

FISHERY AND AQUACULTURE COUNTRY PROFILE	Food and Agriculture Organization of the United Nations	FID/CP/PAK
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THE ISLAMIC REPUBLIC OF PAKISTAN

Geographically, Pakistan comprises three main regions: the mountainous North, where three of the world's great mountain ranges (the Hindukush, the Karakorams and the Himalayas) meet; the enormous but sparsely populated plateau of Balochistan in the south-west; and the Punjab and Sindh plains of the Indus River and its main tributaries. Located in south Asia, between 23°42' and 36°55' N and 60°45' and 75°20' E, Pakistan is bordered by India on the east, China on the north-east, Afghanistan on the north-west, Iran to the south-west and the Arabian Sea in the south.

Pakistan has a range of ecosystems, from the mountains of the north, to the hot plains of the Indus Valley, and a temperate coastal strip in the south. Rainfall is generally limited, from 130 mm/yr in the northern parts of the lower Indus plains to 890 mm/yr in the Himalayan region. Rains are monsoonal, fall late in summer. The national average rainfall is 760 mm/yr.

Pakistan's agriculture is dominated by the Indus River, which flows through the country for 2 500 km from the Himalaya and Karakoram mountain ranges to the Arabian Sea.

The Indus and its tributaries support the largest irrigation system in the world. This is the largest network of canal system in the world, serving 1.4 million hectares of cultivated land and feeding the underground *karez* distribution system in Balochistan.

Agriculture is the hub of Pakistan's economy, which consists of crops and livestock. It directly contributes 25 percent to GDP and provides employment to 44 percent of the national labour force. Major crops include wheat, rice, cotton, sugarcane, maize, tobacco, barley and rape-seed. Important fruits are mango, citrus, banana, guava, dates, apple, pear, plum, apricot and peach. Pakistan has two main crop seasons: *kharif* and *rabi*. Kharif crops are sown from April to June and harvested from October to December. Rabi crops are sown from October to December and harvested during April to June.

3. FISHERY SECTOR STRUCTURE

3.1 Overall fishery sector

Fishery plays an important role in the national economy. The marine fisheries sector is the main component, contributing about 57 percent in terms of production. In 2006, exports of fish and fishery products represented 1.1% of total merchandise trade. Fishery is the most important economic activity in the villages and towns along the coast, and in most of the coastal villages and settlements it is the sole source of employment and income generation. Almost the entire fleet has been either motorized or mechanized, and freezing is the main mode for processing.

Inland fisheries is generally of a subsistence nature, based on rivers, irrigation canals and reservoirs, with some 180 000 people involved, mostly part-time, with almost 20 000 small crafts.

Aquaculture has received increasing attention in recent years and the government has established several fish hatcheries and training facilities for fish farmers. Fish farming is practised in the Punjab, Northwest Frontier Province (NWFP), and Sindh Province on a limited scale, where species such as trout, common carp, grass carp, silver carp and other carp species have been introduced, alongside the native Indian carps. Farming of marine shrimp species has been started on a pilot scale (using *Penaeus merguensis* and *P. indicus*), but has not established itself commercially due to lack of technical expertise, shrimp seed, infrastructure and facilities.

3.2 Marine subsector

Pakistan's coast extends 1 100 km from India to Iran, with an EEZ of 240 000 km². The continental shelf area is about 50 270 km². The total maritime zone of Pakistan is over 30 percent of the land area. The area includes some very productive areas, with rich fisheries and mineral resources. The only major freshwater input comes from the Indus

River at the eastern extremity, which discharges some 200 km³ of water and 450 million tonnes of suspended sediment annually. This has created the Indus cone, a 2 500 m deep pile of loose sediment on the floor of the Arabian Sea, which fans away from the mouth of the river as a vast, sub-aqueous delta. The coastal ecosystem includes numerous deltas and estuaries with extensive inter-tidal mudflats and their associated wetlands, sandy beaches, rocky shores, mangroves and sea grasses.

The north-western portion, the Makran coast, extends from the Hub River to the Iranian border, and is about 772 km long, with a shelf area of about 2 000 km². The bottom is generally rocky and the shelf is uneven. The continental slope (>200 m depth) starts between 10 and 30 n.m. from the coast. The region is characterized by a number of bays, such as Sonmiani, Ormara, Kalamat, Pasni, Gwader and Giwani bays. Trawling is not possible in some areas because the shelf is narrow and rough.

The south-eastern portion, the Sindh coast, is 348 km long and extends from the Indian border to the Hub River. The bottom is generally sandy or sandy-muddy. The shelf area is about 35 740 km². This area, especially in the Indus delta region, extends up to 80 n.m. from the coastline. The region, unlike Makran, is characterized by a network of creeks with mangroves that serve as nursery grounds for finfish and shellfish resources.

The first modern fish harbour was constructed at Karachi in 1958. Subsequently, the fishing fleet grew and now is mostly mechanized.

The marine capture fisheries are artisanal in nature, although undertaken on a commercial scale, which includes the shrimp trawl fishery, tuna fishery, industrial (deep-sea) fishery, small-scale demersal fishery, and small pelagic fishery. There is also some recreational fishery for billfish and tuna, pelagic species, and hand-line fishing (bottom fishing).

The shrimp trawl fishery is very important because of its high foreign exchange earnings and the employment it generates. It is only permitted in Sindh. However, shrimp are also caught by using passive fishing gears such as cast net or *thukri* net. It is carried out in shallow waters from October to March, while in July, August and September shrimp is caught in creeks and brackish waters. It is processed frozen for export to USA and European markets.

Commercial shrimp trawling started in 1958, after the Central Fisheries Department (now the Marine Fisheries Department – MFD) introduced mechanization of larger fishing craft in 1956. After the introduction of mechanization, the trawler fleet expanded rapidly, becoming the backbone of fisheries in Pakistan. Now all the shrimp trawlers are fully mechanized, using trawl winches for net hauling. The presence of trawl winches on shrimp trawlers makes it possible to use these vessels for demersal trawling in waters deeper than those trawled for shrimps.

The tuna fishery is another important fishery carried out by artisanal fishing boats. Usually, the fishermen shoot their gillnets in the evening and retrieve them the next morning, mainly targeting the higher-valued commercial pelagic fish species. The net is used to fish in mid-water or on the bottom by changing its ballasting and buoyancy. The fish is exported as fresh, chilled product to Iran through informal channels for canning purposes, fetching much higher prices than if exported to Sri Lanka in the traditional dried and salted product form.

The deep-sea resources remain relatively unexploited because local vessels are neither suitable nor equipped for deep-water fishery. In order to exploit the resources available in the EEZ, the Government of Pakistan has in the past allowed some fishing under licence by foreign-flag vessels, but it is now restricted to Pakistan-flag vessels, the owners of which pay a fixed royalty and annual licence fee.

Deep-sea fishing has had an impact in that it has stimulated a frozen fish market for local fish exporters. The ribbonfish is now the backbone of the fish industry. It also motivated local entrepreneurs to develop their own deep-sea fishing vessels for exploitation of the resource.

Small-scale demersal fishery is the most widespread in coastal inshore waters of Sindh and Balochistan. Wooden vessels use nylon gillnets with a stretched mesh of 150 mm. The gillnet is locally known as a *ruch*, and is used mid-water or on the bottom. Set

gillnets are also used by the coastal fishermen for catching demersal fish species like marine jewfish, croakers, grunters, snappers, groupers, ribbonfish and pomfrets.

A small-scale pelagic fishery operates in Sindh, using surrounding nets, locally known as *katra*, hence the fishery is known as the *katra* fishery. Fishing operations are conducted from wooden boats called *hora* (a boat with both ends pointed, with very broad breadth and using 1 or 2 long-shaft outboard engines) in depths shallower than 20 m, targeting scattered shoals of clupeids, especially the Indian Oil Sardine. Most *katra* boats are based at Ibrahim Hydri, Chashma Goth, and Shamspar Baba Island fishing villages. The peak seasons are October to November and February to April. The catches are all used for production of fishmeal. The duration of a fishing trip is 14 to 16 hours. No chilling or other preservation is available onboard.

3.2.1 Catch profile

During 2007 total production including aquaculture was 570 300 t, 60 percent of which came from the marine sector (Table 1). There is an overall decreasing trend in marine capture fisheries since 1999, whereas fish production from the inland sector is increasing primarily from freshwater aquaculture. The contribution to total marine capture production by catches from deep waters in the Pakistan EEZ was 5 000 t (1.3 percent). On both the Sindh and Balochistan coasts there are many widely dispersed small landing places, used by small craft equipped with sails or outboard engines, or both.

Table 1. Production of fish

	Production (tonnes)						
	2001	2002	2003	2004	2005	2006	2007
Marine catch	420 698	418 104	399 040	386 653	340 206	349 421	340 190
Marine aquaculture	80	72	69	70	75	85	92
Inland catch	122 468	114 030	92 794	93 687	94 644	140 000	100 000
Inland aquaculture	57 632	66 898	72 978	76 583	80 547	121 740	130 000
Total Pakistan	600 878	599 104	564 881	556 993	515 472	611 246	570 282

Shrimp landings have fluctuated mostly between 18 000 and 30 000 t since 1970, with a peak of 34 900 t in 1993. The number of shrimp trawlers increased from 443 to 2 500 during the same period. The estimated MSY for shrimp is 21 000 tonnes, which indicates that the present level of effort and catches may not be sustainable.

The prime shrimp category (*jaira*), which consists of *Penaeus* spp., shows an average production of 6 370 t/yr over the years 1971 - 2007. *Kalri*, the second main category, which consists of *Metapenaeus* spp., had average landings of about 7 140 t/yr in the same period. Catch of other shrimps, mainly composed of *Parapenaeopsis* spp., is about 11 400 t/yr in average. The combined production comes to about 25 000 t/yr, while the MSY is estimated at 16 500 to 17 000 t/yr. The recent declining trend of shrimp catch is basically due to excessive fishing mortality and growing overcapacity.

Tuna and allied species in the EEZ may sustain catches of about 25 000 t/yr, while total Pakistan catch of tuna and allied species in the 2000-2007 period is about 27 500 t/yr in average. Management and assessment of large tunas has to be harmonized with relevant decisions made and recommendations issued by the Indian Ocean Tuna Commission (IOTC).

For all sardines and anchovies combined, the average landing comes to about 59 000 t/yr in the 1971-2007 period. The landing of Indian Oil Sardine showed large fluctuation between less than 10 000 tonnes to the peak of 92 700 tonnes in 1993, but since then steadily decreased to 31 000 tonnes in 2007.

Due to poor handling onboard fishing boats, sardines are used for fishmeal. If storage conditions were improved by storing sardines in chilled water onboard the fishing vessels, they could be utilized for canned products.

Indian mackerel (*Rastrelliger kanagurta*), for which separate catch statistics are available only starting from the year 2000 (from 2004 in the statistics reported to FAO), is exported as whole frozen to the far eastern countries. Landings are increasing, and reached about 38 500 t in 2006.

Average lobster (*Panulirus* spp.) catches during the 1971-2007 period were about 480 t/yr. Landings of crabs *Brachyura* fluctuated, with a peak period during 1998-2004 with catches over 5 000 t/yr. There are two principal groups of species: swimming crabs and mud crabs.

Cephalopods, including cuttlefish and squids, are mostly incidental catches of local fishing boats targeting other species. The average catch during the last ten years was about 7 500 t/yr.

The demersal finfish group include a large number of food fishes that are commercially important, either in terms of market value or in terms of quantity landed. The major fishes are sharks, rays and skates, sea catfishes, eels, threadfin breams and sea breams, barracudas, mullets, groupers, croakers, grunters, emperors, travellies, ribbonfish, pomfrets, snappers, etc. Production peaked around the year 2000 and has decreased since then. There are several other fish species that have the potential to be harvested commercially in the future.

3.2.2 Landing sites

Karachi Fish harbour is the biggest and oldest fish harbour in the country, being used by all categories of fishing boats. The harbour was designed to cater for about 1000 fishing boats, but currently more than 4 000 fishing boats are based there, making it heavily congested. At present it caters for the needs of 70–80 percent of the local fishing fleet. At Korangi, a new fishing harbour was constructed in 1993 but it is little used.

Other fishing harbours exist, and fall under a variety of managerial jurisdictions:

- Karachi – Autonomous authority nominated by the Sindh Government
- Ibrahim Hyderi – Local Government
- Korangi – Pakistani Fish Harbour Authority (Federal; MinFAL)
- Pasni – Autonomous authority nominated by the Secretary of Fisheries, Government of Balochistan
- Gawader – Federal; Ministry of Communications (A fisheries harbour-cum-mini-port)
- Gaddani – Balochistan Coastal Development Authority
- Damb – Balochistan Coastal Development Authority

3.2.3 Fishing production means

Mechanization of boats by inboard marine diesel engines was started in 1956 under the auspices of MFD (then Central Fisheries Department). There are four basic types of fishing boats: (i) mechanized; (ii) mechanized-cum-sail boats; (iii) sail boats; and (iv) *doonda* boats.

Mechanized fishing boats

There are 4 335 mechanized fishing boats registered, which includes shrimp trawlers and gillnetters. Trawlers operate only in Sindh.

The shrimp trawlers are locally built of wood according to traditional design. As an adaptation for trawling, most boats have a transom (straight) stern, but some are of the unchanged hora type, with a pointed stern. In the latter case, the net is pulled in over the side. The average overall length is 15 m (range 10–23 m), the average keel length is

11.6 m (range 8.5–18 m), the average breadth 4 m (range 2–7 m), and the average depth 1.9 m (range 0.8–3 m). They are fitted with marine diesel (inboard) engines, mostly between 66 and 125 hp (range 22–170 hp).

The gillnetters are also locally built of wood, according to traditional design. These boats are pointed at both ends and the net is pulled over the side. The overall length ranges between 13 and 35 m. They are fitted with 120–250 hp inboard marine diesel engines.

Industrial and freezer vessels are also operated in the EEZ of Pakistan's coastal shelf depending upon the numbers permitted by the government. These vessels are required to stay within 20 and 35 n.m. offshore. All their catch is exported. The activities of these vessels are monitored by the Maritime Security Agency through a Vessel Monitoring System (VMS). A 12-n.m. coastal zone (territorial waters) has been reserved for the exclusive use of the small-scale sector.

Mechanized-cum-sail boats

These are also made of wood, but generally smaller than gillnetters. They are fitted with 2 to 3 outboard engines. They are locally known as hora boats.

Most of the sailboats are now operated in freshwater bodies. Their number is decreasing.

Doonda boats are fibreglass lifeboats of scrapped ships, with an overall length of 7.5 to 10.5 m, and converted into fishing boats. These boats are fitted with 22–33 hp engines. These boats can operate in up to 20 m depth. These are recent in Pakistan, starting in the late 1980s. At present there are about 2 000 such boats in operation, mainly based at Karachi. However, small fleets of such boats are also operated from Gadani, Pasni, Gwader, Ibrahim Hydri and Chashma Goth.

Fishing Gear

Shrimp trawls are locally constructed from imported nylon webbings and are called *gujjo*. A typical trawl net is operated with 120 hp vessel, and a stretched mesh of 50 mm in the body and 25 mm in the cod end. The cod-ends of these nets are fitted with Turtle Excluder Devices (TEDs).

As the size of the mesh in the cod end is very small, it does not allow juveniles to escape. Therefore, a large quantity of undersized shrimp and fish are caught. Most of the by-catch, locally termed *kachra* or trash fish is sold at throwaway prices. An increase in the minimum mesh size permitted in cod ends, and an efficient escape device in the net would permit juveniles to escape.

MFD has already started trials using square-mesh panels in the trawl net. Various sizes (25 to 38 mm stretched) have been tested. Apart from saving juveniles, the use of square mesh panels will also speed up sorting out shrimp from trash fish, hence maintaining the freshness of shrimp catch by quicker chilling after capture.

Ruch (gillnet) has a stretched mesh size of 150 mm. The maximum length of a gillnet is between 2.5 and 5 km.

Poplate plastic net is a polyamide monofilament net with a mesh size of 155 mm stretched. The average length is 2 to 4 km. It is used by *doonda* fishing boats. Since pomfret is the main target species of this net, the gear became known as the poplate plastic net. This net is set mostly in 16–20 m bottom depth to catch a variety of demersal fish.

Surmai plastic nets are polyamide monofilament gillnets used by *doonda* fishing boats targeting mackerel, hence the local name. The mesh size is 78 mm stretched. It is set on the bottom or in mid-water, and is usually 2–4 km long.

The gillnet fishery is replaced by longline fishing in November, December and January.

Katra nets are surrounding nets for small pelagic species. They are 150 to 200 m long and 24 m to 30 m deep. The bunt, where catch is retained, lies in the middle of two lateral wings. After encircling the fish school, the footrope of the *katra* net is hauled in from both wings simultaneously. There is no purse line *per se*, but an extension rope attached to the middle of the bunt assists in hauling operations. The net has 15 mm stretched mesh in the lateral wings and 12 mm stretched mesh in the bunt.

3.2.4 Main living marine resources

Pakistan is endowed with marine and inland fisheries resources. The potential was estimated at 1 million tonnes/year from the marine fisheries alone. However, this figure may be too high considering that after a peak of about 500 000 tonnes, catches have been declining despite an increase in the number of active fishing vessels. The commercially important fisheries resources comprise some 250 demersal fish species, 50 small pelagic species, 15 medium-sized pelagic species and 20 large pelagic fish species. In addition, there are 15 commercial species of shrimp, 12 of squid/cuttlefish/octopus, and 5 of lobster. The influence of the Indus River system on the marine fisheries of the Sindh coast is substantial, as this river system has historically transported enormous quantities of nutrients and sediment to the continental shelf. Pakistan has extensive inland water areas, which, depending on the type of water body, possess varying potential for development of inland fisheries and aquaculture. The Indus River dominates the water resources of Pakistan. Inland water bodies, such as natural lakes, reservoirs, river systems and ponds cover an area of approximately 8 million hectares.

The shrimp species in Pakistan's waters include *Penaeus merguensis*, *P. penicillatus*, *P. indicus*, *P. monodon*, *P. semisulcatus*, *P. japonicus*, *Metapenaeus affinis*, *M. monoceros*, *M. brevicornis*, *M. stebingii*, *Parapenaeopsis stylifera*, *P. sculptilis*, *P. hardwickii* and *Metapenaeopsis stridulans*.

Marine resource surveys in the Arabian Sea off Pakistan indicate that shrimp is overexploited, while the mesopelagic resources are barely exploited.

Table 2. Fisheries resources and production (tonnes)

Resources	Biomass	MSY	Production 2006	Status
Demersal	500 000	213 000	175 674	-
Small pelagic	700 000	225 000	100 000	-
Large pelagic	80 000	43 000	47 000	OE*
Shrimps	88 000	18 000	18 433	OE*
Lobster	8 000	2 000	600	OE*
Crabs	25 000	8 500	4 218	-
Cephalopods	30 000	11 000	5 400	RA**
Bivalves/gastropods	20 000	5 000	731	RA**
Total	1 451 000	525 500	352 056	

Key: *Overexploited ** Requires further assessment

Demersal fish resources show signs of being fully exploited, so only limited expansion of demersal catch is possible. An incremental potential of 37 000 t appears available, mostly off the Balochistan coast. The potential yield in the area beyond 35 n.m. has been estimated at only 16 000 t.

There may be potential to expand the small pelagic fishery by venturing further offshore. However, the potential yield of small pelagic is uncertain. Also it seems likely that local fishermen would need to adopt new fishing techniques in order to fish off-shore stocks.

Large pelagic fish resources in the form of tuna and tuna-like species exist in the EEZ of Pakistan. Fishing for these generally result in substantial by-catches of marlin and sharks. Skipjack tuna and other valuable scomberoids, i.e. frigate mackerel, Indian mackerel, Spanish mackerel, barracuda, pelagic sharks and dolphinfish, are commonly harvested by the local fishing fleet. The 2006 production figures indicate overexploitation relative to MSY level estimates. Furthermore, consideration has to be given to the migratory nature of large pelagic species and to the need to manage these resources at a regional level.

Mesopelagic fish resources exist just off the continental shelf, between 150 and 300 m depth during the day, and rise to 50 m depth at night. For the north Arabian Sea, stocks have been estimated at about 20 million tonnes, about half of which are in the Pakistan maritime area. They are known to be attracted by light and might be fished economically using purse seines (6 mm stretched mesh) and light attraction. No commercial fishery exists in Pakistan. Mesopelagic species are prime candidates for conversion to fishmeal. Comprehensive studies of the shrimp fishery showed that the MSY should be about 15 000 t/yr, and requires an effort of 550–600 boats. It is clear that *jaira* shrimp in Pakistan are being overfished. As there are currently 2 300 fishing trawlers in operation, there is clear evidence of excess in fishing capacity.

Lobsters are also overexploited.

Crabs, cephalopods and other mollusc resources are an unconventional resource but there is good potential in the export market as a substitute for shrimp and lobster.

Other marine resources exist (mussels, oysters, clams, crabs, seaweed, sea urchins, etc.) but more information is required to determine the feasibility of developing fisheries or mariculture of these species.

3.2.5 Management applied to main fisheries

Fisheries are an important natural resource of Pakistan. As there is potential for development of the sector, the Government intends to give the sector high attention in the future. The Ministry of Food, Agriculture and Livestock (MinFAL) has developed a *Policy framework and strategy for the development of fisheries and aquaculture in Pakistan*. The document sets the broad direction for development of the fisheries and aquaculture sector, and indicates the role of the sector in reaching Pakistan's overall development goals. The three policy goals for fisheries as set by government are:

- Increased economic growth
- Poverty alleviation
- Food security

According to Pakistan's constitution, the management of marine fisheries outside the limit of territorial waters (12 n.m.) is a federal responsibility. MinFAL is the federal agency responsible for fisheries. The Livestock Wing of MinFAL has direct supervision over fisheries matters within the Ministry's jurisdiction. The Marine Fisheries Department (MFD) is the executive fishery agency of the federal government, with primary responsibilities for ensuring management and development of fishery resources in the interest of the nation. Fisheries management is carried out through licensing, by indicating exploitable stocks and species, by designating environmentally friendly fishing gear and methods, and by enforcing restrictions with regard to closed seasons, closed areas, etc. Most of the fishing grounds exploited so far lie within the jurisdiction of provincial administrations.

Provincial Governments have their own fisheries administrations, namely:

- Directorate of Fisheries, Peshawar, Northwest Frontier Province (NWFP), headed by a Director
- Directorate of Fisheries, Lahore, Punjab, headed by a Director General
- Directorate of Fisheries, Karachi, Sindh, headed by a Director
- Directorate of Fisheries, Pasni, Balochistan, headed by a Director

Other federal agencies with fisheries-related functions include:

The Water and Power Development Authority (WAPDA) has a Directorate of Fisheries to manage and develop fisheries in the six major reservoirs under its control, with a total surface area of 250 000 acres (100 000 ha).

The common management measures include prohibition of fishing using destructive or harmful fishing gears, regulation of net mesh-size limit, closed seasons and closed areas. In the shrimp fishery, the closed season occurs during the recruitment period; it is also recommended that shrimp trawling in nursery areas (creeks) should be prohibited. A closed season is also imposed on catch of major common carps during the breeding season (June–July).

There is no regulation limiting the number of fishing boats in the small-scale fishery as this is open access fishery. Capacity management applies only to industrial fishing. Licences are issued on the basis of vessel GRT and aim to allocate different-sized vessels to various zones of the EEZ. A recommendation to reduce the shrimp trawler fleet to a more sustainable level of 500–600 trawlers has faced problems in implementation.

The industrial fishing is restricted to those enterprises that have a specific permit issued by MFD. Such permits are not transferable and this means that entry to industrial fishing is controlled.

There is no tax on fisheries income. Imports of fishing equipment and fish processing machinery are also free from import duty.

Pakistan is a member of the IOTC, responsible for managing tunas, marlins, swordfish and sailfish in the Indian Ocean.

3.2.6 Fisher communities

The fisher population in the marine sector has been increasing steadily, whereas the employment in the inland fisheries sector has fluctuated.

3.3 Inland subsector

Freshwater capture fisheries are dominated by the Indus River and its tributaries. The fish fauna of the Indus system in its northern part is cold-water type, while the greater middle and southern parts of the system are warm-water fisheries zones. Greater differences exist between various zones of one river than between different rivers of the same zone. River modification as a result of Indus basin development has changed almost the entire profile of the major rivers. Consequently, the fish communities in rivers have been affected mainly by external influences.

Fisheries in rivers and reservoirs account for more than 80 percent of total inland fish production. The riverine fishery management system is operated mainly by provincial fisheries departments. They enforce regulatory laws that restrict catch by size of fish and establish closed seasons. In the absence of any fisheries management plan, integrated coordination of the development of inland fisheries is limited.

3.3.1 Reservoirs

Six large reservoirs have been created in the past four decades through the construction of dams and barrages across rivers, which provide about 250 000 ha for fish production. In addition, there are several smaller reservoirs. Although the large reservoirs and barrages remain the major source of fish production, there is a continuous decline in landings. The fisheries production is currently managed by WAPDA through harvest limits during certain seasons and minimum size of fish landed.

3.3.2 Lakes (sweet or saline) and other wetlands

In the Sindh Province alone there are more than 100 natural lakes of different sizes covering an area of about 100 000 ha. Among them Lakes Halijee (1 800 ha), Kinjhar (12 000 ha) and Manchar (16 000 ha) are quite important for fish production, and Manchar alone supports 2 000 fishing families. Apart from these big lakes, a cluster of small lakes called Bakar Lake extends over 40 000 ha. The natural lakes in Punjab cover about 7 000 ha.

Some of the lakes, such as Nammal (480 ha), Ucchali (943 ha), Jahlar (100 ha), Kalar Kahar (100 ha), Kharal (235 ha) and Khabakki (283 ha), are brackish and are too saline to support aquaculture.

3.4 Recreational subsector

There are three main types of recreational fisheries in Pakistan: (i) billfish and tuna fishing, in the EEZ off Karachi; (ii) sport fishing (pelagic) in coastal waters; and (iii) hand-line fishing (bottom fishing) in inter-tidal and shallow waters. About 1 000 people with 120–150 fishing boats are involved in this sector, and they are not licensed. However, their boats are required to be registered by Marine Mercantile department for seaworthiness.

3.5 Aquaculture subsector

Aquaculture in Pakistan is still in its infancy, but there is immense potential for development. Aquaculture production has rapidly increased since 2000 from around 10–15 thousands tonnes to reach over 100 000 tonnes in 2006 and 2007. Despite its vast fresh, brackish and marine waters, only carp culture is practised in inland waters. Carp are cultured in earthen ponds, using mostly extensive farming systems with very few inputs. In Pakistan, the fish fauna is rich but only seven warm-water species and two cold-water species are cultivated on a commercial scale. Trials with shrimp culture in the Indus delta region did not succeed due to non-availability of hatchery-produced seed.

Freshwater carp farming is the major aquaculture activity in Punjab, Sindh and NWFP. The northern mountains of Pakistan have good potential for trout culture, but production is still very small.

Aquaculture is a recent development and management of the sector is still poor. Two Asian Development Bank (ADB) projects have assisted in strengthening the institutional structure, through the development of model farms, hatcheries and production of juveniles, as well as through human resources development and strengthening of extension services. Aquaculture has also received a substantial amount of government investment, and facilities are now in place that can provide the basis for a major future expansion.

With the exception of trout culture in the North-West Frontier Province (NWFP) and the northern region, virtually all aquaculture consists of pond culture of various carp species. Pakistan has no coastal aquaculture operations, despite its potential.

According to the latest estimates, the total area covered by fish ponds is about 60 500 ha (Sindh, 49 170 ha; Punjab, 10 500 ha; NWFP, 560 ha; and the other provinces (Balochistan, Azad Jammu Kashmir [AJK] and Northern Area [NA]), 240 ha).

About 13 000 fish farms have so far been established across Pakistan, varying considerably in size. The average farm size is 5 to 10 ha. No direct data on the number of fish farmers employed in this sector is available as fish farming in most parts of the country is carried out as an integral part of crop farming. According to best estimates, about 50 000 people are either directly or indirectly employed in the sector.

In the Sindh Province, the majority of farms are located in Thatta, Badin and Dadu, the three districts through which the River Indus passes. Badin and Thatta have waterlogged floodplain areas suitable for fish farming. In the Punjab Province, farms are located mostly in irrigated areas or where there is abundant rain and the soil is alluvial. As a result, Sheikhupura, Gujranwala and Attock Districts have most farms (three-quarters of all farms in the Punjab).

NWFP has comparatively fewer farms, with trout farms in Chitral, Swat, Dir, Malakand, Mansehra, Federally Administered Tribal Area (FATA) and other parts of NA. Carp culture is practised in Dera Ismail Khan, Kohat, Mardan, Swabi and the Abbotabad Districts of NWFP.

Some carp farms use a semi-intensive culture system. On a typical carp farm in Pakistan, the ratio of the warm-water species stocked on the farm is catla (10–20 percent), rohu (30–35 percent), mrigal (15–20 percent), grass carp (15–20 percent) and silver carp (15–20 percent).

Intensive culture has not yet been developed because of non-availability of low-cost feed and limited production expertise.

Cold-water aquaculture provides a unique opportunity in the mountainous areas of NWFP, Balochistan, AJK and NA. At present two species, brown trout (*Salmo trutta*) and rainbow trout (*Oncorhynchus mykiss*) are being produced and cultured successfully for use in sport fishing activities. Intensive rearing of trout is practised in commercial raceways in Swat, Dir, Chitral and Hazara in NWFP and in AJK and NA.

The marketing chain for fish is similar to that for other agricultural commodities. Products are sold into the market to wholesalers and then onto retailers and end consumers through agents working on a commission basis. Farmed fish tend to be marketed either at the farm gate, through intermediaries or by open auction, where ice-packed fish is sent to fish markets and sold. Buyers can be members of the public, retailers, wholesalers and agents for processing plants or exporters. Fish markets are very common in Sindh and at selected locations in Punjab. All markets are under the control of the local administrations.

Most fish markets have inadequate facilities; usually they lack cold storage facilities, have poor hygienic conditions and inadequate communication links, etc. Most aquaculture product is consumed locally. Rohu has a substantial local market; good market size is usually from 2 kg up to a maximum of 3 kg. Prices tend to decline when the fish is more than 3 kg; other factors include freshness of the fish and the supply–demand situation in the market. Local consumers (up-country areas) generally prefer freshwater fish over marine fish because of their familiarity with river and inland farmed fish, as well as the fresh condition of the product. This difference is reflected in both wholesale and retail prices, where freshwater fish is sold at a higher price than marine fish.

[HTTP://WWW.FAO.ORG/FISHERY/COUNTRYSECTOR/NASO_PAKISTAN/EN](http://www.fao.org/fishery/countrysector/naso_pakistan/en)

4. POST-HARVEST USE

4.1 Fish utilization

Marine fish is marketed as fresh, frozen, canned, cured, reduced to fishmeal, other purposes, and some retained by fishermen for their own use. The freshwater catch is marketed fresh for local consumption. Out of the total marine fish production, the percentage for human consumption ranged between 65 and 70 percent in 2006. The rest of the catch was used for other purposes, especially reduction to fishmeal. The annual per capita fish consumption in Pakistan was about 2.0 kg in 2006.

Fish and shrimp processing is usually divided into mechanical and non-mechanical processing. The mechanical category includes (i) freezing plants; (ii) canning; (iii) fishmeal plants; and (iv) fish liver oil extraction plants. In the non-mechanical category there are dried fish, dried shrimp, shark's fin, fish maws, live lobster/crab, and fish roes.

There are 27 processing plants for the production of frozen products in Pakistan, 1 for canning, and 8 for fishmeal processing. Almost 100 percent of the frozen and canned fishery products are exported, while the bulk of the processed fishmeal is used in the country in the manufacture of poultry feed.

5. FISHERY SECTOR PERFORMANCE

5.1 Economic role of fisheries in the national economy

Fish is a source of cheap and valuable animal protein for the population, and the industry makes a major contribution to the economy of Pakistan as an earner of foreign exchange. Imports of fish are negligible, whilst the value of exports of fishery products was about USD 196 million in 2006. It contributes only 0.3 per cent to overall Gross Domestic Product (GDP), 1.3 per cent to Agriculture GDP and less than 1 per cent to national employment.

The fisheries sector provides employment opportunities to an estimated 1.5 million individual fishermen, family members and related fishery workers, thereby providing direct support to nearly 6.0 million citizens throughout the country. In some rural areas,

notably in Sindh and Balochistan, where very limited alternative sources of income are available, fishery development has contributed significantly to improved living conditions. Aquaculture is also seen as a means of filling an expected future gap between supply and demand for fish. If coastal aquaculture of high value shrimp and finfish species were to develop, export earnings would increase.

5.2 Demand

The population of Pakistan is increasing rapidly. In 2006 the population was 160.9 million. Fish production was 611 246 t, of which 476 711 t were fit for human consumption. The per capita fish consumption was about 2.0 kg/yr, which is very low by international standards. Pakistanis are not fish eaters by nature. Inland fish production is mostly consumed locally, and this situation is expected to continue, with the inland population consuming any increased fish production achieved through aquaculture.

5.3 Supply

The government's strategy is to increase national fish supply based on sustainable production and improved marketing of aquatic products, built around the following three fundamental axes:

- Sustainable development of aquaculture production (inland and coastal)
- Sustainable increase in inland and marine capture fisheries production
- Resolving post-harvest constraints (handling, storage, value-adding, marketing and transport)

5.4 Trade

The Pakistani seafood industry is primarily export-oriented and mainly governed by the requirements of the exporter. The performance of the export sector has been appreciable and export earnings have increased substantially since independence. In 1947 only salted dried products were exported from Pakistan, but now high-grade frozen seafood products as well as live marine animals are exported. There is no doubt about the potential for increased seafood exports, but post-harvest losses are a major constraint to the development of the fisheries sector.

In the 1970s, dried fish products were the major commodity exported by the fisheries sector. It was sold mainly to Sri Lanka. Thereafter, frozen fishery products became the leading export commodity. Frozen fishery products are now exported to about 65 countries. Major importers of frozen fish from Pakistan are China, Malaysia, Hong Kong (SAR), Thailand, EU countries and USA. Export of chilled fishery products has increased significantly in the last five years. These are purchased by Gulf countries and by Singapore. Live lobster and crabs are exported to China, Singapore, Malaysia, etc.

In 2007, total fishery exports were 123 600 tonnes (product weight) valued at USD 188 million. The exports mainly comprise frozen fish, frozen shrimps, lobsters and crabs, dried fish and molluscs. Only a small quantity of fishmeal was exported.

Shrimp was the main export item. It was exported as freshly frozen, either shell-on tails or as peeled product. Shrimp canning ceased in 1983, and has been replaced by freshly frozen crab meat, which is exported to USA. Fishmeal, fishmaws and shark fins are also exported.

5.5 Food security

The relatively modest size of the industry and the large number of people depending on marine fisheries for a living make it obvious that the marine fisheries sector can realistically cater only for a certain limited portion of the coastal population with regard to economic development and alleviation of poverty.

5.6 Employment

The record of job creation in fisheries has been somewhat mixed. Employment in the primary sector peaked in 1997 at 416 405 fishermen, but declined to 324 489 in 2006. This declining employment is most apparent in the inland sector. The inland sector is

somewhat more labour intensive and less productive (177 572 fishermen each producing an average of 0.80 t/yr) compared with the more mechanized marine sector (146 917 fishermen each producing 2.59 t/yr). It is clear that the high annual rate of increase in production is not due to increases in labour force size but rather to more efficient fishing and greater market demand (to supply fishmeal factories in particular).

Employment in the secondary sector (processing/marketing) is estimated to be around 55 000. A high proportion of those employed are women working in shrimp processing plants (sorting and peeling). Women also constitute most of the labour force involved in net repair. It is clear that, given the sluggish rate of new job creation in the primary sector and the probable future need for considerable labour in marketing and distribution, the greatest potential for creating new jobs will be in the secondary sector.

5.7 Rural development

Aquaculture has contributed significantly to rural development in many developing countries of Asia. This is largely due to the opportunities it offers for employment (part-time and full-time), which help in sustaining peasant and fishermen in rural areas, reducing the drift of population to urban centres. Employment opportunities generated through aquaculture development, including production, processing, transport and marketing, can be expected to control to some extent the rural-urban drift. In Pakistan, aquaculture has received a substantial amount of government investment over the past decade, and facilities are now in place that can provide the basis for a major expansion of aquaculture production.

6. FISHERY SECTOR DEVELOPMENT

6.1 Constraints

Overexploitation of aquatic resources on the one hand is the result of the mechanization of fishing vessels and on the other hand of the increase of the size of the fishing fleet combined with growing demand for seafood for export and domestic consumption. Some of the resources have been depleted, whereas others are overexploited and under threat of depletion. Shrimp stocks have been severely overfished, and a major decrease in landings of important shrimp species as well as a major reduction in size of commercially important species is noticeable. Lobster resources have already been overfished and annual landings have decreased from more than 5 000 t to about 750–800 t. Resources of crab, ivory shell and some finfish have also shown signs of overexploitation.

There is a lack of facilities for resource surveys and stock assessment, and no stock assessment survey has been carried out in the last 15 years. Information about the present status of various resources in shallow and offshore waters is lacking. No exploratory surveys have been carried out recently, so new fishing grounds and unexploited stocks have not been identified, and fishermen are compelled to fish in known fishing grounds, thus increasing pressure on fish stocks.

Some exotic gears were introduced in the 1970s, when there was a heavy influx of immigrants in coastal areas of Sindh. Two such exotic gears — *katra* encircling net and the *bulloa* estuarine set bag net — are considered extremely harmful to the population of juveniles of commercially important species which abound in creek systems. Additionally, the *gujja* trawl shrimp net is also being used in creek areas. Coastal communities, NGOs, environmentalists and fisheries scientists have for a long time been pleading for a total ban on the use of these gears because of their devastating effects on local fauna, as well as on the population of commercially important species. Although legislation has been introduced, it is inadequate in the face of lack of monitoring and surveillance facilities. The impact of unabated use of this gear is seriously affecting the stocks of commercially important species. Use of some of this gear has started in Balochistan, especially in Miani Hor and along shallow coastal waters. In Balochistan, there is a serious resentment towards the use of trawl nets by Karachi-based fishing boats. This has resulted in conflict between fishermen of Sindh and Balochistan. A number of attempts have been made in the past to resolve this issue, including at one stage permitting trawling in Balochistan

under licence, but the conflict remains unresolved, and poaching by Sindh-based trawlers and *katra* boats seems to continue. The fishermen of Sindh and Balochistan have shown resentment towards deep-sea fishing operations in the EEZ. However, deep-sea fishing operations are monitored through satellite-based systems and no case of poaching has been recorded since the restart of deep-sea fishing in 2002.

Influx of freshwater from the River Indus is known to be a major cause of the productivity in off-shore waters as well as in the estuarine waters of Sindh. Reduction in the flow of the Indus in past decades has seriously affected fisheries in the estuarine areas of Pakistan. The production of some commercially important species, such as river shad *palla*, barramundi *dangri* and Indian threadfin *rawans* has already decreased substantially in the past four decades. This has serious socio-economic repercussions for coastal communities, including contributing to rural-urban migration, and the build up of greater pressure on other natural resources, such as mangrove. The intrusion of sea in the absence or reduction in river flow has occurred in some areas and has a serious impact on production of important fish species as well as on agriculture and other economic activities. Some of the highly productive estuarine fishing grounds have been converted into saline lagoons where productivity of commercially important species is minimal.

Increasing pollution and environmental degradation have completely wiped out some of the important fishing grounds along the Karachi coast. Similarly, environmental degradation due to land reclamation, mangrove denudation and other factors have also affected the natural productivity along the coast, especially in Sindh.

Lack of infrastructure constrains development. There are only four operational fishing harbours, and there are no landing facilities at some major fishing centres such as Ormara, Jiwani, Sonmiani, Kalmat, Ibrahim Hayderi, Ketu Bundar and Shah Bunder. Similarly, road linkages along the coast of Pakistan are fragmentary. Other infrastructure, such as communication, educational and medical facilities, are also lacking along most of the coast.

Despite several attempts by private and public sectors entities to start aquaculture in coastal areas of Pakistan no commercial aquaculture has been established by the middle of 2008.

Post-harvest losses due to poor handling practices, lack of preservation facilities on board fishing vessels and in the landing centres are some of the most important factors resulting in poor quality raw material for processing and consumption. It is estimated that about 70 percent of the harvested seafood becomes degraded and even putrefied before it reaches the consumer or the processing facility. Additionally, almost entirely all the by-catch of trawl fisheries decomposes, but still is used for production of poor quality fishmeal. Although a programme for the improvement of fish holds and handling in fish harbours was started, the programme did not succeed. A similar situation prevailed in the pre-processing industry, where shrimp is peeled under unhygienic conditions.

6.2 Development prospects and strategies

The government's strategy, adopted to achieve the targets with medium growth rate (6 percent) and with higher growth rate (>10 percent), has been prepared with the aim of addressing, *inter alia*, job creation, income generation, environmental aspects, women's participation and empowerment, export enhancement, and poverty alleviation. The strategy aims to achieve:

- Establishment of shrimp and finfish aquaculture in coastal areas of Sindh and Balochistan.
- Reduction in post harvest losses
- Establishment of improved marketing system
- Exploitation of untapped resources
- Enhancement of productivity of the coastal areas
- Adoption of better management practices
- Improvement in human resources and skills development
- Improvement in socio-economic conditions of the coastal communities

6.3 Research

Marine resources research activities are the main function of MFD. Scientific research is undertaken by various sections in the department. MFD is also responsible for administering marine fisheries research and training, for the compilation and distribution of national fisheries statistics, and for the inspection of fish and fishery products for export. It is also responsible for the management of fisheries resources beyond territorial waters. The biological section of MFD undertakes research related to biology, and to the behaviour of commercially important fish and shellfish including their distribution, migrations, food and feeding pattern. The hydrological section is engaged in research activities dealing with the collection of data on physiochemical parameters affecting the distribution and abundance of fishes of commercial importance. The technological section is engaged in standardization and quality control of fish and fishery products. Consignments intended for export are subject to pre-shipment inspection after analysing random samples. This section also issues certificates of quality and origin for export of fish and fishery products.

The Zoological Survey Department is located in Karachi and is attached to the Ministry of Environment. It is mandated to conduct fundamental research on fauna and flora. Thus, it lists all terrestrial and aquatic animals of Pakistan. The department operates a Marine Biological Laboratory that undertakes taxonomical activities.

The Agriculture and Livestock Marketing and Grading Department is charged, *inter alia*, with the issuance of quality certificates for export of fish and fishmeal. It is also entrusted with providing marketing intelligence services to various economic ministries in connection with wholesale prices of agriculture and livestock commodities.

The Pakistan Agriculture and Research Council (PARC) concentrates on strategic research for the purpose of reducing major constraints affecting increase in fisheries production. PARC also has a Social Science Service undertaking marketing and economic studies. For fisheries, it sponsors research schemes focusing principally on marine biology of fish, shellfish and weed along the Pakistan coast.

The Animal Quarantine Department, located at Karachi, is attached to the Livestock Division. It was created under the Pakistan Import and Export of Animals and Animal Products Ordinance of 1979, for ensuring, *inter alia*, the health and welfare of animals and animal products exporting from Pakistan, including fish. For this purpose, it provides a Central Certification Service for importers and exporters of animals and animal products, and for testing of samples in its laboratory.

Pakistan Water and Power Development Authority (WAPDA) was established in 1958 to manage and develop its water and power resources. It operates under the Ministry of Water and Power. This authority has a Directorate of Fisheries to manage and develop fisheries in six major reservoirs under its control (i.e. Mangla, Terbela, Khanpur, Hub and Chashma) with a total surface area of over 100 000 ha.

The Pakistan Council for Scientific and Industrial Research (PCSIR), located in Karachi, is engaged in basic applied research on processing methods, preservation, spoilage and quality control of existing products, including marine fish and shrimp products. PCSIR also focuses on the development of new products, such as fish protein concentrates and other fish extracts.

The National Institute of Oceanography (NIO) was created in 1983 to conduct resources research. NIO conducts extensive surveys, data collection and research required for understanding the physical, chemical, biological oceanographic and environmental processes (i.e. upwelling, monsoon changes, sedimentation of Indus estuary, and pollution) which could influence decisions as regards the exploitation of living and non-living resources in the Arabian Sea.

The Pakistan Museum of Natural History, situated in Islamabad, conducts research, including on fisheries, for conservation and educational purposes. It provides facilities such as fellowships to students for research in Botanical, Geological and Zoological sciences. It is the central depository for type specimens.

The Pakistan Standards Institute, under the Ministry of Industry, specifies technical standards for raw material, processing and storage of fish and shrimp.

The Federal Bureau of Statistics (FBS) is empowered to conduct national demographic and socio-economic surveys, including fisheries surveys. Its statistics division compiles and analyses national data, while its external trade section provides fish export data to MFD.

Fisheries research is also undertaken in universities, although focusing greatly on academic rather than applied research activities.

The Centre of Excellence in Marine Biology (CEIMB) within Karachi University has an Institute of Marine Biology dealing mainly with taxonomy, and offers courses leading to MSc and PhD degrees.

Sindh Agriculture University (Tando Jam) has a Zoological Survey Department (ZDKU) that conducts research in marine and inland fisheries.

The Freshwater Biology Department (Jamshoro) of Sindh University has a plant protection department conducting research on marine biology.

6.4 Education

Most fishermen are illiterate. There is a dearth of trained manpower in the fisheries sector of the country. At present, no formal training is required to seek employment in the fish harvesting, handling and processing sectors or in ancillary industries. There is demand for trained manpower in the fisheries sector but as no trained manpower is available, reliance has to be placed on the traditional fishermen. In the processing sector, untrained manpower is recruited, which over time becomes familiar with processing.

Education and training in inland fisheries and aquaculture requires knowledge in the quality of water, breeding of fish and shrimp, raising of juveniles to adult stage in ponds, fish pans, fish cages, both extensively and intensively, control of fish diseases, and overall farm management.

In order to cater for the training needs of the fishers and the fish industry, a fisheries training centre was established by MFD at Karachi fish harbour, with the financial assistance of ADB in 1993. The centre is equipped with modern training facilities. A mobile training programme was also started for fishing villages. So far, this centre has conducted courses of short duration (3–5 days) in various aspects of fisheries, such as small-scale modern fishing techniques, fish handling and processing on board fishing boats, deck hand training, engine operation and maintenance, HACCP in seafood processing, etc.

6.5 Foreign aid

The United Nations Industrial Development Organization (UNIDO) has been involved in the implementation of the 3-year European Union (EU)-funded Trade-Related Technical Assistance (TRTA) programme with total budget of EUR 5 450 000. The Government of Pakistan also provides an in-kind contribution of EUR 1 111 000.

The programme has three components:

- Component 1 (ITC) implemented by the International Trade Centre (UNCTAD/WTO) focuses on creating awareness and building the necessary capacity in Pakistan to benefit fully from its participation in the WTO Agreements. Key target audiences are government officials, the business sector and civil society as a whole.
- Component 2 (UNIDO) implemented by UNIDO, focuses on the improvement of the quality, standards, metrology and accreditation systems in the country. This will enable Pakistan to address challenges and requirements brought by WTO agreements in this field, as well as to increase the competitiveness of Pakistan's export industry.
- Component 3 (WIPO) subcontracted by ITC to the World Intellectual Property Organization (WIPO), will focus on intellectual property issues. Activities under this component aim at strengthening the IPR system in Pakistan and enhancing its capacity to use the intellectual property system for developmental goals, where necessary by examining international obligations in the intellectual property field.

Under Component 2, UNIDO has been engaged in assisting the various stakeholders of the fisheries sector in Karachi to address compliance issues regarding hygiene and safety of fishery products destined for export to EU countries.

A Declaration of Intent between the Government of the Kingdom of Norway and the Government of the Islamic Republic of Pakistan on Cooperation in the Fisheries Sector was signed on 24 January 2006 by the President of Pakistan during his visit to Oslo, Norway. The declaration refers to institutional cooperation, which was subsequently substantiated by the adoption of two interlinked project documents for:

- Assistance in planning and implementation of a marine fisheries resources survey; and
- Competence strengthening in fisheries institutions of Pakistan

7. FISHERY SECTOR INSTITUTIONS

The Ministry of Food, Agriculture and Livestock (MinFAL) operates at Federal level. The responsibility for marine fisheries in Pakistan constitutionally rests with MinFAL, its fisheries component consisting of an office headed by the Fisheries Development Commissioner.

MFD, Karachi, is the executive agency of MinFAL. It is mandated to:

- exploit and manage fisheries and other living resources in the Exclusive Economic Zone of Pakistan
- conduct exploratory fishing surveys and biological research on various aspects of fisheries
- conduct stock assessment in coastal and offshore waters of Pakistan
- study occurrence, life history and distribution of commercially important fish species
- suggest measures for the operations of the fishing fleet
- introduce newer fishing techniques and improvement of traditional methods
- train fishermen in various disciplines, including modern fishing techniques, engine maintenance, fish processing and quality control
- liaise with various national and international agencies
- collect, analyse, interpret and publish fisheries statistical data
- advise federal and provincial governments in matters relating to fisheries
- provide quality control services for export and domestic consumption of fish; and
- provide technical assistance to and to promote the fish processing industry.

MFD is also mandated to provide support to and liaise with the Provincial governments of Sindh and Balochistan, in particular the departments of fisheries in those governments.

Further, MFD cooperates with various research institutions located in Karachi, such as the National Institute of Oceanography and the Centre of Excellence in Marine Biology of the University of Karachi.

Other relevant structures are:

- Fishing harbour authorities;
- The Mercantile Marine Department, responsible for the registration of all vessels, including fishing boats; and
- Coastal Development Authorities in Sindh and in Balochistan Provinces, each with access to considerable funding that can be harnessed for coordinated fisheries sector development initiatives.

8. GENERAL LEGAL FRAMEWORK

The Exclusive Fishing Zone (Regulation of Fishing) Act, 1975, as amended 1993, extends to the whole of Pakistan and to waters within the exclusive fishery zone of Pakistan beyond the territorial waters. It regulates the management of fishing in the EEZ of the

country. The provisions of the law are in accordance with the provisions in the *Law of the Sea Convention*, and cover:

- Licensing and management of fishing operation in the EEZ of Pakistan
- Fishing craft subject to navigational regulation
- Prohibition of illegal fishing, including fishing with dynamite and poison
- Closed seasons and prohibited areas
- Penalties for contravention of any provisions, including seizure and disposal of fishing craft, fishing gear and fish catch

The *Agriculture Produce (Grading and Marketing) Act, 1937*, provides authority and control for the grading and marketing of agricultural produce. Dry fish, shellfish and fishmeal are graded under the provision of this act.

The *Pakistan Animal Quarantine (Import and Export of Animal and Animal Products) Ordinance, 1979* law provides for control of the import and export of animals and animal products, and the issue of health certificates to regulate the trade and to prevent the introduction or spread of diseases.

The *Federal Government, vide Notification No.F.272/FDC/99* dated 6 April 1999, in exercise of the power conferred by Section 12 of the *Pakistan Animal Quarantine Ordinance*, exempts the export of fish and fishery products from all the provisions.

The *Sindh Fisheries Ordinance, 1980*, provides rules and regulations for marketing, handling, transportation, processing and storage of fish and shrimp for commercial purposes and sale of fish used for domestic and inter-provincial trade in the Province of Sindh. Contravention of this Ordinance is punishable by imprisonment up to six months or by a fine of PRs 10 000, or both. A provision has also been included for a total ban on the use of destructive fishing gear, and for a closed season for shrimp during June and July.

The *Balochistan Sea Fisheries Act No. IX, 1971*, provides authority for control of fishing craft, fishing licences and processing of fish and fishery products in the territorial water of Pakistan along the coast of Balochistan. Contravention of any provision of the Ordinance is punishable by one month imprisonment or PRs 5 000 fine, or both.

The *Karachi Fisheries Harbour Authority Ordinance No.11, 1984*, provides the legal basis to carry out efficient operation of harbour facilities and for periodic inspection of hygienic conditions of processing plants, ice plants, cold storage and other related activities.

The *Coastal Development Authority Act (Sindh, Act No. XXVIII, 1994)* provides the legal basis for planning, development, operation, management and maintenance of coastal areas, including development of fisheries, livestock, horticulture and agriculture.

The *Pakistan Environmental Protection Ordinance No. XXVII*, deals with protection, conservation and improvement of the environment for the prevention and control of pollution, including biodiversity, ecosystems, effluent, hazardous substance emission and water pollution. It also provides for rules for implementing international environmental agreements.

The *Pakistan Fish Inspection and Quality Control Act, 1997*, deals with the registration of fish processing plants and fish exporters, and constitutions and functions of the inspection committee. The function of the committee includes inspection of fish processing plants, fish exporters, and handling of fish and fishery products. It also defines the powers, duties and functions of fishery officers, and penalties for contravention by processors and exporters.

The *Pakistan Fish Inspection and Quality Control Rules, 1998*, provides a detailed description of conditions required for registration of processing plants for export, ice factories, fish handling on board fishing vessels, landing places, and fish processing establishments. It also makes provisions for the registration of testing laboratories for seafood products, and for the notification of approved cleaning materials, etc.