

**SUSTAINABLE FISHING ENTREPRENEURSHIP
TRAINING WORKSHOP ON FISHERIES POST
HARVEST LOSSES, OVER FISHING,
INCREASING BY-CATCH
TRAINING REPORT**



**23RD December 2016 – WWF-Pakistan and
Engro Foundation**

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ABSTRACT:

Sustainable fishing is the major ultimate solution to secure the fish stocks of commercially important and edible fish not just to improve of the livelihood of thousands of fishermen dependent on it worldwide but also to secure the biodiversity to maintain healthy marine ecosystems.

To overcome this challenge, scientists all over the world are coming up with solutions by overcoming the post-harvest losses of fishing. This is done by designing and implementation of various nets of various designs and mesh sizes to prevent as much loss as possible.

Centre of Excellence in Marine Biology, University of Karachi accompanied their junior research fellows to WWF-Pakistan's 'Sustainable Fishing Entrepreneurship Training Workshop on Fisheries Post Harvest Losses, Overfishing & Increasing By-catch' supported by Engro Foundation to ascertain the hands on knowledge to young scientists regarding how fishing impacts positively as well as negatively on biodiversity of Pakistani waters.

The Training was designed by professionals of WWF-Pakistan where the students were skilled with how exploitation of natural resources is harming the biodiversity with how to overcome the challenges that are currently being faced by the fisheries sector and how Government as well as WWF-Pakistan is playing its role to overcome these challenges.

The Training was conducted under supervision of Prof. Dr. Shahnaz Rashid, Assistant Professor, Centre of Excellence in Marine Biology, by Mr. Muhammad Moazzam Khan, Technical Advisor Marine Program, WWF-Pakistan.

The report is based on the learning experiences and what has been concluded from the training by the students.

BACKGROUND AND INTRODUCTION:

Centre of Excellence in Marine Biology, University of Karachi accompanied their junior research fellows to WWF-Pakistan's 'Sustainable Fishing Entrepreneurship Training Workshop on Fisheries Post Harvest Losses, Overfishing & Increasing By-catch' supported by Engro Foundation to ascertain the hands on knowledge to young scientists regarding how fishing impacts positively as well as negatively on biodiversity of Pakistani waters.

The One-Day Training Workshop was conducted at WWF-Pakistan's Karachi Office on Friday 23 December-2016. The aim of this workshop was to aware students with the pros and cons of fishing and how exploitation of natural resources is harming the biodiversity with how to overcome the challenges that are currently being faced by the fisheries sector and how Government as well as WWF-Pakistan is playing its role to overcome these challenges.

The Training was conducted under supervision of Prof. Dr. Shahnaz Rashid, Assistant Professor, Centre of Excellence in Marine Biology, by Mr. Muhammad Moazzam Khan, Technical Advisor Marine Program, WWF-Pakistan.

ABOUT WWF-PAKISTAN:

Pakistan contains a diverse topography of geographical features and is home to incredibly diverse flora and fauna. Over the last century, lack of understanding and awareness has led to human practices that have exploited the country's natural resources without replenishing them. A growing population and increasing infrastructure needs have also led to the decimation of animal habitats and forests, and resulted in loss and endangerment of animal and plant species only found in Pakistan.

With an urgent need for an organization to meet and counter these growing conservation and environment issues, WWF-Pakistan was formed in 1970.

For its first fifteen years, WWF-Pakistan was a small organization which relied on individuals for financial support and honorary scientific input. It was in the late 1980s that the first formal project for environmental education was started. Since then, the programmes of WWF-Pakistan have expanded rapidly to increase its conservation efforts. WWF-Pakistan works around 20 offices with a team of close to 250 dedicated staff members. With its head office in Lahore, it has regional offices in Karachi, Islamabad, Peshawar, Gilgit, Muzaffarabad and Quetta, and project offices wherever there is need and the potential to make a difference.

WWF-Pakistan is a proud member of the WWF International Network, one of the world's largest and most experienced independent conservation organizations, with almost four million supporters, 6,200 staff members and a global network active in more than 100 countries. We have a global vision when it comes to conservation, but we hold true to local perspectives and needs while accomplishing our work.

PURPOSE:

WWF-Pakistan carries out conservation work according to the Global Programme Framework. The Framework includes biodiversity and human footprint meta-goals.

2050 Biodiversity Meta-Goal

By 2050, the integrity of the most outstanding natural places on earth is conserved, contributing to a more secure and sustainable future for all.

2050 Footprint Meta-Goal

By 2050, humanity's global footprint stays within the earth's capacity to sustain life and the natural resources of our planet are equitably shared.

2020 Biodiversity Goals

Biodiversity is protected and well managed in the world's most outstanding natural places. Populations of the most ecologically, economically and culturally important species are restored and thriving in the wild.

2020 Footprint Goals

By 2020, humanity's global footprint falls below its 2000 level and continues its downward trend, specifically in the areas of:

- Energy/carbon footprint
- Commodities (crops, meat, fish and wood) footprint
- Water footprint

WWF-Pakistan has an average of 30 active projects implemented throughout the country.

FISHING & FISHERIES OF PAKISTAN:

Pakistan is endowed with rich fishery potential. It is located in the northern part of the Arabian Sea and has a coastline of about 1000 KM with a broad continental shelf and its Exclusive Economic Zone extends up to 350 nautical miles from the coast. There are about 11,000 fishing boats in coastal area of Pakistan which operate in shallow coastal waters as well as in offshore areas. These fishing boats undertake fishing trips lasting for few hours to about 45 days depending upon type of fishing. Fishery sector provides employment to 1.5 million individuals and their families. In some of rural areas especially in Sindh and Baluchistan where alternate employments are non-existent, fishing and fish keeping has proved to be the best source of improving living standard of people.

Fish is the cheap and best source of protein for human and fishing and fisheries industry is the important source to earn foreign exchange for Pakistan. Import of fish in Pakistan is almost negligible, while export is on the large scale nevertheless fisheries share in GDP is only 0.3 percent.

FISHING METHODS IN PAKISTAN:

The following fishing methods are used in Pakistan:

SHRIMP FISHING: Shrimp fishing is very meaningful because in addition to earn huge foreign exchange this method provides employment also on the large scale.

TUNA FISHERY: Tuna catch is an important aspect of fishing industry. Tuna is caught by artisanal fishing vessels. Generally, Tuna is shot in the evening through Gillnet and the net is fetched in the morning targeting mainly pelagic species as they command high commercial value.

BENTHIC FISHERY: Deep water fishing is used comparatively less because the local fishing vessels are neither suitable nor they are properly equipped for fishing in deep waters. Benthic fishery is carried on small scale along coastal in shore waters. Fishermen use nylon gillnet for this purpose. Benthic variety includes Jew fish, Croakers, Grunters, Shaper, Groupers, Ribbonfish, and Pomfret.

PALEGIC FISHERY: Pelagic fishing is used in Sindh on small scale by special nets using wooden sailboats. Fishing by this method is done especially in Ibrahim Hydari and Chashma Goth villages.

VESSELS: Two types of vessels are used for fishing in Pakistan firstly, Mechanized Docked Boats which are 6000 and secondly mechanized Sailboats made of wood which are 2000 in Pakistan.

FISHING GEARS:

CAST NET:

A cast net, also called a throw net, is a net used for fishing. It is a circular net with small weights distributed around its edges. The net is cast or thrown by hand in such a manner that it spreads out on the water and sinks. This technique is called net casting or net throwing. Fish are caught as the net is hauled back in. This simple device is particularly effective for catching small bait or forage fish, and has been in use, with various modifications, for thousands of years. It is used especially to catch mullet, which will not bite a baited hook.



Contemporary cast nets have a radius which ranges from 4 to 12 feet (1.2 to 3.6 metres). Weights are usually distributed around the edge at about one pound per foot (1.5 kilograms per metre). Attached to the net is a handline, one end of which is held in the hand as the net is thrown. When the net is full, a retrieval clamp, which works like a wringer on a mop, closes the net around the fish. The net is then retrieved by pulling on this handline. The net is lifted into a bucket and the clamp is released, dumping the caught fish into the bucket⁴

Target Species:

This kind of nets is used to catch fish swimming near the water surface, in rather shallow waters. Some species of shrimps are also captured with cast nets.

Cast nets-bycatch:

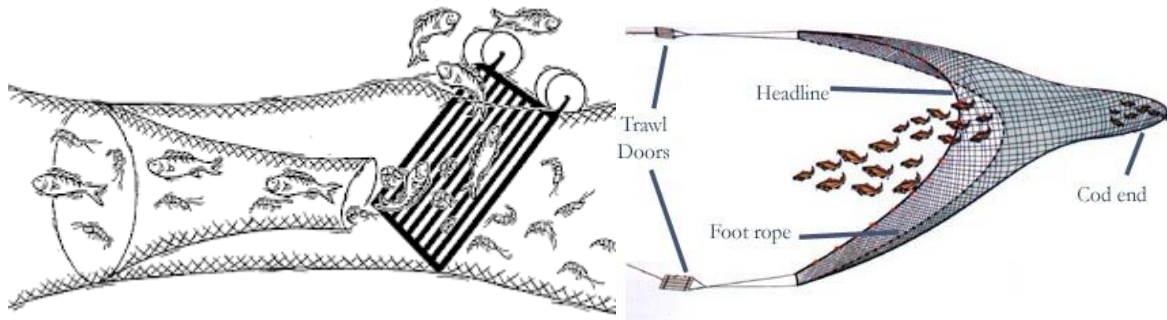
It has negligible bycatch and usually all bycatch is utilized as fish meal or other products. It is mostly operated in shallow coastal waters (inter tidal area), therefore, limited number of species are being caught as bycatch. It has no significant impact on biodiversity. It is mostly a targeted operation.

TRAWL NET:

Trawling is a method of fishing that involves pulling fishing net through the water behind one or more boats. The net that is used for trawling is called a trawl. The boats that are used for trawling are called trawlers or draggers. Trawlers vary in size from small open boats with as little as 30 hp (22 kW) engines to large factory trawlers with over 10,000 hp (7.5 MW). Trawling can be carried out by one trawler or by two trawlers fishing cooperatively (pair trawling).

Trawling can be contrasted with trolling, where baited fishing lines instead of trawls are drawn through the water. Trolling is used both for recreational and commercial fishing whereas trawling is used mainly for commercial fishing. Trawling is also commonly used as a scientific sampling, or survey, method.

Two types of trawls are being used fish trawl net and shrimp trawl net. Size vary for both i.e upto 40m for shrimps and 100+ m for fish.

**Bottom vs. mid-water trawling:**

Trawling can be divided into bottom trawling and midwater trawling, depending on how high the trawl (net) is in the water column. Bottom trawling is towing the trawl along (benthic trawling) or close to (demersal trawling) the sea floor. Midwater trawling is towing the trawl through free water above the bottom of the ocean or benthic zone.

Midwater trawling is also known as pelagic trawling. Midwater trawling catches pelagic fish such as anchovies, shrimp, tuna and mackerel, whereas bottom trawling targets both bottom-living fish (groundfish) and semi-pelagic fish such as cod, squid, halibut and rockfish.

The gear itself can vary a great deal. Pelagic trawls are typically much larger than bottom trawls, with very large mesh openings in the net, little or no ground gear, and little or no chaffing gear. Additionally, pelagic trawl doors have different shapes than bottom trawl doors, although doors that can be used with both nets do exist.

Target Species:

Bottom, demersal and pelagic species

Trawl bycatch:

Trawling is the most harmful gear as far as bycatch is concerned. It is extremely high bycatch in shrimp or fish trawling. Bycatch consists of commercially important fish and shellfish species, non-commercial fish and shellfish species, juveniles of fish and shellfish species and invertebrates and bottom material. Although now the legislation is in place of catch fish and shellfish species of various size categories, but implementation is yet to see the daylight. Fishing fleet is very large and such the affect to habitat, biodiversity and stocks are under serious merely because of trawling operation.

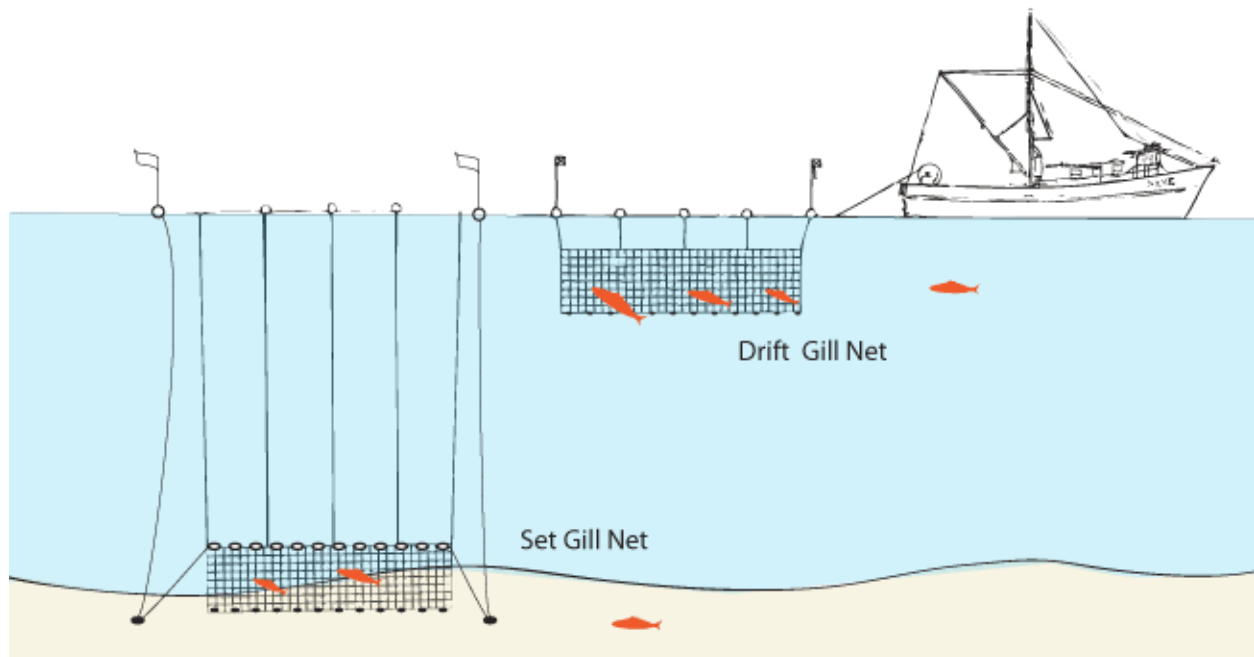
GILLNET:

A gillnet is a wall of netting that hangs in the water column, typically made of monofilament or multifilament nylon.

Mesh sizes are designed to allow fish to get only their head through the netting, but not their body. The fish's gills then get caught in the mesh as the fish tries to back out of the net. As the fish struggles to free itself, it becomes more and more entangled. A variety of regulations and factors determine the mesh size, length, and height of commercial gillnets, including area fished and target species. There are two main types of gillnets:

Set gillnets are attached to poles fixed in the substrate or an anchor system to prevent movement of the net

Drift gillnets are kept afloat at the proper depth using a system of weights and buoys attached to the headrope, footrope, or floatline.



Target Species:

Salmon, groundfish, cod, haddock, polluck, flounder, hake, barracuda, herring, mullet, rockfish, seabass, shad, sharks, sturgeon, swordfish, tuna

Gillnet by-catch:

Gillnetting has been a major source of mortality for all sea turtle species. Turtles encountering gillnet can quickly become entangled around their head or flippers as they try to escape. Entangled turtles will drown if held under the water but have a higher chance of survival if they can reach the surface to breathe. The nylon can tighten around the turtle's soft body parts and cause deep cuts potentially leading to infections, limited movement, or complete loss of the limb. Limited use of appendages can impair a turtle's natural feeding, breathing, and swimming behavior.

Gillnets can entangle a wide variety of marine mammals as well. Depending on the gillnet mesh size, animals can become entangled around their necks, mouths, and flippers. Entanglement can prevent proper feeding, constrict growth, or cause infection after many months. Marine mammals entangled in set gillnets can drown while those entangled in drift gillnets can drag gear for miles as they migrate and forage, leading to extreme fatigue. Species most commonly caught in gillnets include large whales, humpback whales, fin whales, right whales, harbor porpoise, bottlenose dolphins, common dolphins, right whale dolphins, sea lions and more.

Bycatch Reduction:

Many factors have been studied in trying to minimize incidental capture, including adding breakaway panels and changing net slack, mesh size, and set depth.

Current regulated mitigation measures include:

Seasonal and regional pinger (acoustic device) used to warn cetaceans are required in California and Maine through New Jersey

Prohibitions on large mesh gillnets

Closures of certain fishing areas at certain times (known as time/area closures)

Inserting weak links into gillnets to allow large whales to break free when entangled

SEINE NET:

A seine is a large fishing net that hangs vertically in the water by attaching weights along the bottom edge and floats along the top. Boats equipped for seine fishing are called seiners. Seine fishing is fishing using a seine.

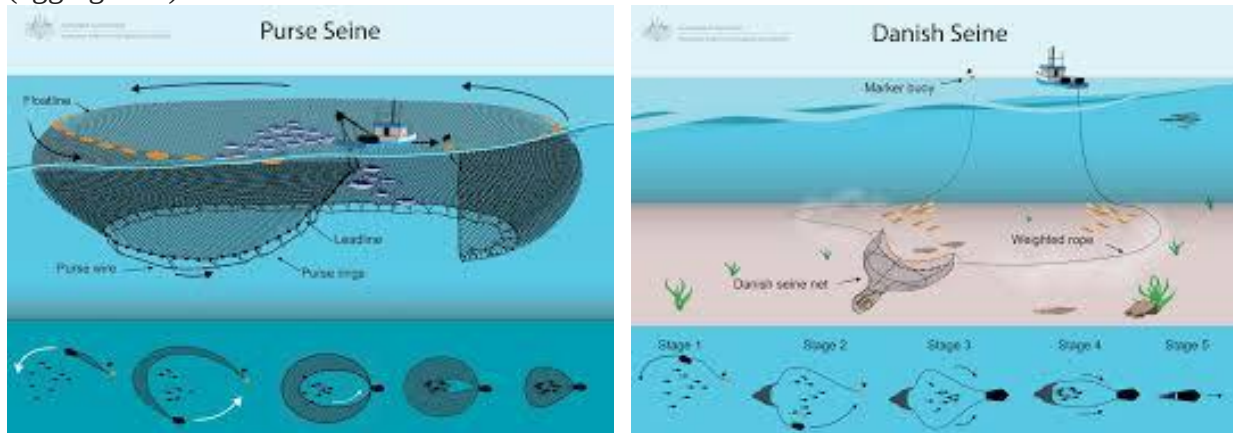
Seine nets are usually long flat nets like a fence that are used to encircle a school of fish, while a boat drives around the fish in a circle.

There are two main types of seine nets: *Purse seines* and *Danish seines*

Purse seine

A common type of seine is a purse seine, named such because along the bottom are a number of rings. A rope passes through all the rings, and when pulled, draws the rings close to one another, preventing the fish from "sounding," or swimming down to escape the net. This operation is similar to a traditional style purse, which has a drawstring.

The purse seine is a preferred technique for capturing fish species which school, or aggregate, close to the surface: such as sardines, mackerel, anchovies, herring, certain species of tuna (schooling); and salmon soon before they swim up rivers and streams to spawn (aggregation).



Danish seine

A Danish seine, also occasionally called an anchor seine, has a conical netting body, two relatively long wings and a bag. The drag lines extending from the wings are long, so they can encircle a large area. A Danish seine is similar to a small trawl net, but the wire warps are much longer and there are no otter boards. The seine boat drags the warps and the net in a circle around the fish. The motion of the warps herds the fish into the central net.

Target Species:

The main species fished using seine gear are tiger flathead and eastern school whiting.

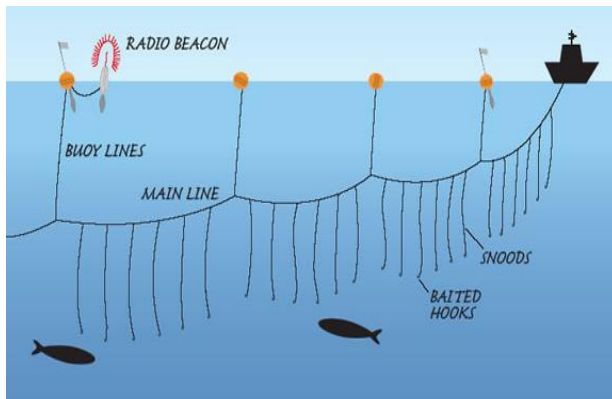
Trawl bycatch:

The seine method of fishing has minimal impacts on the environment. The most recent ecological risk assessment identified one species, the Australian fur seal, as the risk from the seine fishing. The populations of these species are in the proximity of seine operations in the Commonwealth Trawl Sector and considering the susceptibility of seals to the method of fishing, they are classified as the risk. There is currently a code of practice to minimize interaction with seals in this fishery.

The overall impact of seine fishing on habitats is quite low with only three benthic habitats identified as at risk. These habitats are generally on smooth bottom and support epifauna such as large sponges.

LONGLINE:

Longline fishing is a commercial fishing technique. It uses a long line, called the main line, with baited hooks attached at intervals by means of branch lines called snoods. A snood is a short length of line, attached to the main line using a clip or swivel, with the hook at the other end. Longlines are classified mainly by where they are placed in the water column. This can be at the surface or at the bottom. Lines can also be set by means of an anchor, or left to drift. Hundreds or even thousands of baited hooks can hang from a single line.



Target species:

Longliners commonly target swordfish, tuna, halibut, sablefish and many other species.

Longline bycatch:

Longline fishing is controversial in some areas because of bycatch, fish caught while seeking another species or immature juveniles of the target species. This causes many issues, such as the killing of many other marine animals while seeking certain commercial fish. Seabirds are particularly vulnerable during the setting of the line.

ESTUARINE SET BAG NET:

Bag nets are kept vertically open by a frame and held horizontally stretched by the water current. There are small scoop nets that can be pushed and dragged and big stownets, with and without wings, held on stakes or on anchors with or without a vessel. There is also a special winged type with boards or metal plates (called otter boards) that keep it spread open. Stownets, larger than scoop nets and held in place against a current, are used in many rivers and by the Koreans for sea fishing in the strong current off the southwest coast of their country. In this case the stownet is anchored with a vessel.



These are fixed nets with rectangular mouth that are kept open by two vertical bamboo poles the nets taper from the mouth and end in a bag of fine 5-18 mm mesh there are two types the estuarine set bag net (ESBN) and the marine set bag net (MSBN) the ESBN are operated in depths of 3-10 m the gear is considered destructive since it catches juveniles of a large variety of shrimps and fin fish species the marine set bag net are large with a somewhat bigger mesh size and are operated during the dry season in 10-30 m from island bases and catch similar species to the ESBN but mostly at pre- adult sizes.



Target species:

An exotic fishing net introduced to catch small fish and shrimp in creeks.

Estuarine Set Bag Net Bycatch:

Considered harmful as it catches juveniles and larvae of commercially important fish (Locally known as Bhulla)

TRAP NET:

Trap nets are large commercial fishing nets used by fishermen. The trap nets sit on the bottom. They have long lead or section of net made up of thick 14 inch mesh that can be long as 1250 feet. These leads are visible to schooling and divert the fish in an enclosure called the heart. The heart has wings or net sections that form a v shape and are supported by the floats and anchors. Fish swim through a tunnel and become trap in a box shaped trap. There are many types of trap nets, two are given below:

Basket trap:

These are small cylindrical or drum shaped net portable traps usually between 50 to 150 cm long and 30 to 60 cm in diameter. These are formed of wire netting or split bamboo having a narrow funnel shaped opening at one end of about 5 to 8 cm in diameter while at the other end, a hinged door permits the removal of collected fish. The traps are



laid down at various places at a bottom with long buoy line and weighted with stone or large weight. These are hauled up usually after one or two days. These are generally set in shallow parts of ocean and lakes particularly when fish congregate for spawning.

Tubular trap:

These traps are used mostly in Africa they are funnel shaped slightly curved made of wicker work which permits the free entrance of fish at the broader end but prevents the retreat because there is no room for fish to turn around towards the narrow end these traps may be baited or unbaited.



Target Species: Large stationary nets or barrages are used to catch migrating fish (pelagic and demersal). Pots are used for catching lobster, crabs, shrimps, octopus, eels, and all kinds of reef fish and euryhaline species.

Trap Nets Bycatch:

Low negative environmental impact, caught juveniles or undersized species can be released alive. Mesh size in the trap can also be used to release small sized individuals. Lost pot will continue to fish and thus "ghost fish" but, in more and more fisheries, a regulation requires that a pot includes some escapement window/panel.

GHOST NETS:

Ghost nets are fishing nets that have been left or lost in the ocean by fishermen. These nets, often nearly invisible in the dim light, can be left tangled on a rocky reef or drifting in the open sea.

Some commercial fisherman use gillnets. These are suspended in the sea by flotation buoys, such as glass floats, along one edge. In this way they can form a vertical wall hundreds of metres long, where any fish within a certain size range can be caught. Normally these nets are collected by fishermen and the catch removed. However, if this is not done the net can continue to catch fish until the weight of the catch exceeds the buoyancy of the floats. The net then sinks, and the fish are devoured by bottom-dwelling crustaceans and other fish. Then the floats pull the net up again and the cycle continues. Given the high-quality synthetics that are used today, the destruction can continue for a long time.

The problem is not just nets; old-fashioned crab pots, without the required "rot-out panel", also sit on the bottom, where they become self-baiting traps that go on catching crabs year after year. Even balled-up fishing line can be deadly for a variety of creatures, including birds and marine mammals. Over time the nets become more and more tangled. In general, fish are less likely to be trapped in gear that has been down a long time.



PROBLEMS OF FISHERY INDUSTRY:

OVERFISHING: Shrimps overfishing for the whole year is the basic problem of fishing and fishery industry due to which fish are not given the chance to grow as they are caught in the first stage of their growth. Moreover, fish are caught during their breeding season.

WATER POLLUTION: Water pollution at coastal area is confined to Karachi only. Karachi Fish Harbor faces different types of pollution. Oil spillage from the vessels and domestic and industrial wastes are the big threat. Experiments proved the existence of various chemicals, toxic and heavy materials in marine life. These injurious and deadly elements are being transferred to the humans through fish. Water pollution is not confined to Karachi coastal areas but rivers of Pakistan are also the victim of this problem.

LOSS OF MANGROVES: Mangroves (oceanic forests) are the hurdles against high and low tides. These mangroves play the role of breeding ground of fish and shrimps. Mangroves cannot grow and develop in polluted water.

CONCLUSION TO WORKSHOP:

The workshop was concluded on the remarks by Mr. Muhammad Moazzam Khan (Technical Advisor, Marine Program, WWF-Pakistan) that traditional knowledge of fishermen is tremendous but making them aware of modern technologies, the enhancement and how the biodiversity plays its role to maintain the ecosystem will not only lead to prosperous fisheries but also will pay us in a long run.