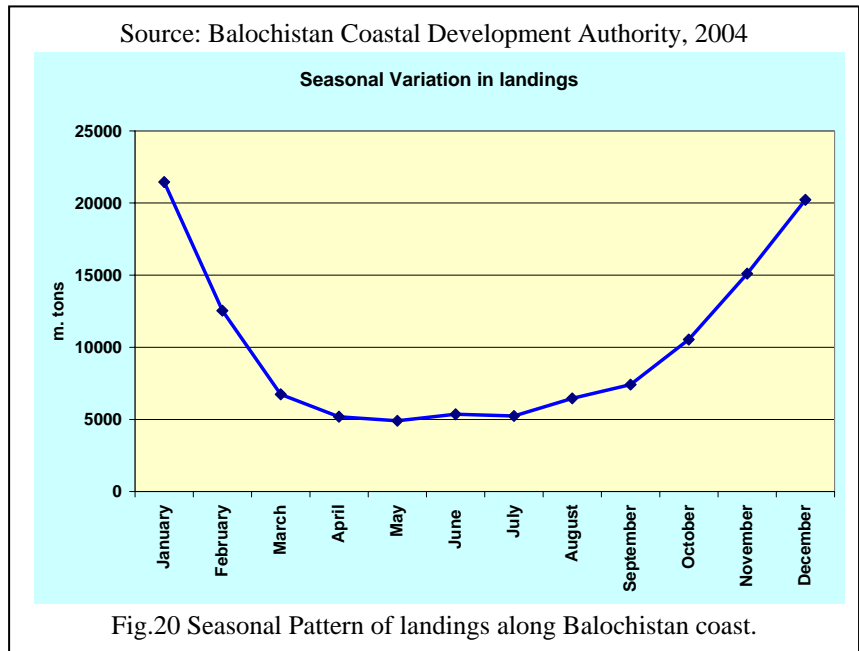
production. The production in marine sector increased from 422,201 metric tons in 1997 to 474,665 metric tons in 1999. It decreased upto 382,409 metric tons during 2002. The production from inland sector increased from 167,530 in 1997 to 179,865 metric tons in 1999 and it decreased upto 139,798 metric tons during 2002.

There are a number of landing centers along Sindh coast but separate data of these centers is not available. There are 8 major landing centers along the coast of Balochistan i.e. Gaddani, Dam, Ormara, Pasni, Sur, Gwadar, Pushkan and Jiwani, whereas, there are about 25 fishermen settlements. The annual fish landings at Gawadar and Pasni were observed to be more than 30,000 m. tons each whereas, at other stations landings are less than 10,000 m. tons (Fig. 19).



About 35 categories of fish belonging to about 150 species are commercially landed along the Pakistan coast. Among these, sadinellas, tuna, Indian mackerel, catfishes and sharks are dominating. Among shellfish, shrimp, lobsters, crabs, cuttlefish and ivory shell are important.

The data on seasonal patterns of fish landings for Balochistan is presented in Figure 20. Similar data of seasonal patterns of fish landings is not available for Sindh province. Seasonal pattern of landings indicates higher landings during the winter months i.e. from October through March whereas low landings were observed during southwest monsoon period i.e. from May to August. During monsoon landings decrease due to intensive wave action which makes fishing operation difficult and ban on shrimp trawling in the provincial waters of Sindh. During summer monsoon most of the fishermen cease their operation.



4. INDEBTNESS

Almost all fishermen along the coastline conduct their operation using one or another kind of loans both from formal and informal sectors. Major formal loans are obtained by boats owners in Karachi and other large towns for the construction, repair or upgradation of the boats. The loans taken from the formal sector is not substantial. The data obtained from State Bank of Pakistan indicates that during the past five years total loan extended to the fisheries sector amounted to annually about Rs.140 million (Table-V) which also includes loan taken by the processing sector which has the major share in these loans.

Table-V Loans provided by various banks including Agriculture Development Bank of Pakistan (ZTBL) to fishermen/fisheries sector.

PERIOD	AMOUNT (RS. IN MILLION)
2000-01	35.85
2001-02	125.74
2002-03	157.64
2003-04	151.95
2004-05 (July-December)	147.11

Source: State Bank of Pakistan/Marine Fisheries Department, 2005

In the informal sector major loans are extended by the auctioneers, mole holders (in Karachi), traders, representatives of the processing plant and individuals. Most of these loans are taken for fishing operations, repair of fishing boats and procurement of the gears etc. Operational loans are taken for procurement of ration, fuel, ice, drinking waters and for other supplies. These short duration loans range between Rs 500 to Rs 300,000 per trip, depending upon type of fishing and the nature of fishing operations. In small villages these loan are extended by traders and transporters to individual fishing boat captain (*nakhuda*) for the preparation of the operations. In such cases no written documentation or written agreement is made except that the trader notes down the amount in his diary. Such boats after the fishing trips are bound to sell their catch to the loaner who buy the total catch of the fishermen usually on prefixed prices and deduct the amount of loan and pay the remaining balance to the fishermen. In larger towns the role of extending the money for operational purpose is usually extended by the auctioneers who follow the similar pattern except that the fish is sold in open auction. In Karachi a similar practice is being followed, however, it is done by the mole holders (who are primarily auctioneers). In case of a failed fishing trip where the boat returns with fish catch which fetches less prices than amount extended for operational loans (such trips are called '*Lara*'), then the loan amount is brought forward and deducted from subsequent trips.

In addition to the operational loans, other loans and money is provided to the boat owners, these include money that is extended at the outset of the fishing season. These loans are given by traders, auctioneers or mole holders to bind particular boats to sell its harvest to them. This "retention money" ranges from few thousand rupees in case of small boats to upto Rs. 300,000 to 500,000 in case of large fishing boats. The retention

money is usually provided for repair of boat and engine, procurement of engine, gears and also for personal use such as construction of house, marriages and other domestic purposes. In coastal areas of Balochistan as well as in the creek areas of Sindh such retention money is usually valid for one year. At the onset of the fishing season new retention money is offered. In small villages and towns fishermen is bound to sell the produce at about 10% less price than those prevalent. Despite the fact that a fisherman gets low price they still prefer to take the retention money and operate with one trader.

5. RECOMMENDATIONS FOR VALUE ADDITION TO FISH CATCH AND SUSTAINABLE LIVELIHOODS

There is no doubt that fisheries techniques being practiced along the coast of Pakistan requires attention for making the methodologies of fishing more effective, however, major thrust is needed in post harvest technologies to ensure that the produce of fishermen may not loose its quality before it is marketed. Improvement in marketing network also requires especial attention so that direct access to priced market may be readily available to the fishermen communities. For the development of coastal communities a three pronged strategy is required:

- improvement in fishing methodologies,
- reduction in post harvest losses and
- expansion in the marketing access.

It may be mentioned that this strategy primarily aimed coastal communities along Sindh and Balochistan coasts, however, in broader outlook; the strategy is equally applicable to fishermen of Karachi and adjacent areas.

4.1 Improvement of fishing methodologies

The gears being used by the fishermen seems to have developed either through their use since centuries and got into its present form or introduced to modified to suit the local conditions. There are methodologies of catching fish with techniques which are comparatively less destructive and harmful to the natural resources. For example, use of traps such as, '*Gagoors*' (which are in common use in Persian Gulf countries), if properly done can be helpful for the communities to catch quality fish which can fetch better locally as well as in the international markets. The use of such trap is considered to be environmentally friendly because it has less effect on the non-target local biota. Similarly aimed fishing for particular species, if managed, can also be an additional source of income to local communities without affecting the environment. Introduction of trap fishing for ivory shell in Pakistan is a novel example of aimed fishing which is now quite popular in the villages along the coastline and became a source of additional income for some fishermen in Gwader, Pasni and Karachi area. Similar, there are a number of other examples in which alternate were developed and are being used effectively such as, catching and processing of jelly fish in creek areas and Sonmiani.

4.2 Reduction of post harvest losses

It has been estimated by Marine Fisheries Department that more than 70% of the fish catches get partially or totally degraded because of post harvest losses (Moazam 2005, in process), owing to poor handling on board as well as during offloading, transportation and auctioning and sale. Improvement in fish handling on board, especially use of adequate quantity of ice on fishing vessels can ensure that quality of the fish catch is maintained. Presently no ice is used in fishing boats that are involved in one day ('*hela*') fishing. Use of ice after immediate removal of fish from the net is necessary to keep the fish in premium quality condition. Proper stacking on board larger fishing vessel can ensure better quality of the landed fish. Similarly use of fish crate and insulated boxes on board fishing vessel, during offloading, transportation and sale can also help in reducing post harvest losses.

4.3 Expansion in the market access

The coastal communities based in coastal towns have difficulties in access to better markets primarily because of inadequacy in the communication network. Construction of Coastal Highway along Balochistan coast and all weather access to Keti Bundar and other coastal towns made it possible to link coastal communities to the main population center in Karachi. However, the transportation is not primarily done by traders and middlemen, therefore, the benefit is now adequately trickled down to the fishermen, however, an overall increase in prices of the fish at first sale is noticeable which has helped in increasing the income of fishermen. With further improvement in the marketing access the communities can be better benefited.

4.4 Introduction of sustainable fishing practices

In most cases along Pakistan coast, fishing practices are being done as part of tradition without taking into consideration their sustainability. With the exception of some communities along the Balochistan where traditional conservation methods are still being practiced, most communities do not care about the resource position, over-exploitation and other environmental aspects. It is a well known fact that most of the fisheries resources are either already overexploited or approaching level of over-exploitation due to uncontrolled fishing pressures. Some of resources such as shrimp and lobsters have crossed the level of sustainability due to over fishing and it is feared that their potential may collapse in near future. The main reason for over-exploitation is increase in fishing effort, as fleet is expanding unchecked, fishing gears are becoming more efficient, exotic gears ('*Bhoola*' and '*Katra*') have been introduced and popularized and the duration of and the area of fishing operation has significantly increased. No resource survey has been done in past fifteen years, therefore, information about stocks is lacking. Based on the last stock assessment survey of 1990, various resources have been determined (Table-V). By comparing with the exploitation level of various species as given in Annexure-I, it is evident that most stocks have been exploited beyond sustainable limit.

Table-V Stocks of various types of marine fish/shellfish in Pakistani waters.**MARINE BIO MASS OF PAKISTAN**

RESOURCES	STOCKS	MSY
	(M. TONS)	(Maximum Sustainable Yield) (M. TONS)
SMALL PELAGICS	700,000	300,000
LARGE PELAGICS	80,000	60,000
DEMARSALS	500,000	147,825
SHRIMPS	88,000	35,000
White Shrimp		7,360
Brown Shrimp		9,225
Kiddi Shrimp		17,311
Misc. Shrimps		1,104
CEPHALOPODS	20,000	12,000
MOLLUSCS	8,000	4,000
CRABS	10,000	6,000
LOBSTERS	1,300	600
MESOPELAGICS	10,000,000	1,000,000
G. TOTAL	11,407,300	1,717,600

The need to management of the resources, thus, seems to be mandatory which must include use of sustainable fishing methodologies. It may, however, be kept in mind that in Pakistan, concept of sustainable utilization of resources is not well understood. There is a general trend amongst the fishermen to exploit more in terms of quantity without taking into consideration the maximizing the benefit or use of the exploited resource. In case of sustainable harvest, it is necessary that level of harvest must be kept below the minimum allowable catch limit which is usually considered to be a value below the level of maximum sustainable limit.

Implementation of such a strategy is comparatively difficult as fishermen, in general, do not comprehend the need for limiting fish catch below the sustainable limit, thus, cannot be easily compelled to limit their catching ability. As an alternate strategy, shifting to other technologies such as, squid jigging, traps, etc. which help fishermen earn at the previous levels or getting a little extra is considered a better option; however, very few alternate and efficient technologies are known.

4.5 Building of the local fishermen for newer technologies

The fishermen especially those residing in villages and small towns along the coastline are very reluctant to change, however, the success of any technique depends upon it being identical to their traditional ways of operation. A good example of adaptability to a new fishing is start of fisheries for Indian mackerel in Gwader area. Such fishery was non existent prior to year 2002, however, when processing plants started operation in Gwadar area which also coincided with improvement in transportation system to Karachi, fishermen decided to start gillnet fishing targeting Indian mackerel in Gwader (West Bay). Now this fishery is mainstay in Gwader area and more than 500 fishing boats are

engaged in it. However, fishermen of some other areas including Pasni are still against this fishing in Pasni Bay area. The introduction of newer technology must therefore, take into consideration technological, financial, operational as well as traditional aspects as well.

Considering that most coastal communities are rigid and not flexible to change, therefore, those methods which help them earning better will be easily adopted. Considering the present status of resources and their potential, targeted or selective fishing for some untapped stock can be started which will help coastal communities to adopt quickly and earn more. Fishing for octopuses using pots, trap fishing for crab in comparative deeper waters, fish traps (popular in Gulf countries) and light fishing for squids in shallow and oceanic waters are few options for immediate adoption. Some experiments have already been done by various agencies and surveys have indicated presence of the stocks of these untapped species and resources.

Development of artificial reefs at selected places along Sindh and Balochistan coast can be another option for adoption. These reefs are considered to be one of the methods of increasing productivity of an area as such artificial reefs have provide an instant and additional habitat for marine life, which often has been very fast in establishing a foothold in these structures. Artificial reefs not only provide habitat for large fishes but also become breeding, nursery and feed ground for a large number of demersal fishes. These reefs can be built with pooling the resources of an area and then such reef can be established as common property and exploited by the fishermen of the area. Federal and provincial governments have planned to established experimental reef in some selected areas of Balochistan.

4.6 Improvement in fish handling, quality control and fish marketing

The handling practices being used at present do not take into consideration hygiene aspects. Fish and shellfish are not handled in the manner they should be taken care of. Preservation techniques are not fully adopted as well as the physical facilities for preservation of fish are not adequate on a single boat in the country. Fishing boats in the coastal village and towns do not have required facilities for landings thus leading to further deterioration of the catch. Improper transportation is the third most important factor leading to deterioration of the fish catch.

Handling on board fishing vessels and in the landing center requires a broad based programme which must be supported and managed by the government controlling agencies, whereas, with proper demonstration fishermen can adopt these technologies of better handling on board fishing vessels. A massive programme of fish hold improvement was started by the Fishermen's Cooperative Society under the auspices of the Small and Medium Enterprises Development Authority (SMEDA), but this programme failed due to lack of technical knowledge of the implementing agencies. The programme for improvement of the fish holds (locally call *gala*) is possibly the most important task that has to be taken on priority basis. The modification of the fish holds is required to improve insulation, provide stacking facilities as well as improvement of the internal surface of the fish holds are required to be done in all categories of the fishing boats. Training of the fishermen on fish handling on board has to be started at the community levels all along the coastline.

The improvement of handling practices needs to concentrate on providing proper storage facilities on board fishing vessels of all types. As there is no typical model of fish hold that can fit in all fishing boats, therefore, for every boat type a separate design is needed. For the placement of fish in the fish holds, fish boxes of various types and categories can be used. A number of different type of fish boxes are available in the international markets which can be used. Boxes have already been introduced by the federal government since 1997 and fishermen in Karachi and remote villages now use them. However, the number of these boxes being used by the fisherman is much less. During the past two years a number of processors have imported fish boxes for their use and some of them have supplied to fishermen as well. Manufacturing of the boxes has already been started in Pakistan



Fig.21 Fish boxes of various types and capacities which can be used on fishing boats.

Besides modification of the fish holds and use of fish boxes for storage of fish on board fishing vessels, insulated fish boxes can also be used. These boxes with removable or partially fixed covers can be placed on the deck of the vessels, placed within the fish holds and can be fixed as fish holds (in smaller fishing boats) and effectively used for proper handling and preservation of fish on board as well as for transportation.



Fig. 22 Insulated Fish boxes of various types and capacities which can be used on fishing boats.

Insulated boxes have been imported by a number of processors in Pakistan and are being used in their facilities as well as for transportation of fish from landing centers to the processing plants. Some of the seafood processors have already provided such boxes to fishermen who have now started keeping priced fish catch in these boxes and transport it directly to the processors.

Use of insulated fish boxes and fish crates by the fishing boats will help in increasing the income of the fishermen in the coastal areas because it will significantly reduce the post harvest losses. To make these popularized both federal and provincial governments are making efforts. About 500 fish boxes are being distributed by the provincial governments amongst the fishermen of Balochistan free of cost in last few months with the aim to make them popular. Fish crates are now locally manufactured at a cost of about Rs. 500 to 700 per box. They are costly in comparison to the wicker baskets (Rs 50 to 100) is not comparable, however, most wicker baskets last one or two fishing trips, the plastic crates last many years, if properly used.

For access to better markets, transportation of fish in improved and quick ways can help in increasing the income of the fishermen. Construction of the coastal highway along Balochistan coast and improvement of roads in Sindh has now made it possible to transport fish more efficiently and quickly from even remote areas to main fish market in Karachi. Medium sized Lorries which can carry upto 2 to 5 tons of fish are now being plied between some of the remote areas to Karachi on regular basis. It maximally takes about 8 to 12 hours to bring fish from remotest parts of Balochistan to Karachi market making it possible to bring fish in fresh conditions. Further improvement is being done with the use of insulated boxes and even some Lorries have been fitted with insulated containers and cooling machineries enabling better transportation.

Although it seems difficult for individual fishermen to arrange for his own direct transportation system from coastal villages and towns to Karachi, however, fishermen could organize themselves to develop a communal facility whereby they may pool their resources and make arrangement for transportation of fish from their villages to main markets or to the main fishing centers. Use of insulated fish boxes in this regard can be helpful; however, it would require organization and cooperation amongst fishermen to develop short circuited marketing system under their own arrangements. A number of villages have now electricity available and indigenous supply of ice can be arranged. Small ice producing units can also be established on communal basis. Small capacity flake or tube ice producing units can be installed in villages with government support as well as by the fishermen's organizations. Some of small ice making plants can cost upto Rs. 100,000 to 200,000.



Fig. 23 Small sized flake/tube ice plants that can be established/installed in villages and coastal towns.

It seems difficult for the communities to establish chill room or refrigeration facilities and to operate them economically. Establishment of a small chill store (about 25' x 40') with a temperature of 0°C will cost more than Rs 4.30 million as per detail given in Table VI.

Table-VI. The details of cost of Refrigeration Facilities at any coastal village/town

S. No.	Detail of Item	Approximate Cost
1.	Insulated Panels for a store of 40' x 25' x 12' with prefabricated metal clad and 5" insulation of polyurethane	Rs 1.5 million
2.	Condensation Unit 1	Rs 1.2 million
3.	Evaporating Unit 1	Rs 0.5 million
4.	Installation charges including wiring, pipes, gas charging etc.	Rs 0.4 million
5.	Standby generator	Rs 0.7 million
	Total	Rs 4.3 million

The cost of fabrication of cold stored can be reduced if instead of using insulation panels, the building is got insulated by putting sheets of Styrofoam and other cheaper insulation material. However, still the cost of construction and operation of chill room will be much beyond the capacity of coastal communities. In addition, added benefit of having chill room facilities at the coastal village will be only marginal.

4.7 Some Alternate Options of Income Generation for Fishermen

In addition to the exploitation of the fisheries resources using newer technologies, there is a possibility of involving use of non traditional resources. Seaweeds are known to be abundantly found along Pakistan coast and hitherto are not utilized for any purpose. Although, more than 300 different types of seaweed are known from Pakistan only a few commercially important species are found in reasonable quantities. Brown seaweed *Sargassum spp.*, *Stokya indica*, *Calpomonia sinousa*, *Iyengaria stellata* and *Dictyopterus spp.* which can be a source of alginates, are found in substantially large quantities and can be harvested/collected and dried for further marketing (Saifullah, 9173). Similarly, red seaweed such as *Hypnea musciformis*, *Gracillaria spp.* and *Gelidium spp.* which can be dried and used for production of agaroids (carragenan and agar). Coastal community at Sandspit which is located along a rocky shore can consider utilization of seaweed resources. Other three communities are located in creek and backwater areas where commercially important seaweed species are not found. There is no industry for seaweed utilization in Pakistan, however, dried seaweed can be exported. However, for coastal communities it seems difficult to be involved in its direct export. There is a need to assess the quantities of the commercially important seaweed species before any programme for its utilization by coastal communities can be examined.

In the beds of small rivers along Balochistan coast, dwarf palm (locally known as 'peesh') grows in substantially large quantities. The leaves of dwarf palm are being used for making mats, wicker baskets, ropes and other products. Coastal community at Kalmat can be motivated to use dwarf palm which can be harvested from rivers in Makola and Basul areas. The women folk can be involved in making mats and baskets etc. which have a large market along coastline and in Karachi and other hinterland areas. Womenfolk in other coastal settlements can be also involved in harvesting and using shells in making jewelry and other decoration items which can supplement their income.

4.8 Methodology for coastal communities to have easy access to micro-credits

Presently, fishermen along the coastline have access to loaning facilities through informal sources as well as from the banking and other Development Financing Institutions (DFI's), however, formal lending facilities are restricted to large towns and cities only. Informal lending sources especially in coastal villages, includes auctioneers and seafood processors. In large cities, especially in Karachi, major informal money lenders are mole holders which are organized auctioneers. The informal money lenders have developed a system whereby they provide a 'bonding' money which is mostly provided for repair of boats or engine, procurement of gears or to provide assistance in making arrangement/improvement of houses, for marriage ceremonies or for paying off the debts, etc. Fishermen prefer this system because it assures them that their produce is sold easily and that they have not to be running around for disposal of their catch. The money lender also provide them operational loans prior to every fishing trip, therefore, the for fishermen this system seems to be efficient from the operational aspects. Because of the lengthy procedural requirements and limited access to fishermen, formal lending system through banks and DFI's is not popular amongst fishermen.

If the informal money lending system is compared with the formal banking sector, there are a lot of formalities that are required before fetching any loans. The requirements of the fishermen are primarily of two types i.e.

- Major amount required for making boat, repair boat, repairing engine and procurement of gears or family expenses. Such amounts are required during off seasons or prior to onset of fishing season.
- Operational requirements which are required prior to each trip for purchase of fuel, ice, water and ration as well as for immediate repair of engine or gears.

Fishermen are mostly reluctant to take any loan which includes interest considering it to be against religion. In addition, fishermen usually do not have time especially during fishing season to complete the banking formalities. In addition, fishermen are mostly illiterate and are dependant on the banking staff to complete the formalities. It seems difficult to identify any simplistic approach to this problem.

There seems to be no simple solution to get rid from present system of money lending in the fish harvesting system. Fishermen themselves like to be benefited from such a system as it provides them with efficient availability of loans at right time and at their doorsteps. For them running to banks and completing the formalities is seemingly impossible. Additionally, the present system ensures them with disposal of their catch as well. Moreover, some of the moneylenders are village headman or respectable personalities and some fishermen like themselves to be associated with them as compared to any other money lending system.

A careful examination of the money lending system prevalent at present indicates that with the exception of individual cases of ripping the fishermen and shacking them in burden of loans, most fishermen are effectively and efficiently using the present informal system of money lending. There seems to be apparently no quick solution or readily available alternate which can be adopted. Micro-credit system through formal banking

and money lending systems or leasing is well organized in Pakistan and there is no immediate future of such a system in fisheries sector of Pakistan in near future.

4.9 Capacity building of fishermen

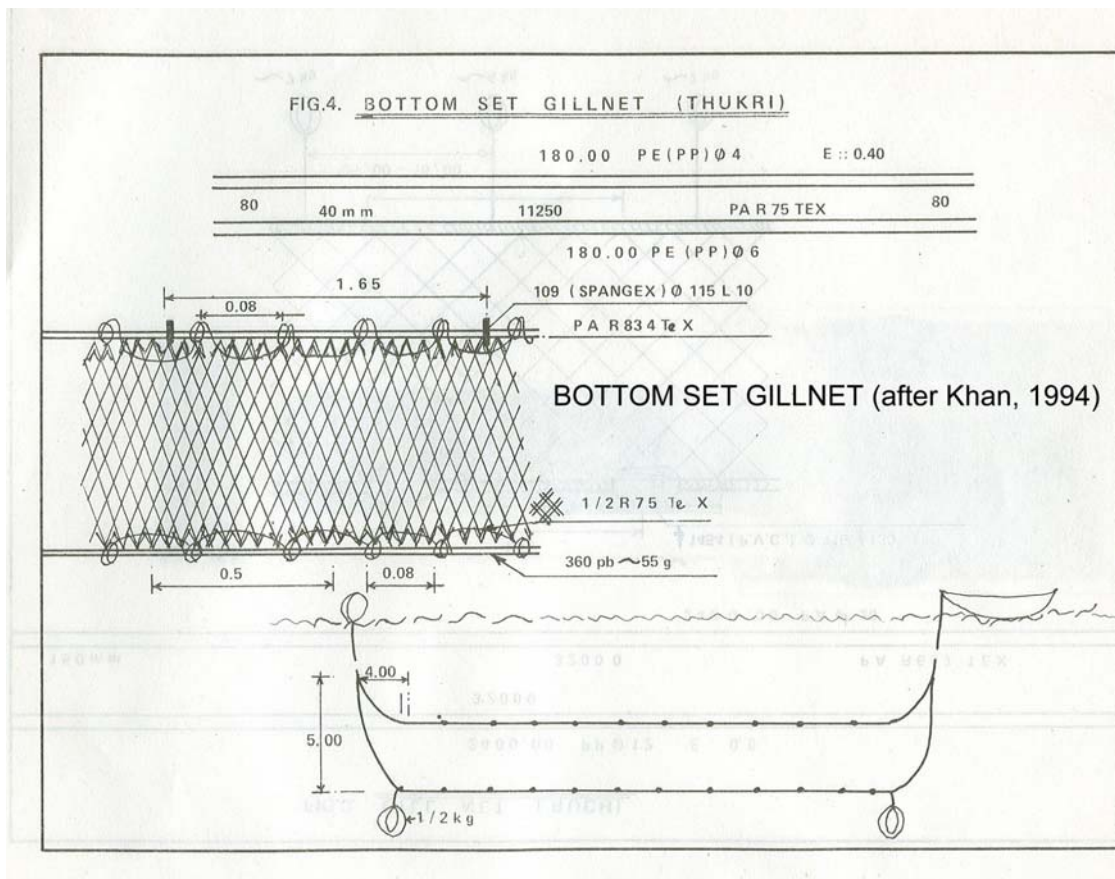
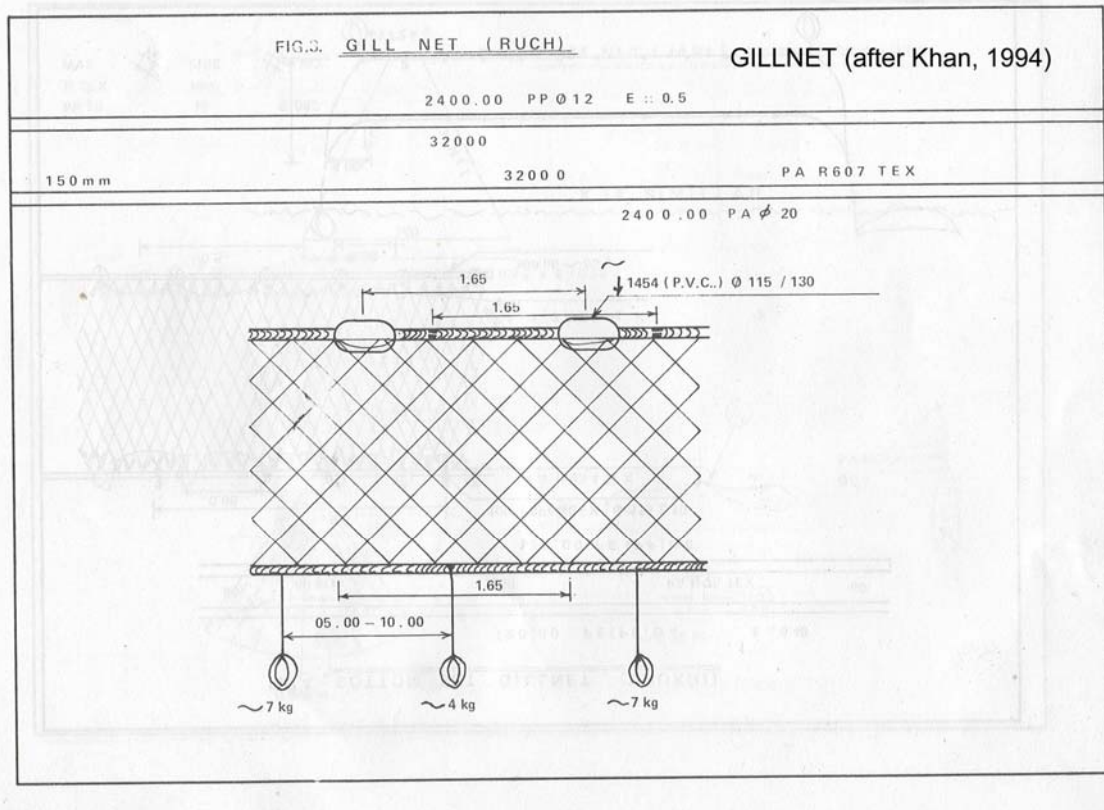
It is generally accepted that fishing techniques being used by the fishermen are reasonably efficient, however, in some cases the operation can be made more effective and less time consuming especially in navigation, rules of the roads, deployment and retrieval of fishing gears and use of efficient gears. It has, however, been observed that training of fishermen, if not coincides and matches with the availability of the gears and other gadgets usually does not serve any purpose. The training programme for fishermen, thus require careful planning especially if it pertains to fishing operation, navigation and related fields. Without formal training the fishermen of Sindh and Balochistan, especially those belonging to coastal villages, being fishermen since many generations are usually familiar with basic navigation and fishing techniques. The training of the fishermen in such trades seems to have less priority.

Despite effective fishing operations, fishermen were observed to require basic training in fish handling and storage on board. Training on handling on board fishing vessels and at the landing centers thus seems to be more important than training on any other aspects of fisheries. Such training needs to be arranged at community as well as at individual fishermen levels. Short term courses (possibly one day) can be arranged for training of fishermen.

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- Saifullah, S. M., 1973. A preliminary survey of the standing crop of seaweeds from Karachi coast. Bot. Mar. 16: 139-144.
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Annexure – I Sketches of Various Types of Fishing Nets



CAST NET (after Khan, 1994)



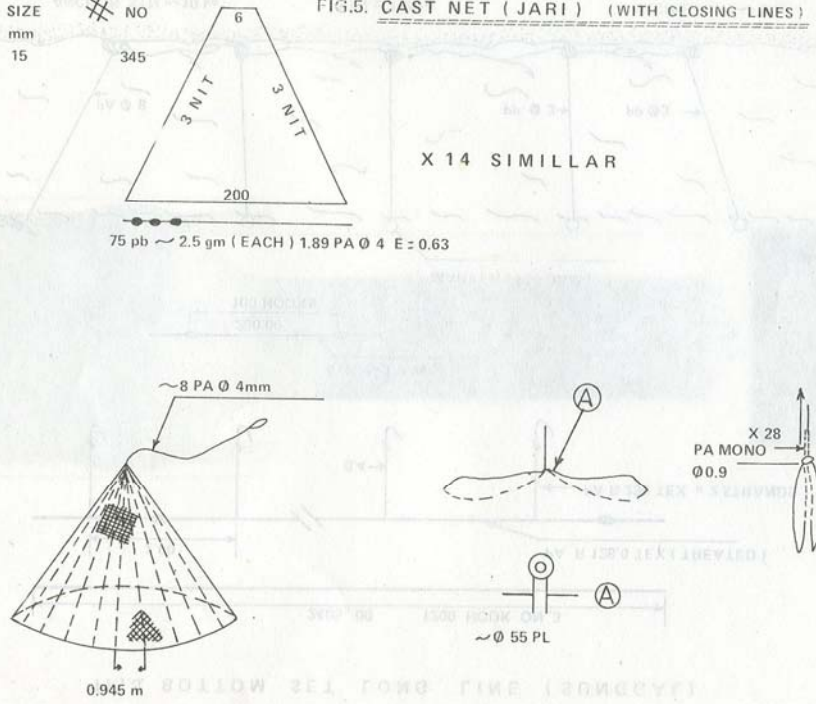
MAT  SIZE  NO
 R T₂X
 PA 75
 15
 345

FIG.5. CAST NET (JARI) (WITH CLOSING LINES)



0.945 m

75 pb ~ 2.5 gm (EACH) 1.89 PA Ø 4 E = 0.63

X 14 SIMILLAR

Ø 55 PL

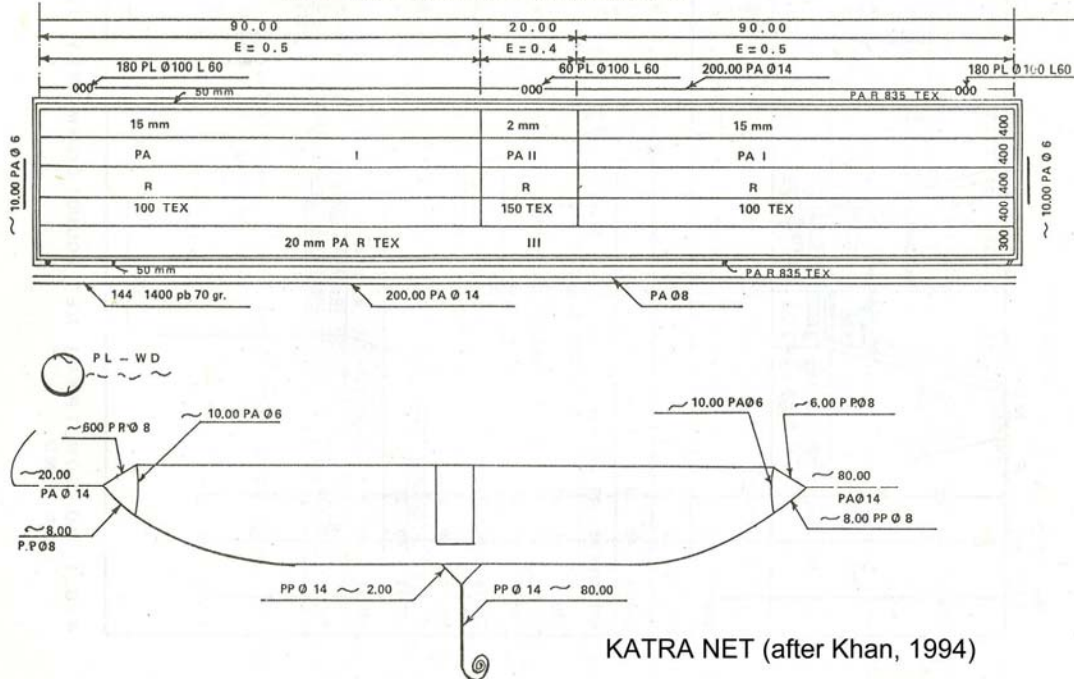
~ 8 PA Ø 4mm

X 28
 PA MONO
 Ø 0.9

Ø 55 PL

0.945 m

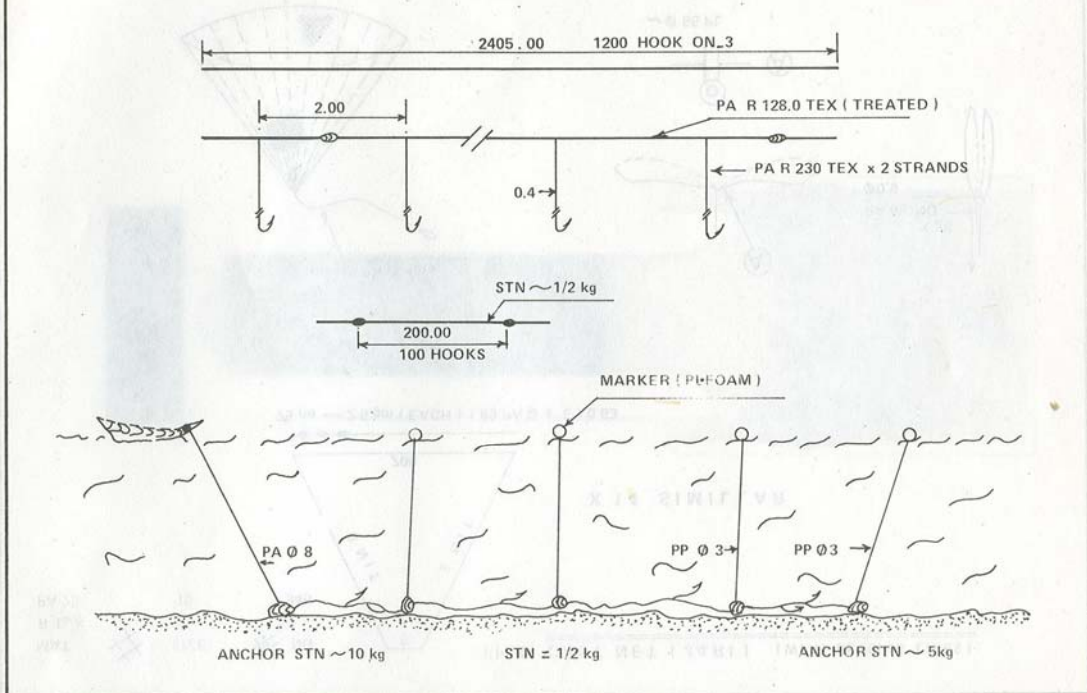
FIG.2. KATRA NET (PURSE SEINE)



KATRA NET (after Khan, 1994)

BOTTOM SET LONGLINE (after Khan, 1994)

FIG.6. BOTTOM SET LONG LINE (SUNGGAL)



TRAWL NET(after Khan, 1994)

