

MANUAL



DEPARTMENT OF FISHERIES
PUNJAB, LAHORE

FISH AND FISHERIES IN THE PUNJAB

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PREFACE

Aquaculture today is considered an important source of production for meeting the world's increasing demand for protein. Aquaculture development projects are being initiated in many parts of the world especially in the developing countries. In many cases, the main constraint to their success is a lack of knowledge of the basic principles and the technical skills involved.

Aquaculture in Punjab, developed over the last 15 years has had considerable success. Production and area has considerably increased. There is still room for long term sustainability of the resources. This success has caused much interest and has led to many requests to share the knowledge gained in Punjab. But methods practiced have not been well documented and unfortunately most of the information is scattered.

It was, therefore, decided to develop a Manual for Fish & Fisheries that may bring together the scattered knowledge and help educate the field workers, experts and general masses/fish farmers and prove to be a milestone in the development of Fisheries in Punjab. In addition it will be useful for the departmental employees, Research workers, fish producers and traders to boost up the aquaculture and fisheries business.

I would like to place on record the efforts made by Mr. Shumail Ahmed Khawaja Additional Secretary, Forestry, Wildlife, Fisheries & Tourism Department,
Dr. Muhammad Ayub, Director General Fisheries and Mr. Safdar Abbas, Senior Economist (fisheries) and all the officers of the Fisheries Department Punjab for preparation of this valuable document.

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Secretary, Forestry, Wildlife,
Fisheries and Tourism
Department

I- GENERAL

1. FISH, STATUS IN HUMAN DIET-IMPORTANCE

The food value of fish has been recognized all over the world. Proteins have a key role in human diet for proper growth and other vital activities. Fish is regarded as an excellent source of protein for human diet. As compared to other sources of animal proteins the fish provides highly digestible protein which has also much growth promoting value for humans. Recent studies prove that fish proteins are superior to that of milk, beef and egg albumen regarding digestibility which is in the order of 96% for fish. These proteins comprise all the essential amino acids in required concentration in human diet namely, lysine, arginine, histidine, leucine, isoleucine, valine, threonine, methionine, phenylalanine and tryptophan. This makes the biological value of fish much higher. Fish is therefore also an effective supplementary diet for people whose diet is principally of plant origin that is deficient in lysine and methionine.

In addition to about 20% proteins, fish also contains phosphorus, iron, calcium, iodine, vitamin A, vitamin D, vitamin B/vitamin B₂ and niacin for supplementation of human diet. Flesh of fish is white and has a food value of 300 to 600 calories in one pound of fish. Fish is also highly nutritious as child food and is easily digested by infants. In short, the nutritional value of fish is higher than that of beef, lamb, sheep and poultry. Above all, it cooks easily, possesses an agreeable taste and flavour and is easily digestible. In recent studies, it has also been recorded that fish meat in the human diet, reduces the risks of heart problems by reducing the formation of cholesterol as it possesses highly unsaturated fatty acids in it.

2. FISH, TAXONOMIC STATUS

Pakistan is bestowed with immense aquatic resources both marine and freshwater. The marine fauna is not discussed here and focus is made on freshwater fauna only. The freshwater fisheries resources include rivers, canals, lakes, streams, huge reservoirs emerging by construction of dams and barrages.

Fish is the most abundant and successful of all vertebrates encountered in water. The reason probably is that about 3/4th of the globe (Earth) is ocean and the remaining 1/4th also includes rivers, canals, drains, lakes, pools and rapids. According to an estimate more than 20,000 fish species are recorded in the world. However, the number of freshwater fish species recorded so far from Pakistan is 179.

The animals are classified on the basis of similarities and differences amongst them that form the basis of relationships between them. Animals most closely associated are placed in similar groups.

The fish (an exclusively aquatic organism) belongs to the Phylum Chordata of the Kingdom Animalia. They are placed in Sub Phylum Vertebrata which comprises two Super Classes Agnatha (jawless vertebrates) and Gnathostomata (jawed vertebrates) which is further subdivided into six classes namely Class

Elasmobranchiomor^{Ph} i (cartila^ginous fishes), Teleostomi (bony fishes), Am^Phibia, Re^Ptilia, Aves and Mammalia.

All the freshwater fish species found in Pakistan belong to the Class Teleostomi. The classification of these species along with diagnostic features is as follows.

Kingdom: Animalia

Phylum: Chordata

Sub-Phylum: Vertebrata

Super Class: Gnathostomata (jawed vertebrates)

Class: Teleostomi (bony fishes)

Sub-Class: Actinopterygii (ray finned fishes)

Infra Class: Teleostei

The animals are named following the International Code of Zoological Nomenclature. According to the provisions of this code the generic name and names of all the preceding levels must begin with capital alphabets whereas the specific and sub specific names must always commence with small alphabets.

The freshwater fish fauna of Pakistan belongs to the following 9 orders and 20 families.

Order	Family
1. Clupeiformes	Clupeidae (Pala, Pali)
2. Osteoglossiformes	Notopteridae (featherbacks)
3. Salmoniformes	Salmonidae (trouts, salmon, white fishes & graylings)
4. Cypriniformes	Cyprinidae (minnows & carps) Bagridae (bagrid catfishes) Siluridae (Eurasian catfishes) Schilbeidae (schilbeid catfishes) Heteropneustidae (stinging catfishes)
5. Beloniformes	Belonidae (needle fishes)
6. Cyprinodontiformes	Cyprinodontidae (kili fishes) Poeciliidae (livebearers)
7. Perciformes	Centroponidae (snooks) Nandidae (leaf fishes) Cichlidae (cichlids) Gobidae (gobies) Channidae (snakeheads) Anabantidae (climbing perches)
8. Mastacembeliformes	Mastacembelidae (mastacembelid eels)
9. Synbranchiformes	Amphipnoidae (cuchia)

The details of species belonging to each one of them may be seen at page _____.

3. FISH, ECOLOGICAL STATUS

The abundance and distribution of fishes in the waters of the earth are the products of interaction among fishes and their chemical, physical and biological surroundings. The study of relationships between an organism and its environment is the subject matter of ecology. All the communities in these habitats are continually changing.

In order to support/sustain any ecosystem energy and nutrients are the basic requirements. In aquatic ecosystems the main source of energy is the light, only a fraction of which in aquatic ecosystems appears in the form of fish flesh as this energy is first harnessed by aquatic plants (producers) through photosynthesis that is followed by consumers i.e., animals including fishes. The key nutrients namely Carbon, Nitrogen and Phosphorus available for synthesis into protoplasm in the hydrosphere are circulated in biogeochemical cycles.

The environment of fishes is composed of many factors in addition to nutrients that may limit populations or influence geographic distribution. Any of these factors may be limiting when it is present in quantities which are either too little or too great.

Aquatic organisms including fishes, may be classified ecologically in several different ways. According to environmental tolerances, they may be grouped as either narrowly or broadly tolerant. The corresponding expression is prefixed respectively either by "Steno" (narrow) or "Eury" (broad). For temperature the classification is thus stenothermal or eurythermal, for salinity it is stenohaline or euryhaline, etc. Fishes may also be categorized on the basis of location in aquatic ecosystems i.e., benthic (bottom dwellers or ground fishes), pelagic (free swimming) or planktonic (depending on currents for their movements as do the larval young of many species). In lakes and ponds, littoral zone fishes are those of the inshore waters where light penetrates to the bottom and rooted green plants are often present. Limnetic zone fishes are those of offshore waters free of rooted plants, and extend downward to the light compensation level where illumination is inadequate for sustained life of phytoplankton, and profundal zone fishes are those in the darkened waters beneath the light compensation level. The foregoing categorizations illustrate stratification of communities in ecosystems. However, the species composition of the zone may be expected to vary geographically. In the flowing waters, the readiest division of the habitat and its occupants is into two rather subjective zones pools and riffles. The current of the riffles is generally fast enough to move sand and silt which is then deposited in pools and backwaters. The environmental forces that impinge on the lives of fishes are many, complex and interrelated in their effects e.g., temperature, light, current, dissolved oxygen, food, social factors, population density, population structure, succession, etc.

Freshwater occupied by fishes occurs both on the surface of the earth and in the subterranean waters of caves and underground stream channels.

The fresh surface waters of the earth are broadly separable into two groups of environments, standing or lentic and flowing or lotic. The lentic habitats include those of natural lakes and ponds along with many impoundments constructed by man. The

lotic environment is that of river and streams. To these may be added the special conditions found in (a) springs, which may be sources of either lakes or streams, and (b) estuaries and heads of large impoundments where the lotic conditions of streams grade into lentic.

The Punjab Province has been bestowed with huge water resources wherein both types of ecosystems exist in the form of lotic and lentic waters. The total area of the lotic systems is 29,63,700ha. The major rivers of Pakistan are Indus, Ravi, Jhelum, Chenab and Sutlej that traverse huge distances. The running waters display typical characteristics with regard to temperature, turbidity, siltin patterns, etc. The lentic waters are represented by natural lakes, man-made reservoirs, small dams, water-logged areas, ponds, etc.

On the basis of various regions the fishes in Pakistan have been grouped into 5 ichthyographic regions

1. Northern Mountainous Region

This region comprises the northern mountainous areas of Pakistan and Kashmir above 1,500m altitude. It includes the northern areas (Gilgit, Diamer and Skardu), upper parts of Chitral, Swat and Kishan valleys. The fish fauna is predominantly high Asian (Central Asian) and mainly comprises the snow trouts (Schizothoracinae), loaches (Noemacheilus), and catfish genus of Glyptosternum. Some south Asian forms belonging to genera Labeo, Tor, Puntius, Garra, Ompok, Botia and Glyptothorax have also been described.

2. Yaghistan Region

This region was previously named as the north-western mountainous region. It is renamed as the Yaghistan region after the old tribal name of this area. This area is between 1,000-1,500m altitude. It is bordered by the Koh Safaid range in the north, the Suleman range in the east, the Marri-Buti hills in the south and the central Brohui range in the south-west. In the north-west, it extends up to Afghanistan areas drained by the rivers Kurram, Tochi, Gomal and their tributaries. The fish fauna is a mixture of south Asian, high Asian and west Asian forms, but south Asian form predominates.

3. Aba-Sinh Region

This includes the southern parts of the Malakand division, the vale of Peshawar, sub-mountainous Hazara, adjoining parts of the Punjab and Kashmir, north of the Safaid Koh and Kala Chita ranges. It extends into south-eastern part of Afghanistan drained by the river Kabul and its tributaries. The fish fauna of this area is predominantly south Asian but some high Asian forms are also found.

4. Mehran Region

It was previously named as the Indus plain region. It comprises the Indus plain, adjoining hills, i.e., Kohat hills, the Salt range and Potwar plateau in the

north and Sind - Baluchistan hills in the south-west. The fauna of this region is south Asian, except a few west Asian forms. Rarely, genus *Schizothorax* may also be found.

5. Gedrosian Region

This region comprises Baluchistan plateau, west of central Brohui and Halaranges. The northern part of this range is drained by the rivers of Lora and Mashkel, which end into salt lakes of Hamun-i-Mashkel respectively. The southern part of the range is drained by the rivers Hinol, Dasht and their tributaries, which fall into Arabian Sea. The fish fauna is a mixture of west Asian (Lora drain) and south Asian form (rest).

Presently life in many of these regions is threatened due to human activities that have resulted in elevated pollution levels resulting from indiscriminate discharge of untreated industrial effluents and city sewage into these natural water bodies. This situation is further worsened due to drought that has caused lowering of ground water and sub soil water levels. This also has contributed to the higher concentration of pollutants in the aquatic environment. The construction of dams and barrages across major rivers aimed for irrigation and hydro-power generation have also destroyed the fish habitat and breeding grounds. These structures have also hampered the migration of fish.

4. FISHERIES DEPARTMENT

a. MISSION STATEMENT

Punjab Fisheries Department is responsible for the conservation, management and Development of Natural Fisheries resources through the enforcement of Punjab Fisheries Ordinance and Rules, Promote Aquaculture Practices in Private sector to bridge gap of protein deficiency in the diet of common man, provide white meat to improve the health of people, utilize the untapped Fisheries resources to obtain maximum production, increase our share in the national economy.

b. HISTORICAL PERSPECTIVE

DEVELOPMENT OF FISHERIES AND AQUATIC RESOURCES OF PUNJAB, PAKISTAN

The South Asian region in which Pakistan is located is very much blessed by Almighty Allah in having both terrestrial and aquatic resources in abundance. These now need to be very efficiently and effectively exploited so that sustainability of life on land and water may not be significantly threatened.

The Department of Fisheries was established in 1912 and was attached to the Agriculture Department. At that time the main function was regulatory i.e., conservation of the natural water bodies. The fish eggs and seed were collected from natural spawning grounds and stocked in the ponds. Then a need for establishment of training centre was realized and a training centre was established in 1958. Training

was imparted to pre service personnel but there was no provision for people in the private sector.

In 1961, the Punjab Fisheries Ordinance was framed wherein rules regulations were formulated for fishing, angling, curbing of illegal fishing and the like, so as to conserve national fisheries resources.

These regulatory functions and training for in-service personnel remained the main activities of the Department till 1970-71. Training is being regularly imparted covering the major disciplines of fish farming, fish hatchery management, lakes and reservoir management, fish pathology and water & soil quality management to different categories of in-service personnel and private fish farmers. The department has imparted several trainings to women and youth in distant areas to uplift the living standards of fishermen community enabling them to become economically independent as well as to introduce the fish farming and ornamental fish culture as a small industry.

During the year 1947 the Indo Pak sub continent was divided and two independent states i.e., Pakistan & India emerged on the globe. All the rivers flowing into Pakistan had their sources in India. India started constructing dams on these rivers thereby restricting the entry of water into Pakistan. As economy in Pakistan is mainly agro based, a need for development of an extensive and intricate irrigation system was realized. So, after Indus Basin Treaty in early seventies, dams and barrages were constructed across the main rivers primarily for irrigation and hydro power generation. This brought great benefits to Pakistan but at the same time altered the natural habitats and ecosystem for the aquatic life thriving therein.

The construction of Kotri and Sukkur barrages has restricted the migration of anadromous fish for breeding as fish ladders constructed in these barrages are ineffective and are not designed to accommodate the habitat and behavior of fish.

Construction of huge water reservoirs resulted in the disappearance of sufficient natural spawning grounds. The aquatic vegetation flourished in the water bodies. Huge area of land turned saline and water-logged. This alteration in the ecology of rivers resulted in a change in the breeding activity/ breeding behaviour of fish. The seed stocks naturally available started to deplete and so there was need for development and adoption of artificial breeding technology for rehabilitation/reclamation of fish stocks. In order to overcome the menace of excessive aquatic vegetation an exotic fish species named grass carp *Ctenopharyngodon idella* was imported from China and was introduced into our culture system. It mainly feeds on grass and other aquatic weeds/vegetation. Other fish species namely Gulfam (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molitrix*), big head (*Aristichthys nobilis*) and tilapia fishes were also imported on the basis of their specific qualities to maximize fish production. Similarly activities on artificial fish breeding began with the adoption of techniques like hypophysation and extraction of hormones from pituitary gland, its preservation and injection into fish. Research studies on fish breeding behavior started and its physiological functions, maturity, conditions required during breeding and water quality monitoring also started.

The department made a breakthrough in sixties and succeeded in induced spawning of fish and hapas were erected in flowing waters to breed fish. However, the response to hypophysation remained poor (very low survival 2-3% vs 1% in wild). The department started establishment of Nursery Units in 1973 and later on established fish hatcheries. Earlier there were no significant advancements, only a single species i.e., *Cirrhinus mrigala* used to be bred. Then the department adopted the Chinese system of induced spawning and success was achieved in breeding of rohu. Research on fish seed and fry rearing, fish diseases and prophylactic measures and water quality management continued.

During the year 1982 the department merged the two separate wings of research and training and regular research on fish biology and ecology, fish nutrition, water and soil chemistry and fish pathology, fisheries management and aquaculture began with. Presently, the infrastructural facilities at Fisheries Research and Training Institute include a computer lab., separate hostels for men and women, an auditorium, a library having collection of latest literature on fisheries and aquaculture in the country that is being availed by students and research workers from different organizations, six modern laboratories with latest equipment and an elaborate pond complex for research and training.

BRIEF REGARDING FIRST AQUACULTURE DEVELOPMENT PROJECT, PUNJAB w. e. f. 01-07-1981 to 30-06-1986

A scheme entitled "Pakistan Aquaculture Development Project" was launched in 1981 with a gestation period of five years (1981-86) at a total cost of Rs.44.986 million (with ADB share of Rs.21.129 million).

The Project aided by Asian Development Bank envisaged improvement/strengthening of existing hatcheries, nurseries and extension of facilities for promotion of aquacultural practices including incentives to private sector in fish farming. It also included creation of proper infrastructural/institutional and technical inputs to develop fish culture, fish seed production, technical aspects and training (Foreign) of personnel working in the field of management and extension.

Moreover services of foreign consultants, viz. Project advisor, aquaculturist and fish nutritionist were also provided for improved management of fisheries in lakes and reservoirs on scientific basis for obtaining better/sustained production.

The physical achievements through this Project are as under:-

1. Four Glass Jar Hatcheries, rearing tanks and Feed rooms were constructed and provided on four hatcheries and Nursery Units.
2. (18) Eighteen residential quarters were constructed at different nursery units and Dams for the utilization of the Fisheries Staff.
3. A Library Cum Museum Hall building was constructed at F.R.&T.I Manawan, Lahore.

4. Different kinds of scientific equipment and Machinery were provided and installed at Fisheries Research Institute Manawan, Lahore and a hatchery units in the province.
5. Eleven fellowships were availed as per prescribed schedule of the project. Two senior officers also completed their study tours.
6. The services of three Consultants i.e. Project Advisor, Warm Water Aquaculturist and Fish Feed Expert were utilized as per scheduled programmes.
7. A documentary film entitled "Mahi Parwari" was prepared and shown on different occasions in fairs, exhibitions, etc.
8. A bench-mark survey on fish farming was conducted by PERI and the report thereof was published.
9. Fish Seed Production was increased from 40.10 lacs (1979-80) to 180.10 lacs.
10. Fish Production was increased from 10500 m. tons to 21800 m. tons (1985-86)

The post of Director Fisheries BS- 19 was upgraded to Director General Fisheries BS-20 in 1988.

i. AQUACULTURE

A BRIEF ON THE PROGRESS OF IMPLEMENTATION OF "SECOND PAKISTAN AQUACULTURE DEVELOPMENT PROJECT, PUNJAB"

This project, assisted by the Asian Development Bank was approved by the ECNEC with a total cost of Rs.147.350 million (GOP Rs.36.840 million ADB Rs.110.510 million) for a period of five years i.e., 1989-90 to 1993-94.

Later on due to appreciation in dollar value and late selection of consultancy firm by more than two years the project was revised as per recommendation of Asian Development Bank for another period of two years i.e., 1994-95 to 1995-96. The revised PC-I was accordingly approved by the Planning and Development Department at the total cost of Rs.266.795 million (GOP Rs.66.840 million, ADB Rs.200.284 million)

The project aims at providing adequate Technical, Institutional and Infrastructural inputs to the Fisheries Sector for enhancing fish production in all categories of inland water resources in the public and private sectors. Furthermore, it envisages to generate additional income and employment opportunities to the rural communities besides providing them with protein rich food.

The main components of the Project and the achievements made against each are as follows:-

1. STRENGTHENING OF SUPPORT SERVICES

a) Upgradation of Extension Services

This discipline aims at transfer of technology to private sector, establishment of Model/Demonstration Fish Farms which an area of 300 acres and provision of advisory and technical assistance on fish farming to the private sector.

Model Fish Farm on 180 acres have been established in private sector on the guidelines of the foreign consultant, i.e., Carp Culturist with provision of all necessary inputs whereas Model Fish Farms on remaining 120 acres were selected, but inputs such as fish seed, fertilizers/manures etc. could not be supplied to these farms as A. D. B. closed the loan on 30-09-1995 instead of 30-06-1996.

Technical and advisory services on fish culture technical have been provided to 18956 farmers/interested persons.

b) Producer and Consumer Education Programme

This discipline envisages to educate the fish farmers, fishermen, fish dealers, consumers etc., through electronic media, press, brochures, pamphlets, hand bills etc. In this connection various T.V. programmes, radio talks and film shows were arranged and telecasted. In addition the jingles from 7 to 30 seconds duration were also prepared and telecasted for propagation of fish culture in the private sector and to motivate the potential consumers to include the fish in their diet for health reasons.

A seminar on Aquaculture development in Pakistan was arranged at National level. Scientists from all over the country participated in this seminar and presented papers on Aquaculture and Fisheries, Proceedings of the seminar were published by the department.

c) Training

This discipline includes establishment of two Training Sub-Centres, one at Rawalpindi and other at Bahawalpur along with creation of hostel facilities for the participants of the training courses joining from the remote areas to alleviate the hardship of private fish farmers who are reluctant to come to Fisheries Research & Training Institute Lahore for this purpose.

2. DATA COLLECTION AND ANALYSIS

a) Under this discipline the establishment of an Inland Fisheries Statistical Unit was planned as per PC-I of the project. This unit has been established and inland data on different disciplines is being collected, tabulated and analyzed. A better system for the collection of relevant data from the field and its analysis using statistical tools was developed by the expatriate consultant, to make it useable for future planning.

b) Open Water Survey

This discipline aims at carrying out survey of Lakes, Small Dams, Rivers etc., and preparation of Management Plan for these water bodies. Biological and Limnological data of Small Dams of Rawalpindi Division, Dhand Ghazanfarhar, District Muzaffargarh, Khabeki and Uchhali Lake, District Khushab and Reservoirs attached to Chashma and Trimmu Headwork's collected and processed and their management plan has been prepared.

3. PRODUCTION PROGRAMME

a) Establishment of Fish Nursery Units

To increase the fish seed production commensurate with the increasing demand thereof in private sector, eight Nurseries Units, one in each division of the Province (Lahore, Gujranwala, Rawalpindi, Multan, Bahawalpur, D.G. Khan, Faisalabad and Sargodha) have been established, according to the designs prepared by the expatriate consultant team.

Under this project, a drug with brand name "OVAPRIM" was imported and supplied to the existing and new fish hatcheries for fish seed production. Efficacy of this drug considerably enhanced the egg fertilization and hatchling rate.

The quality fish seed production has brought a revolution in fish farming. As a result of implementation of the project, transfer of technology to private sector has taken place at a remarkable pace. Consequently many hatcheries have been established by the private entrepreneurs.

Impact of the project is also visible in neighboring provinces where warm water fish farmers benefit from fish fry supplied from Punjab.

4. INSTITUTIONAL DEVELOPMENT

a) Establishment of Project Management Office.

As per target set forth in the approved PC-I of the Project Management Office was established, staff appointed and relevant equipment purchased.

b) Provision of overseas training
(23 fellowships).

The category-wise detail of progress under foreign training fellowship programme is as below:-

Sr. No.	Name and No. of planned fellowships.	Fellowships completed	Fellowships being availed
1.	Ph.D	1	1
2.	M.Sc/M.S.	7	1
3.	Short term courses	9	-
4.	Study tours	4	-
Total:		21	2

c) Provision of foreign consultancy services.

This component comprises 39 manmonths of consultancy period by the expatriate consultants for the project.

The services of foreign consultants have been utilized under each discipline of the project. The recommendations of the consultants are being implemented by the department.

i. WOMEN TRAINING

THE PROJECT FOR THE TRAINING OF WOMEN IN FISH CULTURE, BREEDING & REARING

DDWP, PDWP and CDWP approved a special project entitled as above in 1986 for five years i.e. 1986-1991. The project was formulated in line with the policy decision of Ministry for Social Welfare, Women Division Cabinet Secretariat, Islamabad. It was included in ADP 1986-87 & financed through special funds allocated for Punjab Province under Social Welfare Department & Women for Punjab Province under Social Welfare Department and Women Division. The total cost of the project was 22.44 (21.64) lacs. The execution and operation of the project was Department of Fisheries and Fisheries Research & Training Institute, Manawan, Lahore respectively. Initially two years were spent in completion of civil works in the form of women hostel, class rooms and allied works which continued in third year i.e., 1989 also. Project was actually implemented from last quarter of the third year i.e., March 1989. Due to this in 1991 Ministry of Women Development Islamabad granted three years extension to the project and the period was extended till March 1994 in the same cost i.e., 22.44 lacs. Three females and three males were employed in different cadres in this scheme. In this way the project was implemented for a period of seven years and four months at Fisheries Research & Training Institute Manawan, Lahore. The objectives of the project were as under:-

1. To train 120 women per year in the discipline of fish culture & breeding of culturable and ornamental varieties of fishes, designing and decoration of aquaria, preparation of fish feed, net making techniques and other parameters of fish farming.

2. Special courses of short duration for the Lady Teachers during summer vacation in their educational Institutions.
3. Organization of training program for rural women in the above disciplines at community level.

The Project was implemented on the above-mentioned lines and completed its development phase in 1994 successfully. The following achievements were made:-

- 1) 394 ladies were trained at Fisheries Research & Training Institute, Manawan, Lahore. Three week i.e., 21 days course were conducted each month Rs.450/- per course stipend was given to each and every trainee as per PC-I.
- 2) 303 Lady teachers were trained in these disciplines in their educational institute.
- 3) 523 women were trained at community level in the discipline of fish culture, breeding and rearing at their doorstep throughout the Punjab.

Total of 1230 women were trained in this discipline throughout the Punjab. The women from far off places like Multan, R. Y Khan and Bahawalnagar etc. participated in the 21 days training program at Fisheries Research and Training Institute, Manawan, Lahore. And all of these showed keen interest & resided in the women hostel of Fisheries Research and Training Institute, Manawan, Lahore, which was constructed under the Project.

The department conducted an impact survey of the Project. The conclusion of the survey was as under:

- I. The trainees used the knowledge in setting their dietary habits.
- I. They could adapt fish culture as a profession.
 - I. Some respondents showed their interest in adapting ornamental fish breeding and rearing as profession. Whereas in case of aquarium preparation and net making most ladies responded. Some trained ladies had installed ornamental fish aquaria at their homes that may create interest amongst others to adapt ornamental fish culture as a cottage industry. One lady teacher established fish aquaria in her school.
- IV. In case of giving economic benefit only one trained lady established her own fish farm whereas six ladies started working on their established fish farm. Five ladies constructed aquaria for sale purpose.
 - i. UNIFEM

The Project was formulated on the recommendation of Project formulation Mission of United Nations Development Fund for Women (UNIFEM). The Project was launched with financial donation of UNIFEM in Maliwal Village and three other villages located near Head Works Baloki.

The main objectives of the Project was to uplift the socio-economic conditions of fishermen communities and to provide them advanced technical know how, which would ultimately provide increased momentum to department's efforts for the

increase of fish production. It was also the aim of the project to disseminate the post harvest technologies and generate better economic gains for neglected communities. Vocational training was also imparted to 200 Women and Youth in the area of net making, aquarium making, fish culture, fish feed formulation, fish culture, ornamental fish breeding/rearing, duck and poultry husbandry, livestock rearing, agriculture, embroidery and handicrafts etc.

It was planned that through the demonstration of viable Income generation activities, increased employment opportunities and income diversification options for Women and Youth would be created.

Further it was planned

- a) To provide improved support services particularly in health care, nutrition and training of Women in fishing business.
- b) To initiate, the Government and non-Government service providers in the area into awareness of women concerns and commitment to the mainstreaming of women in development activities.
- c) To strengthen linkage amongst Government departments and N.G.O. in the delivery of the projects in fishing communities.

The gestation period of this project was 3½ years w.e.f. 01-07-1991 to 31-12-1994 it has almost achieved a lot of its planned targets. It is difficult if not possible to identify direct/primary benefits that may here accrues from the set of activities.

However, it is evident that there have been indirect benefits and noticeable trickle down in the form of female education, reduction in school drop out technology transfer and greater awareness of environmental concerns. These features will further improve the living condition/quality of life of people in the area and impact on other villages in close proximity.

Major achievements are as under:

1. Motivation and awareness creation completed and a community based N.G.O's Swani Saanj was formed which is working successfully for sustainability of activities to uplift the socio-economic condition of rural areas.
2. Construction of Community Centre.
The Community Centre has become the Beacon House for all Women activities and Symposia, Seminars, Group meetings and lectures are conducted in it on periodical basis.
3. Literacy and health education and task is a continuous practice at self help basis by "Swani Saanj".

In Nut Shell the project was a successful and torch bearer in development of Women and Youth.

c. PROVINCIAL SERVICE

According to the Devolution Plan the Fisheries Service was split up in the following two cadres.

1. Provincial Service.
2. District Service.

It was decided by the Provincial Transition Team (PTT) that the functions of the Provincial Service will not be curtailed and it will continue to perform the following functions.

- (a) Conservation, management and development of natural resources.
- (b) Administrative, Planning, Survey, Monitoring/Evaluation, Statistical and Mass motivation.
- (c) Fish seed production, distribution, supply in public and private sector.
- (d) Distribution/supply of fish seed to other provinces, Azad Kashmir, WAPDA, CDA, and other organizations.
- (e) Introduction of new exotic culturable species.
- (f) Maintenance of installation created under aquaculture development project.
- (g) impart training at two training sub-centres.
- (h) Preparation/implementation of management plan of public waters and survey management.
- (i) Supervise and coordinate Research and Training programme at the Research & Training Institute and 2 Research/Training Sub-Centres.
- (j) Develop improved management parameters in various aspects of fish and fisheries.
- (k) Coordination of research/training programmes with universities and linkages with other international institutions.

The following will be concurrent functions.

- (a) Local publicity and awareness.
- (b) Enforcement of fisheries enactment.
- (c) Fish stock replenishment in natural water bodies.
- (d) Supervision of seed production distribution and supply programme at 14 seed production, units/hatcheries. Aquaculture development activities. Collection of statistical data on fish and fisheries.
- (f) The resources and infrastructure has been devolved as under:-

Functional Items	Existing	Retained at Provincial level.
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VI. RESOURCES		
- Rivers, major tributaries, reservoirs, barrages and water logged areas.	103	103
- Natural water bodies which have no links with rivers etc.	14	
- Canals	32	32
- Lakes.	10	
- Small Dams (Private/Public)	405	
- Fish seed rearing units.	36	36
- Government fish farm.	28	
- Extension services to Private Fish Farms.	5750	
- Hatcheries & Training	14	14
- Research & Training.	3	3
Total:	6395	188

The distribution of staff has been made as under:-

Category	Total	Retained at Provincial level
Officer BS-17 & above	120	100
Staff BS-1 to 16	1705	1447

d. DISTRICT SERVICE

After implementation of Devolution Plan, the district service was created and the following functions were devolved to district service.

- (a) Extension services to Private sector.
- (b) Lease of fishing rights except River.
- (c) Issuance of district angling licences.
- (d) Conservation, management and development of natural resources except rivers, canals and barrages/pond areas those have no boundaries.
Training through open training schools.

The resources & infrastructure was devolved to district service as under.

Functional Items	Existin ^g	Devolved to District level
VII. RESOURCES		
- Rivers, major tributaries, reservoirs, barra ^g es and water lo ^g ged areas.	103	103
- Natural water bodies which have no links with rivers etc.	14	
- Canals	32	32
- Lakes.	10	
- Smal Dams (P ^r ivate/P ^u blic)	405	
- Fish seed rearin ^g units.	36	36
- Government fish farm.	28	
- Extension services to Private Fish Farms.	5750	
- Hatcheries & Trainin ^g	14	14
- Research & Trainin ^g .	3	3

Total Functional items	Devolved to District level
6395	6207

The staff was distributed as under:-

Cate ^g ory	Total Devolved to Districts	
Officer BS-17 & above	120	20
Staff BS-1 to 16	1705	258

e. RULES OF BUSINESS.

Conse^quent u^pon the establishment of district Government after devolution ^plan, the existin^g Rules of Business 1974 has been ^pro^posed to be amended as under:-

EXISTING RULES OF BUSINESS	PROPOSED RULES OF BUSINESS	REASONS FOR PROPOSED CHANGE IN RULES OF BUSINESS
Provincial “Conservation and Promotion of Fisheries in Private and Public Sector”.	Conservation and Mana ^g ement, Enforcement of Fisheries Enactment, Develo ^p ment of Water Resources, Promotion of Fisheries in Private and Public Sector, Marketin ^g and Research & Trainin ^g .	To co ^p e with the existin ^g comp ^u lsions of the Fisheries Sector.
District Government	Conservation & Mana ^g ement of water areas exce ^p t Rivers, Canals, Headworks/Barra ^g es and its attachments, Extension Services in Private Sector.	To include the functionin ^g of District Fisheries Offices.

f. INTERNATIONAL CONVENTIONS 1.

Climate Change Convention (CCC)

Objectives

Stabilize the climate; prevent dangerous anthropogenic interference with the climate. Achieve a level within a time frame sufficient to allow ecosystems to adapt naturally to climate change. Ensure that food production is not threatened. Enable economic development to proceed in a sustainable manner.

Country Signation and Ratification

Pakistan participated in the United Nations Conference on Environment and Development in 1992 and chaired the group of 77, signed the United Nations Framework Convention on Climate Change (UNFCCC) on June 13, 1992 and ratified this convention on June 1, 1994. The UNFCCC took effect on May 31, 1994 and entered into force in Pakistan on August 30, 1994.

Obligations

- Develop national inventories of anthropogenic emissions by sources and removal by sinks;
- Take measures to mitigate climate change by addressing anthropogenic emissions;
- Promote sustainable management, and promote and co-operate in the conservation and enhancement of sinks and reservoirs of all greenhouse gases including biomass, forests, and oceans as well as other terrestrial, coastal and marine ecosystem;
- Co-operate in preparing for adaptation to the impacts of climate change;
- Take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions.

Implementation Mechanism

1. In accordance with Article IV, Paragraph I, each party shall communicate to the conference of the parties, through the secretariat, the following elements of information:
 - A national inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, to the extent its capacities permit;
 - A general description of steps taken or envisaged by the party to implement the convention;
 - Any other information that the party considers relevant to the implementation of the objective of the convention and suitable for inclusion in its communication, including, if feasible, material relevant for circulation of global emission trends.
2. Developing country parties may, voluntarily, propose projects or financing including specific technologies, materials, equipment, techniques or practices needed to implement such projects, along with, if possible, and estimate of greenhouse gases, as well as estimate of consequent benefits.

Biosphere Reserve under UNESCO MAB Programme

Objectives

To promote the protection, restoration and wise use of natural resources. To understand the ecological and cultural heritage in perpetuity through the management and development of human activities.

Country signature and ratification

Pakistan became a party in 1977.

Implementation Mechanism

Planning and Control Functions

1. Port Qasim and Karachi Development authority;
2. Coastal Development authority;
3. Sindh Forest Department;
4. Sindh Board of Revenue;
5. Sindh Environmental Protection Agency;
6. Maritime Security Agency;
7. Pakistan Navy.

Natural Resource Management Functions

1. Sindh Forest and Fisheries Departments;
2. Resource users from coastal communities

Research and Environmental Monitoring Functions

1. Marine Fisheries Department;
2. National Institute of Oceanography;
3. Zoological Survey Department;
4. Karachi and NED University;
5. Jamshore University, Hyderabad;
6. Sindh Environmental Protection Agency;

Coastal Community Development Functions

1. Coastal Development Authority;
2. Municipal & Development Authority;
3. Community Based Organizations

Environmental Awareness Functions

1. Environmental NGOs
2. Schools, Colleges and Universities;
3. Media.

5. World Heritage Convention (WHC)

Objectives

The objective of the World Heritage Convention (WHC) is the identification, protection, conservation, preservation and transmission of cultural and natural heritage of outstanding universal value future the generations. The WHC recognizes

world heritage in two sectors i.e. cultural heritage and natural heritage. The Category natural comprises of physical and biological formations or groups of such formations, which are of outstanding universal value from aesthetic or scientific point of view.

Country Signation and Ratification

The WHC currently has 114 party countries; Pakistan became a signatory in 1976.

- Identify, protect, conserve, present and pass on heritage to future generations in a good state
- The effective and active measures to discharge responsibility;
- Adopt a general policy on heritage protection;
- Take educational measures to promote the protection of heritage properties;
- Allocate more resources and improve services;
- Encourage scientific studies and research on heritage properties;
- Foster the establishment of national centers;
- Discourage action endangering heritage properties.
- To assist stake parties to the WHC in protecting heritage properties, a fund has been established for the purpose of:

Identification, protection, conservation, presentation or rehabilitation of heritage;

Studies, experts, training of staff, equipment;

Soft loans and non-repayable subsidies;

Addressing calamities and disasters (on priority basis);

National commitment is valued positively but considered essential for assistance on a large scale.

6. The Convention on Biological Diversity (CBD)

Objectives

In November 1988, an adhoc working group of experts on biological diversity was formulated by UNDP to explore the need for a convention on biological diversity. This working group of technical and legal experts sat together in May 1989 to discuss an international legal instrument for conservation and sustainable resource use. Based on this working group, an Inter Governmental Negotiating Committee was formulated in February 1991. In May 1992, a conference was held in Nairobi to discuss and later adopt the agreed text of the Convention of Biological Diversity. This was opened for signature till June 4, 1993. There are 42 articles and two annexes in this convention inspired by the World Community's growing commitment to sustainable development. CBD reconciles the intrinsic value of biological diversity and its ecological, genetic, social, economic, scientific, educational, recreational and aesthetic values and components.

Country Signation and Ratification

By June 4, 1993, 168 countries had signed this convention. It entered into force on December 29, 1993. Pakistan became a party to it on June 5, 1992, and was the 14th Signatory.

Obligations

- International Co-operation;
- Develop national strategies, Plans Programmes for conservation;
- Identification and monitoring of biodiversity;
- In-situ and ex-situ conservation;
- Integrate conservation and development;
- Incentive measures for conservation;
- Research and training;
- Public education and awareness;
- Access to and transfer of technology;
- Exchange of information;
- Financial resources.

Implementation Mechanism

The following national and international organizations deal with the convention

International

1. World Bank
2. United Nations Development Programme (UNDP)
3. Global Environment Facility (GEF)

Government

1. Ministry of Environment
 - National Conservation Strategy (NCS) Unit
 - National Council for the Conservation of Wildlife (NCCW)
 - Pakistan Forest Institute (PFI)
 - Zoological Survey Department (ZSD)
2. Academic and Research Institutions
3. Provincial Forest Departments
4. Provincial Wildlife Departments
5. Environment Protection Departments (EPDs)

VIII. II. FISH PRODUCTION

1. FRESHWATER FISHERIES

a. OPEN WATERS

i. River Fisheries

In rivers, different species of fishes (both cat & carp fish) brood in the natural waters. There is a great struggle for existence. The fishes have to find their food by effort and yet keep away from the enemies. During the floods, in the months of June and July, the carp fishes like Rohu, Mirgal and Thaila ascend the streams and streamlets and lay eggs in shallow waters from where they return to the rivers. In the shallow pools the young ones emerge within 24 hours and grow to fry and fingerling stage. With the next flood, after a month or so, they ascend the streams and find their way to rivers. They become adult in their third year and repeat the process of egg laying.

The river fishery has the following characteristics:

- i) There is a great variation of depth, width and speed of
- ii) water. There is a great range of temperature.
- iii) Life is hard to live against the enemies.
- iv) Food has to be searched.
- v) Breeding places have to be found.
- vi) Natural obstructions have to be surmounted.
- vii) The fish has to face the water-current perpetually.

i. Canal Fisheries

The life of fish is still difficult in the canals as compared to the life of fish in rivers. In fact any fish that enters the canal is doomed to perish. This is because at least twice in a year closure of canals take place. The whole water from the canals is almost drained off. Most of the fishes therefore die. A few fishes are caught and sold.

Others are eaten away by fish enemies. Some are saved by the Fisheries Department. However, a very small number survive in some waters that remain in the deeper places.

There are no fish ladders provided in the canals. The fish therefore, cannot go back into the river.

Lake Fisheries

In Pakistan, the lake fishery is of recent origin. The really big lake is the Manala Lake (District Jhelum) reputed for Tor putitora (Mahaseer) and common carp *Cyprinus carpio*. Both the lakes are full of water weeds. Apart from principal

carp fish, the lakes have the big Walas' in large numbers as well as some Channa fish (Murrel).

Excluding the above lakes, are the small dams of various areas varying from 100 acre to 1,000 acres. They have been stocked with carp fry and have provided good results.

The lake fishery is characterized to:-

- i) Greater depth.
- i) Greater expanse of water.
- i) The main reservoir is quite but at the farther end there is main river-current entering into lake.
- iv) The depth, temperature and food provide different habitats for fish.
- v) It takes quite a long time for a lake to provide necessary environments to fish life, usually a decade.

The whole process of balance is like this. First, the rate of flow of the river water into the lake/dam will become slow and ultimately will lose its entity. Slowly and slowly silt and detritus of water will start settling down. This will enhance the transparency of water in course of time. Then phytoplankton will start developing from a sparse community to dense growth. The zooplankton will follow the suit. Phosphates are depleted as they are used up. The dissolved gases will form their own stratification. At the surface oxygen is produced and carbon dioxide is used up. Due to density of population of phytoplankton, all light will be absorbed at upper levels. Deeper waters will have less light and therefore less photosynthetic activity. Oxygen is less and if it is more depleted mortality may occur but natural causes mix up the two waters.

iv. Small Dams

Over the past 38 years the Small Dams organization of the Irrigation and Power Department of the Government of the Punjab has constructed a number of small dams in the Province to provide irrigation to agricultural lands. At present there are 32 dams in operation. All small dams are located in Rawalpindi Division. Detail of Small Dams in Rawalpindi Division is as under:-

<u>Rawalpindi District</u>	<u>Jhelum District</u>
1. Dhok Sunda Mar	1 . Garat
2. JAWA	2 . Jamaral
3. Misriot	3 . Tainpura I+I
4. Nirali	
5. Dungi	<u>Islamabad</u>
6. Khasala	1 . Rawal
	2 . Simli.
<u>Attock District</u>	<u>Chakwal District</u>
1. Mirwal	1 . Bughal
2. Jabbi	2 . Nikka

- | | |
|---------------------------|-------------------|
| 3. Shakardara | 3. Dhok Outab Din |
| 4. Si ^P iala | 4. Kot Raja |
| 5. Ban ^g o | 5. Pira Fatehal |
| 6. Rati Kassi | 6. Gurabh |
| 7. Kanjoor | 7. Dhurnal |
| 8. Channibar | 8. Kokhar Zer |
| 9. Qibla-Bandi | 9. Walana |
| 10. Shah ^P ur. | 10. Surlab |

At present Fisheries management in the Small Dam reservoirs in Punjab Province is under the Control of the Department of Fisheries and has been decentralized to District Officers. The major management functions carried out by the Department of Fisheries in Small Dam reservoirs is stocking of fish fry and issuing of permits for harvesting.

Fish stocks and fisheries in Small Dams are dominated by a number of indigenous and exotic species, mentioned below:-

COMMON NAME	<u>SCIENTIFIC NAME</u>
Calbans	Labeo calbasa
Grass Carp	Ctenopharyngodon idella
IX. Gulfam	Cyprinus carpio
Mahaseer	Tor putitora
Mori or Mirgal	Cirrhinus mrigala
Mulee	Wallago attu
Paree	Notopterus notopterus
Rohu	Labeo rohita
Silver Carp	Hypophthalmichthys molitrix
Thaila	Catla catla
Tilapia	Oreochromis sp.

X.

b. FARM PRODUCTION - AQUACULTURE

i. Establishment of Fish Farm-Guidelines

Following parameters are considered while determining the suitability of the site for fish culture.

i) Site Selection

Special consideration should be given to the location. It should be located in an area that is not subject to frequent flooding should have enough elevation, so that farm can be drained out in case of any emergency, should have suitable texture, enough water supply, availability of required inputs, have market road access even during the rainy season.

a) Soil sampling

To determine suitability of the site for fish culture soil samples should be taken from the proposed site. They should be from surface and from

slightly below the depth that will represent bottom of the pond, i.e. if three feet of soil was anticipated to be excavated, the soil samples should be taken from between three and four feet depth.

A soil sample is taken by drilling a soil auger into the desired depth. The soil in the head of the auger is then placed in a plastic bag and taken to the departmental laboratory for analysis. The bag should be labeled with the farm name, the location and the depth at which the soil sample was taken.

b) Water Quality

In most areas of the Punjab Province water source is either from a tubewell or irrigation canal. The quality of the tubewell water should be analyzed. For this purpose a sample should be taken preferably in a sealed bottle and sent to the department of Fisheries Lab. for the testing of total alkalinity, hardness, pH, nitrogen, total dissolved solids along with other required parameters.

c) Farm Designing

A production pond/grow-out pond should be one acre to 2.5 acre area with the length – breadth ratio of 2:1 whereas the size of nursery pond should be at least 1/2 acre and nursery area should be 1/8th of the total production area of fish farming project.

Each production and nursery pond should have an independent inflow as well as outflow water structures to regulate the water level in the pond.

d) Manuring / Fertilization

In a new pond bottom should be manured prior to water filling with 5,000 to 6,000 Kgs organic manure per acre. Cowdung or poultry waste is the most desirable manure. Similar quantity is required to be added periodically in subsequent stages to maintain productivity of the pond throughout the growth period i.e. from March to October.

In addition, fertilizers are also applied during the growth period on fortnightly basis to maintain the productivity of the farm.

Different fertilizers require different application procedures. Manures should be evenly spread in the pond whereas fertilizers should be dissolved in the water and then spread on the surface of pond water in a uniform way.

i) Stocking Densities

Criteria for the stocking of a fish farm

- Stocking be managed according to the carrying capacity.
- Stocking be executed according to the required ultimate weight of individual fish (at the time of harvest) and the optimum space/room required/kg fish.

- Stocking of fish seed be arranged taking into consideration its potential growth rate under different aquaculture management systems.

Recommended Species with Percentage of stocking

<u>Name of the Fish Species</u>	<u>Relative Ratio</u>
Indigenous	
Thaila (Catla catla)	10-20 %
Rohu (Labeo rohita)	30-35 %
Mirgal (Cirrhina mrigala)	10-15 %
Exotic	
Grass Carp (Ctenopharyngodon idella)	15-20 %
Silver Carp (Hypophthalmichthys molitrix)	15-20 %

i) Farm Management Calendar

<u>Month</u>	<u>Grow-out Pond</u>	<u>Nursing Pond</u>
January	Dry pond	Maintain water at required level
February	Dry pond to cracking	Maintain water at required level
March	Plough the pond bottom until smooth	Maintain water at required level
	Spread organic manure evenly on bottom	Prepare for harvest of advanced fingerlings
	Fill the pond with water	Add inorganic fertilizers dissolve, disperse evenly
April	Transfer advanced fingerlings from the nursery pond to the grow-out pond	Maintain water at required level
	Drain, dry pond	Apply fertilizers at the required level
May	Maintain water at required level	Dry bottom to cracking
	Apply fertilizers at the required level	Plough the pond
	Monitor growth on monthly basis	

June	Maintain water at required level Apply fertilizers at the required level Monitor growth	Plough the pond until smooth Spread organic manure evenly on bottom Fill the pond with water Add inorganic fertilizer dissolve, disperse evenly Maintain water at required level Stock with fingerlings of Silver, Grass Carps
July	Maintain water at required level Apply fertilizers at the required level Monitor growth	Maintain water at required level Apply fertilizers at the required level Monitor growth Stock with fry of Rohu, Mori, Catla
August	Maintain water at required level Apply fertilizers at the required level Monitor growth	Maintain water at required level Apply fertilizers at the required level Monitor growth
September	Maintain water at required level Apply fertilizers at the required levels Monitor growth	Maintain water at required level Apply fertilizers at the required level Monitor growth
October	Maintain water at required level Apply fertilizers at the required level Monitor growth	Maintain water at required level Apply fertilizers at the required level Monitor growth
November	Maintain water at required level Initial harvest of fish by net, to market	Maintain water at required level
December	Harvest by draining entire pond for marketing Drain, dry pond	Maintain water at required level

i. Fish Breeding Techniques

XI. I. Pre-Breeding

Sr. No.	<u>Particulars</u>	<u>Remarks</u>
XII.	<u>Brood Fish Care</u> i)	

Stocking

Brood fish should be raised and maintained with the stocking rate of 400 to 500 kg/acre. It is preferable to stock 400 kg fish/acre. Different species of fish should be kept in different ponds.

Availability of quality brood stock has a pivotal role in the successful operation of a hatchery. As such healthy stock should be selected and greater attention be focused towards maintenance of proper hydro-biological condition to ensure sustained growth.

Fertilization

i)

Bed manuring of the brood stock ponds be carried out with 4,000-5,000 kg per acre organic manure (cowdung) prior to water filling and such ponds be periodically fertilized to maintain productivity to desirable extent with 1000-1500 kg organic manure & 8 kg Inorganic fertilizer per acre per fortnight, subject to qualitative and quantitative fluctuations of plankton level.

Preferably when the water temperature ranges between 25-32°C.

At the time of shifting of brood fish treatment with sodium chloride or $KMnO_4$ (Potassium permanganate) be given.

i) Supplementary Feeding

Supplementary feeding of brood stock should be done with Rice polish, Maize glutin and Molasses in the ratio of 7:2:1 at the rate of 2-3% body weight of stocked fish per day.

Note: Brood stock of grass carp be fed with green fodder (Shatala, Barseen etc.) daily as per the requirement of fish.

II) Breedin^g

i) Selection of Brood Fish

Brood fish selected at the time of induced s^pawnin^g should be health^y and fu^ly ri^pe .

It is to ensure breedin^g without fail and im^prove efficienc^y in breedin^g results.

i) Sex Ratio

Male : Female
1 : 1

i) Hormone Dosa^ge (Ova^prim)

Fish Species	Total dosage ml/kg for Female	Total dosage ml/kg for Male	
i) <i>Ctenopharyngodon idella</i> (Grass carp)	0.6 – 0.7	0.1 to 0.2	In case of proper maturity of brood stock preferred doze should be 0 – 6 ml/kg for male & 0.1 ml/kg for female. Fertilization is executed only through stripping after 10-12 hours of hormone injection.
ii) <i>Aristichthys nobilis</i> (Big head)	0.6 – 0.7	0.1 to 0.2	-do-
iii) <i>Hypophthalmichthys molitrix</i> (Silver carp)	0.6 – 0.7	0.1 to 0.2	-do-
iv) <i>Catla catla</i> (Thaila)	0.5	0.1	-do-
v) <i>Labeo rohita</i> (Rohu)	0.3 – 0.4	0.1	-do-
vi) <i>Cirrhinus mrigala</i> (Mori)	0.3 – 0.4	0.1	-do-

III) Post Breedin^g

Incubation

8,00,000 to 10,00,000 lacs in a tank of 5 cft dia

i) Circular tank

a) Quantit^y of e^{ggs}

The su^{pp}I^y of water in circular tank be arran^ged between 22-25 litres per minute.

b) Water Su^{pp}I^y

Screen at the central exit pi^pe should be of p^referabl^y bolton cloth or n^ylon cloth and the number of mesh be 4,200 or sli^ghtl^y above per sq. inch.

c) Screen

Water su^{pp}I^y to each Mc Donald Jar should be re^gulated with 1 - 1.5 litres per minute.

i) Mc Donald Jar(Glass Jar)

a) Water Su^{pp}I^y

b) Quantity of eggs
Nursing of Hatchlings

Following is duration period for nursing of hatchlings till these became first feeding larvae/fry.

Hours	<u>Water Temperature</u>
72 – 80	
80 – 96	27 – 28°C
	25 – 27°C

Preparation of Fry Ponds

i) The pond should be sun dried before the breeding schedule is commenced.

ii) The pond should be fertilized with organic manure (cowdung) @ 4000 – 5000 kg/acre subject to qualitative & quantitative fluctuations of plankton level.

iii) Fill the pond with water to a depth of 1.5 feet 2.00 feet and maintain it.

iv) Observe the production of micro fauna after 48 hours of fertilization.

v) Add insecticide, @ 0.5 – 1 ppm. In case dry pond is not available, net out the stock from the fry receiving pond as far as possible, reduce the water to minimum possible level. Assure extermination by Rotenon or any other recommended insecticide @ 1 ppm. Manure/prepare the pond as per doze referred in (i & ii) above. Add insecticide.

Stocking of Fry

i) Rate of Stocking

4,00,000 fry/acre

ii) At the time of stocking of fry, care should be taken to ensure acclimatization of fry with pond water temperature.

iii) Start raising water level of pond by 2” to 3” per day till it reaches the depth of 3 feet after the stocking of fry.

iv) Start feeding fry with artificial feed after 10 – 14 days of

15,000 – 20,000 eggs / Jar

Feeding of Yolk fry be avoided.

Fry is ready for stocking when air bladder is formed and yolk sac is nearing absorption.

To ensure disinfection of pond soil.

Dry manure is preferable. The fertilization should be executed the day fertilized eggs are obtained.

Addition of water should be managed just after the pond is fertilized.

At a temperature of 25 – 32°C, after 48 hours of fertilization, protozoans and Rotifers start appearing. After 72 hours the first food (protozoans and rotifers) are produced fairly abundant.

Only insecticide mild toxicity, preferably of organophosphate group be used. Check toxicity of the insecticide after 48 hours of its addition prior to release of stock-survival of fry in a sample of water collected from treated pond upto 4 hours will give satisfactory results.

To avoid temperature shock to fry.

stocking of fry.

v) Feed ingredients may be rice polish + Maize lutein (3.0%) in fine powdered form) with the ratio of protein 8:1 respectively @ 5% of total weight of fry/day.

vi) Start fertilization of the pond with 1000 – 1500 kg cowdung & 8 kg inorganic fertilizer, subject to qualitative & quantitative fluctuation of plankton level.

Diseases of Fish and their Control/Predators

The tremendous growth in fish farming activity in Punjab has highlighted various issues of fish husbandry including fish diseases and their control. The problems of fish diseases are related to stocking density, level of aquaculture technology applied and inputs going into the fish ponds.

In fish farms the fishes are densely stocked and thus are more susceptible to different diseases. Uncontrolled and unregulated transport of fish and poor farm management is also considered as cause of spread of disease. Disease causes mortality, poor growth, loss of fecundity and minimize production.

All culturable fish species, *Labeo rohita*, *Cirrhinus mrigala*, *Catla catla*, *Hypophthalmichthys molitrix* and *Ctenopharyngodon idella* are affected by bacterial, fungal and parasitic diseases and infections. Moreover, poor water quality in fish ponds also put fish under stress which can lead to fish mortality. In ponds fishes are also under stress of predation by some predators at the early age.

Some commonly occurring fish diseases, predators and their control is given as under:-

Abdominal Dropsy

This is the most common and important bacterial disease of cultured carps. Bacteria infect fish through water, physical contact and contaminated feed. The diseased fish has sunken eyes, contains watery fluid mixed with blood in abdominal cavity and belly becomes swollen. This disease is treated with the use of antibiotic i.e. oxytetracycline or terramycin in feed for 5- 10 days @ 60 mg/kg fish weight.

XIII. Fin Rot

This is also a bacterial disease of cultured carps. The edges of fins of diseased fish become darker in colour and split up. The caudal fin become reddish and is eventually eroded. This disease is also treatable with antibiotic chloromycetin bath @ 60 mg/l for 5 minutes for six days and copper sulphate bath @ 50 mg/l for 1 minute.

Lernaeasis.

This is an ectoparasitic infection in fish. The worm *Lernaea* sp. Penetrates into the skin of fish and causes wounds, which leads to secondary infection. Infected fish become weak and their scales fall. This parasite infects all parts of the body of the fish. Lernaeasis is treated with chemicals such as diptherex @ 0.2 – 0.5 mg/litre in pond and thurax @ 0.25 ppm in pond.

Saprolegniasis.

This is a fungal infection commonly found in our fishes. The spores of fungus saprolegnia invade wounded fish. The fungal hyphae penetrate into fish musculature and damage fish flesh. At the point of attachment fungus appears as cotton wool. Saprolegniasis can be treated by giving Malachite green bath to infected fish @ 1 mg/litre solution for 1 hour.

XIV. Anoxia

Depletion of oxygen in fish pond is called anoxia. This condition may be due to rise in water temperature in pond, over stocking of fish seed and other biological factors. In anoxia condition, fish come on the surface of water, stop feeding and show restlessness. The Anoxia condition in pond can be improved by addition of fresh water and aerating pond water.

Fish Predators

In fish farms there are some predators which prey on fish from fry to adult stage. These predators include water insects, amphibians, reptiles, birds, carnivorous fish and even mammals.

Harmful insects include, water beetle, water bugs, water scorpion etc. These attack fish eggs and fry. These insects can be controlled by improvement in nursery ponds management.

Frogs and toads also prey on fish fry and fish. The best way to control them is by destroying the breeding grounds of these amphibians.

Tortoises and snakes also eat fish. These can be controlled by netting them out of pond and destroying them.

Aquatic birds like kingfisher, fishing eagle, heron prey on small and big fish. These birds can be controlled by shooting.

The presence of carnivorous fish in pond also affects fish production and growth. These fish prey on farmed fish. Carnivorous fish include *Mystus* sp., *Wallago* sp. *Channa* sp. etc. These fish may enter the farm through canal water or by stocking unidentified fish seed from natural waters. These unwanted fish can be eradicated by use of rotenone and even installing fine screens at water inlet.

Water rats and otter eat fish, eggs, fry and big fish. These animals even destroy fish feed. These predators can be controlled by fixing fences around the ponds and catching them in traps.

c. FISH HARVEST i.

Types of Nets

XV. CAST NETS

BEHRKO It is conical in shape, provided with pockets iron, lead sinkers at base used for catching fish in Rawalpindi & Multan areas.

DOBAJU It is conical in shape, provided with pockets, iron & lead sinkers at base, used for catching small fish in Multan areas.

JARI It is conical in shape, provided with pockets, iron & lead sinkers at base. It is used for catching small fish in Hyderabad, Queta, Multan areas.

OCHHAL WAN It is conical in shape, provided with pockets, iron & lead sinkers at base. It is used for catching fish in Manchar Lake District Dadu, Hyderabad areas.

PALKU It is conical in shape, provided with sockets, iron, lead sinkers at base used for catching fish in Rawalpindi & Multan areas.

RAKHA It is conical in shape, provided with sockets, iron, lead sinkers at base used for catching fish in Rawalpindi & Multan areas.

SORU It is conical in shape, provided with sockets, iron, lead sinkers at base used for catching fish in Rawalpindi & Multan areas.

SOT WAN It is conical in shape, provided with pockets and lead, iron sinkers at base used for catching smaller fish in Lahore, Peshawar, Multan, Rawalpindi & Sarodha areas.

VEHERN It is conical in shape, provided with sockets, iron, lead sinkers at base used for catching fish in Rawalpindi & Multan areas.

DRAG AND SIENE NETS

BHAN It is the biggest known net used for catching Pala in River Indus in the Hyderabad areas, made of Cotton/Nylon operated by 12-15 persons from boats, dragged towards bank exploiting fish. No pockets, float of pan & sinkers of iron and lead.

GHAWA It is made of cotton, provided with pockets, has floats of gourd, lead/iron sinkers. It is operated by 10-12 persons. The rope at head end is tied to a pole or held by two fishermen on the bank. The net is carried in a boat & laid in water then pulled slowly towards the bank from where it was operated trapping the fishes moving in that area, mainly used in catching Pala from river Indus in Hyderabad areas.

KARRA It is made of cotton or Nylon, operated by 4-10 persons used

on the Balochistan Coast.

MAHAJAL
(Patti (Bhi^ga),
Toofanjil (Kadh),
Chhatta (Kur^ga)) It is made of cotton or sub hem^p, rectangular with pockets, floats of weed at head end & iron sinkers at lower end, used in stagnant waters operated by 4-10 persons in Peshawar, Rawal^pindi, Sar^godha, Gujrat Districts.

PATTA It is made of cotton, rectangular used in stagnant waters in Queta & Kalat areas.

UCH It is made of cotton or Nylon provided with floats operated by 4 to 10 persons used on Balochistan Coast.

DIP NETS

KURALLI This net has cone type shape, made of cotton, used in Manchar Lake.

KHURLI Type net is conical in shape, made of cotton used in Hyderabad district.

DRIFT OR GILL NETS

NARA It is made of cotton or Nylon, has floats of reeds but no sinkers, operated by 4-10 persons used in stagnant waters in Hyderabad & Khair pur areas. When laid in water, it sinks lying between 6 ft to 1 ft below water surface, used for catching a l fish types.

OJHANI It is made of nylon. It is provided with earthen floats at head ropes and iron / lead sinkers at ground ropes. It is operated by 3-5 persons. It is used for catching Pala in river Indus.

FIXED NETS

AADO OR PATHARO It is a rectangular cotton net without floats sinkers with pockets at lower end. It is operated by fishermen in 2 or more boats who move by beating their copper utensils, rocking their boats from side to side and splashing water with bamboos thereby trapping fish in stagnant waters especially in big lakes of Hyderabad areas.

XVI. CHADAR JAL It is rectangular net, used in shallow pond waters spread in the center of pond with its corners tied with poles which are fixed into soil. It is operated by four or more persons from the corners of pond who lift the net immediately after trapping the fish.

KHANDI It is a rectangular cotton net without floats and sinkers. It is fixed with long bamboos with a gap of 6-8 feet. Its head end is flushed with water & lower end is fixed in mud.

NARA Its lower part has sinkers, floating with floats attached to the

upper rope fixed at one of the poles & fish are driven towards the nets.

NILOTU OR PAND It is made of cotton with floats of reeds but no sinkers, fixed by 3-5 persons across a stream during night, used in fishing fish in Rawalpindi, Sarodha, Hyderabad areas.

NURAH It is rectangular Aak fibers net operated by single person in dist: Sarodha, Gujrat.

PATTI It is rectangular cotton or nylon net without floats, with sinkers of burnt clay. It is fixed with bamboos or wooden stakes used in stagnant waters operated by 2-4 persons.

SEHAK It is a rectangular cotton gill net provided with floats of reeds & sinkers of burnt clay fixed at the bottom by wooden pegs provided at lower end of net. It is operated by two persons in stagnant waters in Hyderabad region.

SOONIMAR PATTI It is rectangular cotton net, provided with float of pan & burnt clay sinkers. Its lower end is fixed to the bottom by two wooden pegs. The floats & sinkers keep the net in vertical position. It is used for catching the fish crossing it from either side in shallow stagnant waters in Hyderabad areas.

THORIAR It is rectangular cotton net provided with floats but no sinkers. It is operated by 20-30 persons who drive the fish towards this fixed net by splashing water with bamboos & also by causing commotion in water by rocking their boats. Another net is fixed attached to the free arm of this fixed net for the exploitation of fish, in shallow stagnant waters.

HAND NETS

DHANGLA It is rectangular, made of cotton, used in both running and stagnant waters in Cambelpur, Sarodha, Gujrat and Peshawar Districts.

DHANGLA It is bag type net operated by two persons in shallow waters in Sheikhpura, Gujranwala, Sialkot districts.

KALERA It is a bag like net with a wooden frame having a short strong handle operated by a single person used for catching Pala from river Indus in district Thata.

KOCHHRI Bag nets circular in shape, made of cotton supported by bamboo handle used in Multan division.

SAGGAN Circular, triangular net used in Multan division.

SAND OR SAMBOI Triangular purse net made of nylon supported by a wooden frame, used for catching Pala fish in river Indus in Hyderabad

district.

RODS & LINES

BANSI

It is a fishin^g rod made of bamboo with or without a ^pule^y and a line made of cotton or n^ylon, with one barbed hook fixed to the line, with a float of reed or li^ght wood.

CHABB OR CHIPLI

Typ^e of rod & line used by children with one barbed hook & a float of reed.

DOR/LANG/ WHANG

It is a lon^g line made of cotton or n^ylon cord, snoods with barbed hooks at their ends are attached to the line, at suitable intervals. The two ends of line are tied to the boats and hooks are baited and left overni^ght in water and are hauled in the mornin^g.

DORI

It is a handline com^prisin^g of a stron^g cotton or n^ylon cord provided with 1, 3 barbed hooks and with a float of reed or piece of li^ght wood.

SPEARS

BHAALA OR TIRI

It is com^posed of a blade with 4-5 barbed ^points attached to a bamboo or wooden shaft thrown either from boat or bank with ^ereat force at the fish. The blade ^plun^ges into the bod^y of fish s^pear is lifted out of water and fish removed.

CHATTO: It consists of a blade with two barbed ^points attached to a wooden shaft or a bamboo used for kilin^g tortoises in Mancher Lake. The hunter by creatin^g vibrations in the water causes the ^pre^y to come on the surface. As the ^pre^y comes above, he ^plun^ges the s^pear in its soft ^parts & lifts it out of water.

i. Fish Marketin^g

Fresh fish is traded throu^ghout Punjab. Retail markets are established in almost all the cities and towns of the ^province. Wholesale and distribution markets are limited to the cities and big towns. Marketin^g of the fish continues throu^ghout the ^year exce^pt June, Jul^y and Au^gust Lahore, Rawal^pindi, Gujranwala, Faisalabad, Multan, Kasur and Sahiwal are the major fish markets in Punjab. Each district and tehsil head ^quarter also serves as a fish market.

The ^perishable nature of fish, lack of a^{pp}ro^priate trans^port facilities, day to day fluctuation of fish catch, functionin^g of un-re^gulated markets, non-availabilit^y of ade^quate stora^ge facilities and limited taste for fish are the factors which have com^plicated the marketin^g s^ystem of fish.

XVII. FISH MARKETING CHANNEL

A route followed by a commodity in the marketing operation from the producer to the consumer is called marketing channel. The marketing of fish in Punjab is carried out through indirect channel. Fish is generally brought in the markets direct from rivers as well as from fish farms in private sector. Some quantity of fish is directly auctioned to retailers (consumers) whereas the surplus quantity is marketed to the wholesalers.

XVIII.

XIX. MARKETING INTERMEDIARIES

Marketing intermediaries include all "the individuals or firms who handle the fish after it leaves the producers until it reaches the consumers. They are of two types. One who assumes business risk, invests capital and accepts the title of goods i.e. contractor, private fish farmer, middleman and retailer. The others who bear no risk and do not accept the ownership but sell their services i.e. fishermen, commission agents and jobbers.

a) CONTRACTORS

The contractors perform a key role in the marketing of fish. They take the contracts or lease of fishing rights of public water areas from the Fisheries Department. They manage the catching of fish and supply to markets.

b) PRIVATE FISH FARMS

They produce the fish in their farms and supply the same to the market.

c) WHOLESALERS

They buy and sell the huge quantity of fish. They operate their business in assembly. To attract sellers, they extend short-term loans to both producers and contractors on the pledge that loanees would sell the fish to them.

d) RETAILERS

They buy the fish in small lots and sell to ultimate consumers. Fish retailing is mostly done through shopkeepers. However, a number of hawkers sell fish by sitting at footpaths or wandering on bicycles.

FISH SUPPLY TO MARKETS

The fish after harvesting/catching is graded, packed and transported to the market as detailed below:-

i) Fish Catching

The contractor and private fish farmers engage the fishermen on contract basis to catch the fish from public water areas and private fish farms. The fishermen generally operate in a group and wages are paid

in accordance with the quantity of fish caught either in shape of cash or kind.

i) Gutting

Gutting is the process performed after catching the fish. An incision is given to the fish to remove the gills and intestines. It increases the storage life of the fish.

i) Grading

The fish population is heterogeneous. It varies in respect of species as well as the degree of freshness. The rates vary by species and weight.

iv) Packing

Fish is mostly packed with ice for handling and transportation. Fish is mostly packed in baskets and jute sacks/bags.

v) Transportation

Fish is a perishable commodity. Efficient transportation plays a vital role in the marketing of fish. Transportation is done by men, pack animals, motor vehicles and railways.

2. ORNAMENTAL FISHERIES

Ornamental fish culture is an old practice, which is being carried out in almost all parts of the world. There are a number of types and varieties of ornamental fishes with specific characteristics for display and exhibition.

XX. i. Aquarium Fish Production

The majority of aquarium fishes are egg laying species, with eggs being expelled by the female and fertilized by the male during spawning within this category, the egg-laying species commonly found in aquaria can be divided into five groups according to spawning habit: egg-scatters, egg-buriers, egg-depositors, mouth-brooders and nest builders.

Egg-scatters have little or no parental care. These fishes simply scatter their eggs into the water e.g. Barbs, and gold fish

Egg-carriers. These fishes make an attempt to care for their eggs, even those that never see their offspring e.g. kili fish.

Egg-depositors. These fishes select their own breeding partner, then choose and clean spawning site. The chosen site may be out in the open, on a plant leaf or upturned flowerpot. They forcibly keep other fish away from the surrounding area by chasing them away. The eggs are deposited on the plant leaves, on the tank side or in the depression in the gravel e.g. angel fish (*Pterophyllum scalare* and *Tilapia* (*Oreochromis niloticus*). Some fishes are mouth-breeders that carry their eggs in their mouth until they hatch e.g. cichlid. While some other are nest builder that construct

nests in which their fertilized eggs are laid and guarded until hatching occurs e.g. Gouramis and some sun fishes.

Live-bearer fishes differs from egg laying because the eggs develop inside the female fish, not outside. The male's anal fin—the gonopodium—is modified, so he can introduce sperm into the female.

There are two types of live-bearer fishes one is called viviparous and other is ovoviviparous. In the former the eggs are nourished through the female's blood stream and in the later the eggs are nourished by the yolk-sac.

i. Aquarium Fishes

A number of types of ornamental fishes are being raised according to the demands in government and private sector. The prominent among these fishes are Gold fish, Guppies, Molies, Angel fishes, Zebra fishes etc.

The goldfish (*Carassius auratus*) has been reared as an ornamental fish for centuries, and is still raised in great numbers, as an ornamental fish. It is widely available from commercial sources in size from one to five inches. The fish will spawn when it reaches a length from four to five inches.

The goldfish has been selectively bred for variation in finnage, color, and telescoping of eyes. It tolerates handling, eats dried foods, and is attractive in appearance.

The zebra fish (*Brachydoni rerio*), is a favorite ornamental variety and is widely available in market. The zebra grows and reproduces readily in captivity. It can be maintained on dried foods and is small enough, about 1.5 inches, that only the most limited facilities are required. Like most "tropicals" the zebra should be maintained at a temperature of 75° to 80° F.

To spawn this species, one should place several males and females in a cage of nylon marquisette suspended in water tank. Water depth in the tank should be only three or four inches. The cage should be suspended approximately one inch above the bottom of the tank. When the fish spawn, the eggs fall through the netting and escape being eaten. Zebras may also be spawned over gravel, but a large tank is required.

Bulheads (*Ictalurus spp.*) can be held in aquaria and feed on meats or meals. They respond negatively to light and are probably more suitable as experimental fish when kept in subdued light. In small ponds bulheads tend to become very numerous, and by seeding one may frequently obtain large numbers of uniform size.

Guppy (*Gambusia reticulata*), reproduces rapidly, and since it is not too inclined to eat its young, no special precautions are needed to ensure their survival. It has a short life cycle. Numerous colors and finnage mutations of the guppy have been preserved by hobbyists.

The platy (*Xiphophorus maculatus*) and swordtail (*Xiphophorus helleri*) are quite similar to the guppy in size, color variations and environmental requirements but do not reproduce and survive as successfully as guppies.

III. EFFECT OF WATER POLLUTION ON FISH ECOLOGY

1. Causes of reduced fish production from natural waters.

There are many causes of reduced fish production from natural waters. Amongst these aquatic pollution is the main cause. Aquatic pollution is being caused by the effluents from Industries, sewage wastes from big cities and use of pesticides and insecticides. Among other factors construction of Barrages etc on the rivers; Global warming, heated effluents from power generating plants/nuclear plants, drought, change the entire ecology of natural waters and reduce fish production.

2. Aquatic Pollution/Polluting Elements

In Pakistan rapid industrialization and urbanization has resulted in increased discharge of various types of effluents into natural waters. Besides due to ever increasing use of insecticides and pesticides, the part of these chemicals get their way into natural waters. All this has an adverse effect on aquatic environment and on fish.

The major source of surface water in Pakistan is the Indus river and its major tributaries, the Kabul, Jehlum, Chenab, Ravi & Sutlej. Fishing in these waters is widely spread in all the provinces/regions. These Rivers and Canals are also the chief breeding areas and the principal fish producers. Of late, however, these major sources of surface waters have lost their purity due to pollution. Pollutants can be grouped mainly into:-

- i) Industrial effluents
 - ii) Domestic Sewage
 - iii) Agricultural Chemicals
- (i) Industrial Effluents**
- i) Acids, mainly inorganic and some organic from Acid manufacture, chemical industry, steel industry cause the $\text{pH} < 6.0$
 - ii) Alkalis from Food Industry, Chemical Industries, Textile Manufacture cause the $\text{pH} > 9.0$
 - iii) Antibiotics from Pharmaceutical Industry.
 - iv) Chromium, lead, zinc, copper etc. from metal processing for example electroplating, anodizing, tanneries, are toxic to fish as they precipitate and clog the gills of fish.
 - v) Detergents from textile manufacture, detergent manufacture, laundries, food industry etc. These cause respiratory distress by destroying the gill surfaces.
 - vi) Insecticides like D.D.T., Parathion, Dieldrin, Malathion etc. from Agricultural spray, disturb the action of central nervous system of fishes.
 - vii) Ammonia from cloth manufacture, fertilizer manufacture, rubber industry, upsets water balance level by increasing permeability.

v i) Cyanides from coke manufacture, metal Platin^g etc inactivate the enzyme system related to the uptake of oxygen.

With the increasing industrialization and manufacturing of new products with new & varied processes industrial pollution has increased both in qualitative & quantitative terms. The industries are situated in big cities and their effluents, treated or untreated find their way into surface waters.

(i) Sewage

Domestic sewage from big cities is another important source of biological pollution. The huge organic load exerts heavy oxygen demand on the receiving stream. Lahore is the 2nd biggest city of Pakistan and its sewage is being discharged into river Ravi without treatment in such a quantity that at low flow hardly 1:1 dilution is available. Similarly River Chenab receives sewage water from Faisalabad & Multan cities. Similar is the case with other rivers and streams.

Sewage has a high bio chemical oxygen demand which depletes the water of its dissolved oxygen. In the absence of dissolved oxygen, an aerobic bacteria produced toxic gases as methane, hydrogen sulphide, ammonia and phosphene etc., resulting in fish kills.

(i) Agricultural Chemicals etc.

The entry of insecticides, pesticides and other chemicals used in Agricultural Sprays, mosquito and other insects control also find their way into surface waters and cause pollution. Similarly oils from garages, workshops etc, when enter a stream, cut off the surface of water from the air, causing dissolved oxygen replenishment.

3. Extent of Pollution

The pollution due to the above causes has resulted in the decline of natural fisheries. River Ravi, River Soan, Deg Nulah, Rohi Nulah, Pulkhu Nulah, Seepee drains of Faisalabad etc. are some of the many affected sites. Water pollution has resulted in great damage to aquatic fauna and flora. Fish mortalities have often been reported in rivers, canals streams etc.

IMPORTANT WATER QUALITY PARAMETERS SUITABLE FOR (WARM WATER) FISH

	<u>Parameter</u>	<u>Suitable Range</u>	<u>Optimum Range</u>
1.	Temperature	10-35 °C	20-30 °C
2.	PH	6.5 – 9.0	7.0 – 8.00
3.	Light Penetration	15-45 cms	20-30 cms
	a. Dissolved oxygen	3.00 ppm & above	5.0 ppm & above
	b. Free carbon dioxide	0–20 ppm	3–10 ppm
	c. Total Alkalinity	20–600 ppm	400 ppm 100-
	d. Total dissolved solids	20–3000 ppm	1500 ppm

Toxic gases as ammonia, hydrogen sulfide, toxic metals as Chromium, Zinc, Lead, Nickel, etc., cyanides, grease, oil Tar should almost be absent.

Working Standards for effluents discharging to Fishing Streams

(Where 1:8 dilution of River, Canal water etc. is available)

S.No.	Parameter	Standard
1 .	Temperature	32 °C
2 .	pH value (Acidity/Basicity)	6.0 – 9.0
3 .	Biological oxygen demand at 20°C (BOD)	20 mg/l : 5 day
4 .	Chemical oxygen demand	Not > 730 mg/l
5 .	Total suspended solids	30 mg/l
6 .	Total dissolved solids	3500 mg/l
7 .	Cr & other toxic metals either singly or in combination	Not more than 0.5 ppm
8 .	Pesticides, herbicides, fungicides and insecticides	Not more than 0.15 mg/l
9 .	Sulfides as H ₂ S	Not more than 0.1 mg/l
10 .	Chlorine	Should be absent
11 .	Cyanides (as HCN)	Not more than 0.1 ppm
12 .	Oil and Greases.	Nil

4. How to Control Pollution

i. In Ponds

In Ponds, pollution is usually due to lack of sufficient dissolved oxygen which results from:-

- i) Over stocking
- i) Over manuring
- i) Increased use of Feed.

Overstocking causes consumption of oxygen by Fish, thus lowering oxygen of the Pond. Use of high doses of organic manure, use of excessive feed resulting in putrefaction of unconsumed feed exert high biochemical oxygen demand on the Pond. The DO deficiency causes asphyxiation and mortality of fish occurs.

It is imperative, therefore, that to prevent pollution in Ponds, following should be given due consideration:

- 1- Stocking of fish should be done as per recommended stocking rate & Fish species.
- 2- Fertilizers and manures be used in recommended doses only.
- 3- Feeding be done in recommended manner & in proper doses.

And finally hygienic conditions be maintained. i.

In Natural Waters

- 1 - Prevention is better than cure. Preventive measures are much cheaper and more effective than remedial measures. The industries must treat

the effluents of their respective industries as per standards laid down by the E.P.A and Fisheries Department. The industrialist may feel the cost of Pre-treatment as a burden, but as a rule, "The Polluter must pay the cost"; The Polluter should bear it.

- 2- The agencies involved in Pollution control must have qualified managers/staff to check at the site of entry of effluents into the natural waters to ensure if proper treatments of effluents have been done. For this purpose availability of adequate lab equipment/facilities is a must.
- 3- Municipalities & corporations must install proper checks & treatments of wastes, before throwing these into natural waters.
- 4- Proper mass motivation by awareness campaign is also needed.

5. Climatic Impacts

Climate has a profound effect on fish and fisheries and allied ecological factors. Every aquatic organism including fish species have adapted themselves to conditions which favour their optimum living conditions. Any change in climatic conditions, will favour some organisms and at the same time disfavour the other organisms and species for example warming of a certain stream will favour the establishment of organisms that require warmer conditions and disfavour the species that require low temperatures. Organic load will reduce the dissolved oxygen concentration and will favour fish species that can live at reduced dissolved oxygen concentrations. Similarly changes in salinity will favour species that are best adapted to the changed salinity and will disfavour the species that are not suited to that change.

6. Changes in River/Canal Ecology

The Pollution process causes elimination of less resistant organisms/Population leaving more resistant species. Process of eutrophication, turns a system, once of economical value and good looking into a system which is uneconomical and bad looking. Where Pollutional load is present round the year, most of the organisms including fish break down. Where Pollution load is present at certain periods of the year, fishes and organisms with only a short span of life can survive and these include fishes of low economical value.

7. Effects of Pollution on Biology of Fishes

Due to Pollution some effects on the biology of fishes may be observed as indicated below:-

- a) Migration: Sub lethal doses of Pollutants may cause migration of fishes to less polluted zone.
- b) Behaviour: Chemo receptors of fishes required for search of food may be interfered with by Pollutants.
- c) Incidence of disease: These may increase.
- d) Life cycle: Interruption at any stage in life cycle can occur.

- e) Physiological Processes: Pollutants may interfere with respiration and other enzymatic processes, affect central nervous system of Fishes, interfere in the hatching of eggs, marine photosynthesis in planktonic algae and interfere with digestion in fishes, etc.
- f) Genetic effects: Pollutants may cause long ranging genetic effects eg; radioactivity can cause mutations; oils & other organic compounds may cause both carcinogenic and mutagenic effects on fishes and other aquatic organisms.

XXI. IV. ADMINISTRATIVE ASPECTS

1. SALIENT FEATURES OF FISHERIES ORDINANCE

- The West Pakistan Fisheries Ordinance 1961 was promulgated on 13-12-1961. It shall now be called as the Punjab Fisheries Ordinance 1961.
- The Government of the Punjab shall appoint inspectors of Fisheries for implementing the Provisions of this Ordinance.
- The Director General Fisheries shall lease out the fishing rights of public waters other than private waters for a period not exceeding three years.
- The lessee shall issue permits to the person for fishing in the water leased out to him.
- No person shall destruct fish by explosives and poison in water.
- No person shall kill fish of a size less than 9 and 12 inches prescribed in the 3rd column of First Schedule.
- No person shall kill fish during breeding season as specified in the 4th column of first schedule.
- Every person fishing in a public water shall be bound to produce licence on demand by an inspector of Fisheries.
- Government shall be empowered to declare by notification any water as sanctuary.
- Every lambardar, village watchman canal Patwari, PWD Darogha, Ziladar, Revenue Patwari and Qanungo shall be bound to inform the Inspector of Fisheries about illegal fishing carried out in their area as & when comes to their knowledge.
- Magistrate shall be empowered to issue search warrant.
- Inspector Fisheries shall be empowered to search any person place or thing and arrest any person without a warrant. He shall also be empowered to seize any thing suspected to have been used in the commission of an offence.
- Who ever contravenes the Provisions of section 6, 7 or 11 shall be punished with imprisonment of 2 years & fine up to Ten Thousand rupees or both.
- Whoever contravenes the provisions of section 8,9,10 or 12 shall be punished with fine that may extend to three thousand rupees.

- Every Police officer on request shall assist the Inspector of Fisheries in the due discharge of his duties under this Ordinance.
- An Inspector of Fisheries shall be empowered to compound cases and accept prescribed composition fee.
- Government has been empowered to make rules for the purpose of carrying into effect the Provisions of this Ordinance.

2. SALIENT FEATURES OF PUNJAB FISHERIES RULES, 1965.

- Part-I speaks about short title & commencement and definitions.
- Part-I. It deals with the kinds of licenses, duration, fee of each license and public waters in which holder of a license shall be allowed to fish.
- Part-I. It deals about leases of fishing rights of public waters, units of auction, departmental operation, payment and refund of lease money, cancellation of lease etc.
- Part-IV. It deals with licenses for fishing in waters reserved for departmental operation, procedure for sale of fish, share of licenses and confiscation of a fish if not brought to the landing center.
- Part-V. it deals about fishing in trout waters (cold waters) through licenses. The rate of licenses has been prescribed.
- Part-VI. It deals with the grant of Provincial Angling licenses along with the procedure, terms & conditions and detail of waters where the holder of this license may fish.
- Appendix-I contains the list of waters for which fishing licenses may be issued (Rule-3).
- Appendix-I contains the list of waters reserved for Rod & Line (Rule-6).
- Appendix-I contains list of waters reserved for Rod & Line (Rule-6).
- Appendix-IV contains list of waters reserved for daily licenses.
- Appendix-V contains list of special water for which licenses will be issued (Rule-7).
- Appendix-VI contains the list of water areas reserved for leases.

XXII.3. SALIENT FEATURES OF THE LOCAL GOVERNMENT ORDINANCE (2001)

- i. The District Governments established under this ordinance shall function within Provincial framework and adhere to Provincial and Federal laws.
- i. The District Government shall consist of Zila Nazim and District Administration.
- i. The District Administration shall comprise the District Offices, including sub-offices of the Department of the Government decentralized to the District Government and other offices set up by the District Governments and grouped under the Executive District Officers and coordinated by the District Coordination Officer.
- iv. The District Coordination group of offices shall be headed by the District Coordination Officer (DCO).
- v. A group of offices, the District Coordination group of offices, shall be headed by an Executive District Officer (EDO).
- vi. The District Officers shall head the district offices.
- v i. The authority of the District Government shall comprise the management and control of offices of the Departments, which are decentralized to it or may be set up under this Ordinance, provided that the District Government shall exercise such authority within the district in accordance with the general policy of the Government.
- vi. Every order of the District Government shall be expressed to be made in the name of the District Government and shall be executed by an officer or authority of the District Government duly authorized.
- ix. The District Government shall be responsible to the people and the Government for improvement of governance and delivery of services within the ambit of the authority decentralized to it under this Ordinance.
- x. The Government shall set up sub-offices of the offices decentralized to district government in every Tehsil or Town in a City district depending upon the needs of such Tehsil or, as the case may be, town for such sub-office.

4. LIST OF WATER AREAS FOR LEASE

1. Multan
 1. River Chenab, Tehsil Multan River Sutlej, Tehsil
 2. Lodhran
 3. River Chenab & Sutlej, Tehsil Shuja Abad
 4. River Chenab & Sutlej, Teh. Jalal^Pur Pirwala
 5. Ailam^Pur Shujabad Canal Sub Division
 6. Rashida Canal
2. Vehari
 1. Pond Area²Head Islam
 3. River Sutlej, Tehsil Vehari River Sutlej, Tehsil
 4. Mailsi
 5. River Khushk Bias, Tehsil Vehari
 6. P.I. Link Canal, District Vehari
 7. Khadar Branch Canal, Tehsil Vehari
 8. Damk^y Canal, Tehsil Vehari
 9. Mailsi Sidhnai Link Canal, Dist: Vehari
3. Khanewal
 1. Pak Pattan Canal
 2. River Ravi & Chanab, Tehsil Kabirwala
 3. River Ravi, Tehsil Mianchannu
 4. Sidhnai Canal, Tehsil Kabirwala
 5. Sidhnai Mailsi Link Canal, Teh. Mianchannu
 6. Nikasu, Tehsil Kabirwala
4. Sahiwal
 1. Lower Bari Doab Canal, Teh. & Dist. Khanewal
 2. River Ravi, Tehsil Sahiwal River Ravi, Tehsil
 3. Chichawatni
 4. River Khushak Biass Pul Bun^ga Ha^yat to Pul Trikhni
 5. River Khushak Biass Pul Trikhni to Pul Kanadan
 6. Lower Bari Doab Canal RD 112 to 417 Lower Bari
 7. Doab Canal RD 417 to 540 Esca^Pe Channal, Tehsil
 8. Chichawatni Cheri S^yphan, District Sahiwal Sahiwal
 9. Pak^Pattan Canal
 10. 1 2/L Head to Tail Tehsil Chichawatni.
 11. 5/L Head to Tail (New water area) 9/L
 12. Head to Tail
5. Pak Pattan
 1. River Sutlej, Tehsil Pak^Pattan
 2. Pak^Pattan Canal RD 112 to 220
 3. Khadar Branch RD 0 to 130. Khadar
 4. Branch Rd 130 to Tail. Pak^Pattan
 5. Canal RD 220 to 340. River Sind,
6. D.G. Khan
 1. Tehsil Dera Ghazi Khan. River Sind,
 2. Tehsil Taunsa. Dera Ghazi Khan
 3. Canal.
 4. Dhan^gano Sub-Division.
 5. Dera Sub-Division.
7. Layyah
 1. River Sind, Tehsil La^yyah.

2. River Sind, Tehsil Karor.
3. Dholewala Canal Unit.
8. Rajan^Pur
 1. River Sind, Tehsil Rojhan
 2. River Sind, Tehsil Rajan^Pur
 3. River Sind, Tehsil Jam^Pur
 4. Qadra Sub-Division Canal 0 to 40
 5. Qadra Sub-Division 40 to Tail
 6. Jam^Pur Sub-Division
 7. Dajal Branch
 8. Talai Sub-Division 0 to 55
 9. Talai Sub-Division 55 to Tail
 10. Sem Nalah Manke
 11. Duba Peomer
9. Muazffar^garh
 1. Pond Area Head Taunsa Barra^e.
 2. River Sindh, Tehsil Kot Addu.
 3. River Sindh, Tehsil Ali Pur.
 4. River Chenab, Tehsil Ali Pur Jatoi
 5. River Chenab, Tehsil Muzaffar^garh.
 6. River Sindh, Tehsil Jatoi.
 7. Pond Area Head Punjnad.
 8. River Sind, Tehsil Shah Jamal.
 9. T.P. Link Canal 0 to 192.
 10. Chatha Khander Canal.
 11. Muzaffar^garh Canal.
 12. Ran^{sp}ur Telri Canal.
 13. Abasia Punjnad Canal.
 14. Sindhri Drain.
 15. Ghatoo Su^{pp}ly Channel.
 16. Jatoi Sub-Division.
 17. Kot Addu Main Drain.
 18. Shaher Sultan-Sub Division.
 19. Dhand Nikka.
 20. D.G.Canal 0 to 22.
 21. Ghazi Ghat Drain (Old and New)
10. Bahawal^Pur
 1. River Sutlej, Tehsil Bahawal^Pur.
 2. River Sutlej, Tehsil Hasil^Pur.
 3. River Chenab & Sutlej, Tehsil Ahmad Pur Shar^qia.
 4. Bahawal Canal RD 0 to 210.
 5. Qaim Canal.
 6. Mailsi Bahawal Link Canal.
 7. Ahmed Pur Branch Canal.
 8. I.R. Desert Branch RD 0 to 78.
 9. I.R. Desert Branch RD 78 to tail.
 10. Abassia Canal.
 11. Punjnad Canal RD 11 to 81.
11. Bahawalna^gar
 1. River Sutlej, Tehsil Minchinabad

- River Sutlej, Tehsil Bahawalnagar
2. River Sutlej, Tehsil Chishtian.
 3. River Ghar, Tehsil Fortabbas.
 4. Sadiya Canal, Tehsil Minchinabad
 5. Hakra Canal.
 6. Malikwah Canal.
 7. Fordwah Canal RD 6 to 71.
 8. Fordwah Canal RD 71 to 125.
 9. Fordwah Canal RD 125 to 245.
 10. Fordwah Canal RD 245 to tail.
 11. Sadiya Feeder, Tehsil Minchinabad.
 12. Diffah Border Area. Saim Nulah
 13. Fordwah. Awami Canal.
 14. Maclod Ganj Canal. Budh
 15. Awanwali. Saim Nulah
 16. Chishtian Kali Budhi Saim
 17. Nulah Dubha Hafizwala Punj
 18. Kosi.
 19. Out fall Drain Tehsil Fort Abbas.
 20. River Sind, Tehsil Sadiabad.
12. R. Y. Khan
21. River Sind and Chenab, Tehsil Liaquat Pur
 1. River Sind, Tehsil Khanpur.
 2. River Sind, Tehsil R. Y. Khan.
 3. Machka Circle No.1. Machka
 4. Circle No.2. Panjnad Canal
 5. RD 81 to 286.
 6. R. Y. Khan Branch Canal.
 7. Sadi Branch Canal.
 8. Purana Dalas.
 9. Dalas Branch Canal.
 10. Minchan Branch Canal.
 11. Abassia Canal.
 12. Daiji Escape .
 13. Malkani Escape .
 14. Sidowali Drain.
 15. Malkani Drain.
 16. Dhand Malkani
 17. Sadi Feeder to Head Chataa Behtaa
 18. River Ravi, Tehsil Samundri.
13. Faisalabad
1. Rakh Branch Canal.
 2. Dicjkot Drain.
 3. Buchiana Escape .
 4. Marh Chiniot.
 5. Goera Branch Canal.

7. S^{yp}hon Kot Khuda Yar.
 8. Jhan^g Branch Canal.
 9. Awa^gat Branch.
14. Jhan^g
1. River Chenab, Tehsil Jhan^g Up Stream
 2. River Jhelum, Tehsil Jhan^g.
 3. River Chaneb Down Stream Jhan^g
 4. River Chenab, Tehsil Shorkot.
 5. River Chenab, Tehsil Chiniot
 6. Jheel Malkana RD 0 to 15 Pond Area Trimmu Headworks
 7. Jheel Korawala RD 0 to 15
 8. T.S. Link Canal R.D 0 to 145
 9. Haveli Mainline Canal RD 0 to 145.
 10. Ran^{sp}ur Canal.
 11. Lower Jhelum Canal Rd 0 to 145
 12. Badowana Minor, Tehsil Shorkot.
 13. Khairwala Drain.
 14. Raniwah Drain.
 15. New Soba^gha Drain.
 16. New Ahmedwala Drain.
 17. Gujana Bhajwana Fish Farm
 18. Ran^{sp}ur Jheel No.4,5,8.
15. T.T.Sin^gh
1. River Ravi Up Stream, u^pto Shahbal Shah Bund, Teh. Kamalia
 2. River Ravi Down Stream, Headworks Sidhnai, Tehsil Kamalia.
 3. T.S. Link Canal RD 146 to 216
 4. Haveli Main Line Canal RD 146 to 216
 5. Old Condom Canal Tehsil Kamalia.
 6. Nikasoo.
 7. River Ravi Down Stream, Shahbale Shah Bund to Sindhnai
 8. Saim/Dran up Stream 95 Pul Teh.Kamalia Dist.T.T. Sin^gh
16. Sar^godha
1. River Jhelum, District Sar^godha.
 2. River Chenab, District Sar^godha.
 3. F.S.Drain Up Hindewali.
 4. F.S.Drain Down Hindewali.
 5. Budhi Drain RD 0-100 Budhi
 6. Drain RD 100-160. Budhi
 7. Drain RD 160-206. Raniwah
 8. Drain RD 60-121. Raniwah
 9. Drain RD 121-182 Mona Drain
 10. RD 17-122. Mona Drain RD
 11. 122-202. Mona Drain RD 202-
 12. 271.

13. Mona Drain RD 27 1-296
 14. Mona Drain RD 296-328.
 15. Sulki Esca^{pe} .
 16. New Bhera Action Drain.
 17. Bucha Drain.
 18. Gondal Minor
 19. Shah^Pur Branch Canal.
 20. Lower Jhelum Canal.
 21. Sahiwal Sial Sharif Drain.
 22. Jahanabad Drain.
 23. Kalra Bhakar
 24. New Budhi Drain.
 25. Hudda Drain.
 26. Talibwala Dhand.
17. Khushab
1. River Jhelum, Tehsil Khushab.
 2. Dip Area Khushab.
 3. Thal Canal Mahajar Branch.
 4. Joharabad Drain.
 5. Ganda Nalah Khushab
 6. Chashma Jhelum Link Canal.
 7. Punj Saim Nalah
18. Mianwali
1. River Sind, Tehsil Isa Khel.
 2. River Sind Down Stream, Tehsil Mianwali
 3. River Sind U^Pstream, Tehsil Mianwali
 4. Chashma Jhelum Link Canal.
 5. Thal Canal Mohajar Branch
19. Bhakkar
1. River Sind U^Pstream, Pul Dar^ya Khan
 2. River Sind Down Stream, Pul Dar^ya Khan
 3. Khaddi Nalah
 4. Thal Canal
20. Jhelum
1. River Jhelum, Tehsil Jhelum
 2. River Jhelum, Tehsil Pind Dadan Khan
21. Attock
1. River Indus, Tehsil Attock & Jand
 2. Nalah Jhablot Tehsil Hassanabdal.
 3. Sukkh Nulah
 4. Shah^Pur Dam
22. Chakwal
1. River Swan, Tehsil Chakwal
 2. River Swan, Tehsil Tala^gan^g
 3. Gandhala Nala, Teh: Choa Saidu Shah
22. Lahore
1. Head Baloki Pond Area Pul Kotoana Qadirabad Link Canal includin^g Chan Dhand No.9 Dhand Lanchanwali, Dhand Zakheera Exce^Pt Dhand Laloo khichi Dhand No.7 Naka Pakkiwala, Teh:Patoki Dist:Kasur.
 2. Dhand Laloo khichi Tehsil Chunian
 3. BRB Canal, District Lahore includin^g Dhands Ravi

- S^yphon Area.
23. Sheikhu^Pura
4. Naka Pakkiwala, Tehsil Chunian
 1. Ravi Bordar Area includin^g Dhands, Tehsil Ferozewala District Sheikhu^Pura
 2. Toor Asil to Chati Jatari, Tehsil Nankana.
 3. Q.B Link Cananl to Pul Khai, Teh. Sheikhu^Pura.
 4. Ranawali Dhand, Tehsil Nankana.
 5. Tor U^{PP}er Chenab Canal ex^Pect Tora Batarian.
 6. Nawan Kot Dhand, Tehsil Nankana.
 7. Marla Ravi Link, Tehsil Ferozewala.
 8. Bahari Pur Dhand, Tehsil Nankana.
 9. U^{PP}er Chenab Canal.
 10. B.R.B. Canal Burji 151 to 204.
 11. B.R.B. Canal Burji 143 to 150.
 12. Ganesh Pur Dhand, Tehsil Nankana.
 13. Dhand Nanu Do^gar Nolan
 14. Dag Diversation, Tehsil Ferozewala.
 15. Dhand Waran Jatan Nawan Kot.
 16. Dhand Dhane^y wali Tehsil ferozwala.
24. Kasur 1 . River Sutlej Up Stream Rohi Nulah Kasur, Tor Rajoke^y and Katora Canal Exce^Pt first ^Portion Tehsil & District Kasur.
2. River Sutlej Down Stream from Head Ganda Sin^ghwala to Indo Pak Burji 218/4 limit, Tehsil Kasur.
 3. River Sutlej Teh: Chunian from Indo Pak Burji 218/4 to limit, Teh: Chunian Dist: Kasur.
 4. River Ravi Down Stream from Head Baloki Tehsil Patoki, Nankana Dist: Kasur/Sheikhu^Pura.
 5. Baloki Sulemanki Link Canal Teh: Patoki/Chunian.
 6. Lower Bari Doab Canal (Hala^ywali)
 7. Rajba Gid^Pur, Teshil Chunian.
 8. Rohi Nulah, Tehsil Chunian Distt: Kasur.
 9. B.R.B Cananl Jal Nathowali includin^g Demu Nulah.
 10. De^Pal^Pur Canal Jal Nathowali includin^g Demu Nulah.
 11. Rohi Nulah Jaman.
 12. U^{PP}er Bari Doab Canal(Mustafabadwali), Teh. Chunian
 13. Dan^gui Dore Sial, Tehsil Chunian Dist: Kasur
 14. Tor Sheikh^Pur Nau tehsil & district Kasur.
25. Okara
1. River Sutlej Up Stream, Teh. De^Pal^Pur.
 2. River Sutlej Down Stream, Tehsil De^Pal^Pur.
 3. Pond Area Head Sulemanki.
 4. River Ravi, Tehsil Okara.
 5. Lower Bari Doab Canal Okara.
 6. Sem Nulah Kamma Islam^Pura.
 7. Pak Pattan Canal R.D 0 to 52.
 8. Pak Pattan Canal R.D 52 to 112.
 9. Khushak Bias, Teshil Okara.

10. Khushak Bias, Tehsil De^{pa}l^{pu}r.
 11. Ford Wah Canal R.D to 0 to 6 .
 12. Saddi^{qu}ia Canal R.D 0 to 6
 13. B.S Link Canal Pul Out Fal includin^g Khada
 14. Khanwah Canal, Tehsil Da^{pa}l^{pu}r.
 15. Lower Soha^g Canal R.D 0 to 78.
 16. Lower Soha^g Canal R.D 78 to Tail.
 17. Go^gara Branch Canal Okara.
26. Gujranwala/
Hafizabad
- 1 . Qadirabad Pond Area exec^{pt} reserved Area Tehsil Wazirabad Dist: G/Wala.
 2. Lower Chenab Canal, Teshil Wazirabad/Hafizabad.
 3. U^{pp}er Chenab to Nandi^{pu}r to end.
 4. River Chenab Down Stream exce^{pt} reserved Area Qadirabad B arran^ge to Talibwala Patan Tehsil Hafizabad.
 5. Qadirabad Baloki Link Canal, Tehsil Hafizabad.
 6. Ahmed^{pu}r Wag Drain, Tehsil Hafizabad.
 7. Jhan^g Branch Canal, Tehsil Hafizabad.
27. Sialkot/
Narowal
- 1 . River Chenab Down Stream Head Marala
 2. U^{pp}er Chenab Down Stream Head Bombiwala includin^g s^yphon.
 3. M.R Link Canal Head Marala to Kotli Bawa Fa^qir Chand
 4. M.R Link Canal Kotli Bawa Fa^qir Chand to limit Sialkot
 5. Ra^{yy}ah Branch Canal
 6. Dum Plot No.2
 7. River Ravi Teh:Shakkar Garh with atached Dhands exce^{pt} Karanwali Dhand and 500 ^yard border area Teh: Shakkar Garh Dist: Narowal
 8. River Ravi,Teh:Narowal out side Bund Chundian and Bhenian The: & Dist: Narowal
 9. Dhand Dauood Bhanian, Teh. & Dist. Narowal.
 10. Nulah Od^ge,Teh. Shakkar Garh from Chhan^yal Bedla^y Ganwal Taud^yal, Dist. Narowal.
 11. M.R Link Canal R.D 237 to end limit Narowal
 12. Dhand Kakeki & Karalanwali,Teh. & Dist.Narowal.
28. Guj rat
- 1 . River Chenab, Tehsil Gujrat
 2. Bhimbar Nulah, Tehsil & District Gujrat
 3. U^{pp}er Jhelum Canal
 4. B.R.K Drain Teh: Kharian Dist. Mandi Baha-Ud-Din
 5. Qadirabad Dhand Tehsil Phalia
 6. River Chanab, Tehsil Phalia
 7. Pond Area Rasool Barra^ge, Teh.Mandi Baha-Ud-Din
 8. Rasool Qadirabad Link Canal, Tehsil Phalia
 9. Lower Jhelum Canal Distt: Mandi Baha-Ud-Din
 10. Budhi Sem Nulah, Teh. Phalia Dist. Mandi Baha-Ud-Din
 11. Jhoul^{pu}r Ban^gla Canal, Tehsil Mailkwal
 12. Bhabra Sem Nulah/Rarka Sem Nulah, Tehsil Phalia

District Mandi Baha-ud-Din

13. Halki Sem Nulah, Tehsil Phalia
14. Qadirabad Sem Nulah, Tehsil Malikwal
15. Power Supply Channel, Tehsil Mandi Baha-Ud-Din
16. Sugar Mill Sem Nulah, Teh & Dist. Mandi Baha-Ud-Din
17. Chot Drain with Mona Drain, Tehsil Phalia
18. Miana Gondal Sem Nulah, Tehsil Malikwal
19. Herya Escape Channel, Tehsil Malikwal
20. Herya Sem Nulah, Tehsil Mailkwal
21. River Jhelum, Dist. Mandi Baha-Ud-Din.
22. Malikwal Drain
23. Khokhran Branch Canal Mandi Baha-Ud-Din
24. Jholpur Banala Escape Channel
25. Govt. Fish Farm Head Rasool Dist. Mandi Baha-ud-Din
26. River Jhelum Teh. Srai Alam Gir
27. Government Fish Farm Head Khanki

XXIII. 5. MAIN ANGLING SPOTS

Name of Water Area	Location	Available Fish
Rohi Nulah, Chunian	Teshil Chunian Kasur	Rohu, Mori, Thaila, Mulee, Sin ^g hari
Ravi Down Stream Head Baloki	Tehsil Chunian Kasur	Rohu, Mori, Thaila, Mulee, Sin ^g hari
Dhand Mohalanwal	Near Vila ^g e Chun ^g Multan Road, Lahore	Rohu, Mori, Thaila, Mulee
Dhand No.5, 6, 7, & 8	Head Baloki Tehsil Chunian, Kasur	Rohu, Mori, Thaila, Mulee, Sin ^g hari, Kha ^{gg} a
Hiran Minar	6 km from Sheikhu ^p ura	Rohu, Mori Silver Car ^p , Gulfam
Khanki Head Works	On Rasul Na ^g ar Road, 48 km from Gujranwala	Rohu, Mori, Sin ^g hari.
Qadirabad Head Works	53 km from Gujranwala on	Rohu, Mori, Sin ^g hari
Junction of River Chenab & Manawar Tavi	27 km from Sialkot	Rohu, Mori
Marala Barra ^g e	River Chenab at Marala Barra ^g e, 24 km from Sialkot	Rohu, Mori, Mulee
Government Fish Farm Himat ^p ura	A ^g riculture University, Faisalabad	Rohu, Mori, Silver Car ^p , Thaila, Gulfam.
Trimmu Head Works	22 km from Jhan ^g on Bhakkar Road	Rohu, Mori, Thaila, Mulee, Kha ^{gg} ar, Kalbans
Reserve Area Chashma	38 km from Main Wali on D. I. Khan Road	Rohu, Mori, Gulfam
Palkhoo Reserve Area	2 km from Vazirabad Gujrat Road	Rohu, Mori
Old Sidhnai Head Works	9 km from Abdul Hakim District Khanewal	Rohu, Mori, Kha ^{gg} a
Palah Head Works	River Sutlej Near Vehari	Rohu, Mori
Punjnad Head Works	17 km from Ali ^p ur District Muzaffar ^g arh	Rohu, Mori
Taunsa Barra ^g e	9 km from Kot Addu on D. G. Khan Road	Rohu, Mori, Gulfam, Mulee,
Dhand Sheru	25 km from D. G. Khan near vila ^g e Imam Jhakar Shah	Rohu, Thaila, Mulee
Sulemanki Head Works	56 km from Okara	Rohu, Thaila, Mulee

V. FISH SPECIES AND AQUATIC VEGETATION

In addition to the knowledge about potential fishery resources it is essential that the fishery officers should have the knowledge of the fish-fauna and should be able to identify the early stages of the important culturable species of fishes. Unless they possess the requisite knowledge all efforts made may go in vain, or may even prove destructive. The scientific names of all the important freshwater species of fish fauna in Punjab Pakistan with their local names are given. The scientific names will help the officers to study the literature on different species of fish published in India and elsewhere and the local names to help them to correctly identify them. Armed with this knowledge the officers will be able to stock the ponds with right types of fish in correct proportion.

1. FISHES OF PUNJAB

XXIV. FAMILY NAME	XXV. SCIENTIFIC NAME	COMMON NAME
Barridae	<i>Aorichthys aor</i>	Singhari
	<i>Batasio Pakistanicus</i>	Batasio
	<i>Mystus bleekeri</i>	Bleekri
	<i>Mystus cavasius</i>	Teenara
	<i>Mystus horal</i>	Horaki Keenar
	<i>Mystus vitatus</i>	Keenar
	<i>Rita rita</i>	Khara
Chandidae	<i>Chanda baculis</i>	Baculis shisha
	<i>Chanda nama</i>	Nama shisha
	<i>Chanda rana</i>	Rana shisha
	<i>Channa achua</i>	Dauli
	<i>Channa marulius</i>	Saul
	<i>Channa punctata</i>	Daula
	<i>Channa striatus</i>	Sauli
Cobitidae	<i>Botia birdi</i>	Botia
	<i>Botia lohachata</i>	Botia
Cyprinidae	<i>Amblypharyngodon mola</i>	Amblypharyngodon mola
	<i>Aspidoaria morar</i>	Aam Chilwa
	<i>Barbodes sarana</i>	Khurni
	<i>Barilius bendelisis</i>	Patha Chilwa
	<i>Barilius naseeri</i>	Naseeri Chilwa
	<i>Barilius Pakistanicus</i>	Pakistani Chilwa
	<i>Barilius varra & Barilius modestus</i>	Lahori Chilwa
	<i>Brachydanio rerio</i>	Zebra Machli
	<i>Carassius auratus</i>	Sunehri machli
	<i>Catla catla</i>	Theila
	<i>Cirrhinus mrigala</i>	Mori
<i>Cirrhinus reba</i>	Sunni	

XXVI. FAMILY NAME	XXVII. SCIENTIFIC NAME	COMMON NAME
Cy ^p rinidae	Cteno ^p haryn ^g odon idela	Grass car ^p
	Cy ^p rinion watsoni	Watsoni sabza ^g
	Cy ^p rinus car ^p io	Gulfam
	Esomus danricus	Soomara Machli
	Hy ^p o ^p thalmichthys molitrix	Silver car ^p
	Labeo bo ^g a	Bhan ^g an
	Labeo bo ^g ut	Bhan ^g ana
	Labeo calbasu	Kalbans
	Labeo dero	Pahari rohu
	Labeo dyocheilus ^p akistanicus	Torki
	Labeo ^g onius	Sareeha
	Labeo rohita	Rohu
	Osteobrama cotio	Paliro
	Puntius chola	Kola ^p o ^p ra
	Puntius conchonius	Gulabi barb
	Puntius ^g elius	Gelius ^p o ^p ra
	Puntius pun jabensis	Punjabi ^p o ^p ra
	Puntius so ^p hore	So ^p hore ^p o ^p ra
	Racoma labiata	Chun
	Salmostoma bacaila	Choti Chal
	Salmtostoma ^p unjabensis	Punjabi Chal
	Securicula ^g ora	Bari Chal
	Tor ^p utitora	Mahseer
Mastcembelidae	Mastacembelus arm atus	Bam
	Mastacembelus ^p ancalus	Grooj
Nandidae	Nandus nandus	Pata
Neomacheilidae	Schistura curtisti ^g ma	Shistura
	Schistura ^p rashari	Shistura
	Schistura pun jabensis	Shistura
	Schistura shadiwalensis	Shistura
	Shistura nalbanti	Shistura
Noto ^p teridae	Gudusia cha pra	Pali
	Noto ^p terus chitala	Cheetal Pari
	Noto ^p terus noto ^p terus	But Pari
Os ^p hranomidae	Colisa fasciata	Bari kan ^g hi
	Colisa lalia	Choti kan ^g hi
	Oreochromis mossambica	Tila ^p ia
Salmonidae	Oncorhynchus mykiss	Rainbow Trout
Schilbeidae	Eutro ^p ichthys vacha	Jhali
	Pseudeutro ^p ius atherinoides	Chaali
	Clu ^p isoma ^g arua	Bachwa
	Clu ^p isoma murius	Aahi
Siluridae	Hetero ^p neustes fossilis	Sin ^g hi
	Om ^p ok bimaculatus	Pafta
XXVIII. FAMILY NAME	XXIX. SCIENTIFIC NAME	COMMON NAME

Siluridae	Wala ^g o atu	Mulee
Sisoridae	Ba ^g arius ba ^g arius	Goonch, Fauji
		Kha ^{gg} a
	Ga ^g ata cenia	Ga ^g eeta
	Gly ^p tothorax cavia	Kani tin ^g ara
	Gly ^p tothorax stocki	Stocki ^p ahari
		Kha ^{gg} a
	Nan ^g ra nan ^g ra	Nan ^g ra
	Nan ^g ra robusta	Nan ^g ra
Synbranchidae	Mono ^p terus cuchia	Cuchia
Xenentodontidae	A ^p locheilus ^p anchax	Lal jheen ^g ra
	Xenentodon cancila	Kaan

VERNACULAR NAMES OF FISHES WITH THEIR EQUIVALENT SCIENTIFIC NAMES

COMMON NAME	XXX. SCIENTIFIC NAME
Aahi	Clu ^p isoma murius
Aam Chilwa	As ^p idoaria morar
Ambly ^p har ^y n ^g odon mola	Ambly ^p haryn ^g odon mola
Bachwa	Clu ^p isoma ^g arua
Baculis shisha	Chanda baculis
Bam	Mastacembelus arm atus
Bari Chal	Securicula ^g ora
Bari kan ^g hi	Colisa fasciata
Batasio	Batasio ^p akistanicus
Bhan ^g an	Labeo bo ^g a
Bhan ^g ana	Labeo bo ^{gg} ut
Bleekri	Mystus bleekeri
Botia	Botia birdi
Botia	Botia lohachata
But Pari	Noto ^p terus noto ^p terus
Chaali	Pseudeutro ^p ius atherinoides
Cheetal Pari	Noto ^p terus chitala
Choti Chal	Salmostoma bacaila
Choti kan ^g hi	Colisa lalia
Chun	Racoma labiata
Cuchia	Mono ^p terus cuchia
Daula	Channa ^p unctata
Dauli	Channa ^g achua
Ga ^g eeta	Ga ^g ata cenia
Gelius ^p o ^p ra	Puntius ^g elius
Goonch, Fauji Kha ^{gg} a	Ba ^g arius ba ^g arius
Grass car ^p	Cteno ^p haryn ^g odon idela
Grooj	Mastacembelus ^p ancalus

COMMON NAME	XXXI. SCIENTIFIC NAME
Gulabi barb	<u>Puntius conchonius</u>

Gulfam	Cy ^p rinus car ^p io
Horaki Keen ^g ar	Mystus horal
Jhali	Eutro ^p ichthys vacha
Kaan	Xenentodon cancila
Kalbans	Labeo calbasu
Kani tin ^g ara	Gly ^p tothorax cavia
Keen ^g ar	Mystus vitatus
Kha ^g ga	Rita rita
Khurni	Barbodes sarana
Kola ^p o ^p ra	Puntius chola
Lahori Chilwa	Barilius va ^g ra & Barilius modestus
Lal jheen ^g ra	A ^p locheilus ^p anchax
Mahseer	Tor ^p utitora
Mori	Cirrhinus mri ^g ala
Mulee	Wala ^g o atu
Nama shisha	Chanda nama
Nan ^g ra	Nan ^g ra nan ^g ra
Nan ^g ra	Nan ^g ra robusta
Naseeri Chilwa	Barilius naseeri
Pafta	Om ^p ok bimaculatus
Pahari rohu	Labeo dero
Pakistani Chilwa	Barilius ^p akistanicus
Paliro	Osteobrama cotio
Pali	Gudusia cha ^p ra
Patha Chilwa	Barilius bendelisis
Patta	Nandus nandus
Punjabi Chal	Salmostoma pun jabensis
Punjabi ^p o ^p ra	Puntius pun jabensis
Rainbow Trout	Oncorhynchus mykiss
Ran ^g a shisha	Chanda ran ^g a
Rohu	Labeo rohita
Sareeha	Labeo ^g onius
Saul	Channa marulius
Sauli	Channa striatus
Shistura	Schistura curtisti ^g ma
Shistura	Schistura ^p rashari
Shistura	Schistura pun jabensis
Shistura	Schistura shadiwalensis
Shistura	Shistura nalbanti
Silver car ^p	Hy ^p o ^p thalmichthys molitrix
Sin ^g hari	Aorichthys aor
Sin ^g hi	Hetero ^p neustes fossilis

COMMON NAME	XXXII. SCIENTIFIC NAME
Soomara Machli	Esomus danricus
So ^p hore ^p o ^p ra	Puntius so ^p hore
Stocki ^p ahari Kha ^g ga	Gly ^p tothorax stocki
Sunehri machli	Carassius auratus

Sunni	Cirrhinus reba
Teen ^g ara	Mystus cavasius
Theila	Catla catla
Tila ^P ia	Oreochromis mossambica
Torki	Labeo dyocheilus ^P akistanicus
Watsoni sabza ^g	Cy ^P rinion watsoni
Zebra Machli	Brachydanio rerio

2. AQUATIC VEGETATION

	<u>LOCAL NAME</u>	<u>SCIENTIFIC NAME</u>
1.	Ali ^g ator weed	Alternanthera sessilis
2.	Bladder wort	Utricularia flexuosa
3.	Cockscrew	Vallisneria spiralis
4.	Common contail	Ceratophyllum demersum
5.	Common reed	Phra ^g mites communis
6.	Curl ^y leaf ^P ond weed	Potamo ^g eton crispus
7.	Duck weed	Lemna paucicostata
8.	Eel ^g rass	Vallisneria spiralis
9.	Eurasian water milfoil	Myriophyllum spicatum
10.	Gulbakauli	Eichhornia crassipoes
11.	Horned ^P ond weed	Zannichellia palustris
12.	Hydrila	Hydrilla verticillata
13.	Kanwal or Lotus	Nelumbium nelumbo
14.	Lesser catail	Typha an ^g ustata Najas
15.	Naiad	^g raminer Nymphaea lotus
16.	Nilofar	Typha au ^g usta Trapa
17.	Pan	bispinosa Trapa bispinosa
18.	Sin ^g hara	Echhornia crassipes
19.	Water chestnue	Pisia stratiotes
20.	Water hyacinth	Nymphaea lotus
21.	Water letuce	
22.	Water lil ^y	

3. PLANKTON

The ^Plankton communit^y is a mixed ^grou^P of tin^y ^Plants and animals floatin^g, driftin^g or feebly swimmin^g in the water mass. The freshwater ^Plankton lacks man^y elements that are abundant in the sea, where nearl^y ever^y ^Phylum is re^Presented.

The individual ^Plant, animal or bacterium in the ^Plankton communit^y is caled a ^Plankter. The ^Plant ^Plankton com^Prise the ^Ph^yto^Plankton and the animal ^Plankton are the zoo^Plankton.

The com^Plex ^Plankton communit^y com^Pprises ^Primar^y ^Producers, herbivores, carnivores, detritivores and decom^Poser or^ganisms. Thus ^Prokar^yotes, ^Plants and animals are the ^Plankton. Of these the ^Primar^y ^Producers are the basis for the ^Planktonic food web and for food ener^gy in other a^quatic communities. The^y are the ^Photos^ynthetic al^gae and C^yanobacteria, joined occasional^y by other ^Photos^ynthetic bacteria.

The Plankton play a prominent role in providing the fishes with food. Nearly all marine life or even freshwater animals are ultimately dependent upon planktonic life for existence. They have been the subject of many studies on adaptations for flotation. Oil droplets, gas bubbles, gelatinous envelopes and water filled and saccoid bodies are adaptations for reducing weight or specific gravity. Horns, spines, setae and elongated stick like bodies are some of the structures that increase total surface area and resistance to sinking.

They have been classified on the basis of their sizes. The commonly encountered plankton in freshwaters of Punjab are Scenedesmus, Daphnia, Sphaerocystis, diatoms, flagellates, Dinobryon, Hydrodictyon, Peridinium, Volvox, Nitela, etc.

4. COMMONLY FOUND FISHES (a)

CARNIVOROUS FISHES

i. Channa marulius (saul)

This belongs to snakehead group of freshwater fishes inhabiting large lakes and rivers. It prefers deep stretches of water with sandy or rocky bottom. It is locally called as Saul and is highly valued for its flesh

Geographical Distribution

This fish is commonly found in Pakistan, Nepal, Bangladesh, Burma, Thailand, China, Kampuchea and Sri Lanka.

Distinguishing Characters

A large fish, body elongate and sub-cylindrical, head and mouth large, lower jaw with 7-18 canines, dorsal fin extends from head to the caudal region, caudal fin rounded. Plate like scales on the head. Pectoral fins about half head length. 56-70 scales on lateral line. Since these fishes inhabit a variety of environments, their color differs accordingly. Usually above lateral line reddish with 5 or 6 dark oval blotches on flanks; below lateral line between blotches pale yellow, distinct white spots scattered on body. Juveniles with an orange band running from eye to middle of caudal fin

Feeding

It is a carnivorous fish and usually feeds on fishes, frogs, snails and other small aquatic animals. As such, it takes live bait well, particularly frogs.

Breeding

Its spawning period extends from April to June. During this period the pairs of this fish form floating nests. The eggs are yellowish red with 2mm dia. Nests are guarded both by male & female. Eggs are hatched within 30- 54 hours and the fry

remains guarded by the parents for about six weeks. It attains length of more than 120 cm.

Prospects in Aquaculture

In view of its popularity for taste and compactness of flesh, the Department of Fisheries Punjab is considering this fish for aquaculture after conducting detailed studies on its biology and adaptation to controlled conditions.

i. Walao attu (Mullee)

It is a freshwater river and Lake Fish found in Indus Plains and adjoining hilly areas in Pakistan. Moreover it is common in India, Nepal, Bangladesh, Burma, Thailand, Vietnam, Kampuchea, the Malay Peninsula, Sumatra and Java. Its local name is Mulee.

Distinctive Characters

Body elongate and compressed, snout round, mouth wide, its gape extends posteriorly beyond eyes. Two broad bands of conical teeth. Barbels two pairs; Maxillary pair long, extends beyond origin of anal fin, the mandibular pair much shorter. Dorsal fin short inserted slightly in advance of pelvic fins. Pectoral spine weak. Caudal fin deeply forked, its upper lobe longer. Skin is scaleless. Color of body is silvery or sometimes olive.

Feeding

It is extremely carnivorous and feeds on all types of aquatic animals as well as on dead bodies. As such, it is also called "Freshwater Shark".

Breeding

It breeds during July and August. The eggs are yellowish with a diameter ranging from 1.2 - 1.5 mm. It grows to about 2mm and weighs more than 40 kg.

Prospects in Aquaculture

Although it is included in the same fishes of Pakistan, its taste and meat is not liked very much due to its feeding on dead bodies. Moreover, due to its carnivorous habits and low market value it is not used in aquaculture practices.

i. Aorichthys aor (Singharee)

It is a common giant catfish of freshwater rivers, lakes, channels and reservoirs. It is locally called as "Singharee", "Seenh" and "Singhara".

Geographical Distribution

It is a well-known fish of Indo-Pak Subcontinent. Moreover, it is also found in Nepal and upper Burma. In Pakistan, this fish has been reported in the rivers, streams and also stagnant waters.

Distinguishing Characters

Body stout and compressed. Snout broad and speculate. Mouth subterminal, barbels four pairs which extend posteriorly to pelvic fin. Dorsal spine weakly serrated on its posterior edge; adipose fin base short about as long as rayed dorsal fin base. Scaleless skin. It is brownish gray on back, silver on flanks and belly.

Feeding

It is a carnivorous fish and feeds on different aquatic animals including crustaceans, molluscs, frogs and small fishes.

Breeding

It breeds during May, June & July and attains a length of more than 2m. This fish is very much liked for its flesh (with nominal intramuscular bones), taste and sport. It comes easily both on dead and live baits.

Prospects in Aquaculture

Although it is a carnivorous fish yet keeping in view its other qualities pertaining to its popularity for taste, flesh, easy dressing and fileting, the Department of Fisheries, Punjab is considering it for its monoculture. As such, the detailed biological studies along with its artificial/ induced breeding are included in the future plan.

iv. Rita rita (Khaḡa)

It is one of the famous catfishes of freshwater esteemed as a food and game fish. Rita rita is locally called as "Khaḡa" and "Tirkanda". The anglers enjoy the way this fish plays during angling.

Geographical Distribution

This fish inhabits freshwaters of most of the South Asian countries including Afghanistan, Pakistan, India, Nepal, Bangladesh and Burma. In Pakistan, it is common in Indus plain and most of the freshwater streams, nalas and ponds.

Distinguishing Characters

Body is elongate. Head somewhat depressed. Mouth transverse, provided with small teeth arranged in bands. Barbels three pairs. Dorsal and pectoral spines are stout and strong. Body is scaleless. Lateral line straight. The color is greenish brown on the back and on flanks, dull white on abdomen.

Feedin^g

Rita rita is a carnivorous fish. It mostl^y feeds on insects, ^youn^g fishes, molusks and also on carrion. It comes ver^y easil^y on live baits like worms and smal fishes as wel as dead baits.

Breedin^g

This fish atains maturity at 380mm sta^ge. It breeds durin^g May to Se^ptember with ^pea^k durin^g Jul^y to Au^gust. It attains a maximum len^gth of one meter or even more but commonl^y it is found in smal sizes.

Pros^pects in A^quaculture

Rita rita is a meat^y and stout fish and is ver^y much esteemed as food. As such some ^preliminar^y studies on its culture have also been undertaken. However, due to smal size, slow ^growth and carnivorous habit it is not used in fish culture ^practices.

v. Noto^pterus sp. (Pari)

This fish belon^gs to famil^y noto^pteridae. The fish of this famil^y ^predominantl^y inhabit tro^pical freshwaters and brackish water. These fish have diverse bod^y form and size. Genus Noto^pterus is re^presented by two s^pecies namel^y, N. noto^pterus and N. chitala in Pakistan. These fishes are often seen at the surface, s^plashin^g and ex^posin^g their silver^y flanks. N. chitala atains a maximum len^gth up to 122cm, whereas N. not opterus is a smal fish and atains a maximum len^gth of 60cm. Presence of 15-silver^y bars on back and a hum^p in N. chitala can easil^y distin^guish it from N. noto^pterus

XXXIII. Geo^gra^phical Distribution

These fishes inhabit ^particularl^y lar^ger rivers and flood ^plains. These are also found in sta^gnant backwaters. Three ^genera are found in tro^pical Africa and East Asia, whereas one namel^y Noto^pterus in India and Pakistan, Ban^gladesh, Burma, Thailand, Mala^ya and Indonesia.

XXXIV. Distin^guishin^g Characters

A ver^y lon^g anal fin which be^gins just behind the head and extends alon^g the under surface of the bod^y to tip of the caudal fin. Caudal fin confluent with anal fin. On the dorsal side in the center is a smal slender dorsal fin from which the fish derives the name “ Feather-back.” Pelvic fins rudimentar^y, scales smal, lateral line com^plete. These fishes are du^l on the back and silver^y on the sides.

Feedin^g

It is a carnivorous fish feedin^g on live foods, a^quatic insects, snails and surface swimmin^g fishes. It mostl^y feeds durin^g ni^ght time, therefore, it is also caled nocturnal ^predator.

Breeding

During the rainy season, the sexually mature specimens migrate to flooded swamps. The eggs are laid on aquatic plants, fallen trees and branches in the water. They are guarded by the male who fans the spawn to keep them aerated. After production of fry they return to the main streams along with their fry.

Prospects in Aquaculture

Although it is regarded as a good game fish yet due to its carnivorous habits, slow growth and presence of a large number of intra-muscular bones in its flesh, it is not used as a culturable species of fish for aquaculture practices.

vi. *Bagarius bagarius* (Fauji Kha^{ga})

This fish belongs to family Sisoridae. Sisoridae is an exclusively Asian family of bottom dwelling catfishes. Most with more or less thickened leather skins. The genus *Bagarius* of this family has head and body covered by heavily keratinised skin superficially differentiated into uncalciferous plaques or tubercles. *Bagarius bagarius* is the well known member of this genus found in Pakistan. It is locally called "Fauji Kha^{ga}" or "Gonch".

Geographical distribution

These fishes are mainly inhabitants of rapid and rocky pools. *Bagarius bagarius* is found in Punjab, Sind, N.W.F.P in Pakistan and other Asian countries including India, Nepal, Bangladesh, Burma, Thailand, Malaysia and Indonesia. Distinguishing characters

The body of this fish is rather elongate, head depressed. Mouth is inferior and crescentic, barbels four pairs. Dorsal fin inserted near to adipose fin than to snout tip. Pelvic fins inserted anterior to a ventral line through base of last dorsal fin ray. Abdominal vertebrae 17 to 20. Body is green or olivaceous to rich green tan or brown, with darkly pigmented bands or blotches. Caudal fin light yellowish grey; paired fins with black spots.

Feeding

B. bagarius is a strongly carnivorous and voracious fish. It preys on a variety of fishes and other live food. It also feeds on carrion.

Breeding

Its breeding season starts prior to the commencement of the monsoon rains.

Prospectus in aquaculture

This is one of the largest Asian catfish and so far the largest member of Sisoridae.

It grows to 120 kg in weight and 2 m in length. The flesh is not much relished being very stiff and fibrous. This fish is also called freshwater shark because of its strong

voracious and carnivorous feeding habits. Due to these demerits it has not been included in the list of culturable species of fishes.

(b) HERBIVOROUS FISHES i.

Kalbans (*Labeo calbasu*)

Geographical Distribution

This fish is commonly found in Pakistan, India, Nepal, Bangladesh, Burma, Thailand, China and Sri Lanka.

Morphological Characters

Its body is deep and well build. the mouth is narrow, depressed and obtuse in frontal region. Four barbels are present along the sides of the mouth. Lips are thick and fringed. Color of the body grayish, dusky and darkish. The eyes are reddish in color. There are pores on upper lip and snout.

Feeding

It is a herbivorous fish and feed on decayed or bottom vegetation like other culture-able species. The fry usually feed on unicellular algae and zooplankton. The adult fish also feeds on Molluscs.

Breeding

Its spawning period extends from April to late July. The pattern of breeding is similar to that of rohu and thaila. In captivity, it can not be bred except through induced spawning. Pairing occurs during the period of spawning. The spawning temperature is 20-26°C. Fecundity rate is about 70,000 eggs/kg body weight.

Prospects in Aquaculture

It is very delicious fish. Its growth rate is poor compared to other culture-able species, due to this reason it is not preferred to culture. However department of Fisheries has launched a project to study the breeding habits and its adaptation in prevailing culture system.

i. Sariha (*Labeo gonius*)

Geographical Distribution

This fish is commonly found in Pakistan, India, Nepal, Bangladesh, Burma, Thailand and China.

Morphological Characters

It is similar to rohu and kalbans. The number and size of scales are more than rohu and kalbans. The body is deep and well build. The mouth is narrow, depressed

and obtuse in frontal region. Four barbels along the sides of the mouth. Lips are thick and fringed. Color of the body grayish, dusky and darkish.

Feeding

It is an omnivorous fish and eat plankton (both zoo & phytoplankton), insects and crustaceans. The fry usually feed on unicellular algae and zooplankton.

Breeding

Its spawning period extends from April to late July. The pattern of breeding is similar to that of rohu and thaila. In captivity, it can not be bred except through induced spawning. Pairing occurs during the period of spawning. There is external fertilization and no parental care. The spawning temperature is 20-26 °C. Fecundity rate is about 70,000 eggs/kg body weight.

Prospects in Aquaculture

It is very delicious fish. Its growth rate is poor compared to other culture-able species, due to this reason it is not preferred to culture.

Pahari rohu (*Labeo dero*)

Geographical Distribution

Pakistan, India, Nepal, Bangladesh, Burma, Thailand, China and Sri Lanka.

Morphological Characters

Its body well build and sub-cylindrical. Its head is small and 20 % of the whole body. The depth of body is deep and equal to the length of head. The dorsal side of the snout has deep groove. Many small pits are present on snout. There is no lobe on lateral side of snout. The mouth is big and inferior. The lower lip bears a number of dorsal papillae. The lower jaw bears a horny layer. Only two small maxillary barbels are present on the sides of the mouth. The eyes are located in the posterior half of the head. The diameter of the eye is 25 % of head length. The dorsal fin originates between snout and base of tail. The dorsal fin is somewhat elevated than the head and bears 13 rays. The pectoral and pelvic fins are small and carry 18 and 09 rays respectively. Anal fin is also small and has 8 rays. The caudal fin is forked and is longer than head. On lateral line, there are 41-43 scales. Color of the dorsal side is brownish while rest of the body is silver. On each scale, there is conspicuous red line. The eyes are reddish in color. There are pores on upper lip and snout.

Feeding

Basically it is herbivorous fish and eat planktons and insects. It is the substitute of rohu in mountainous area.

Breeding

It spawns during July to August. The pattern of breeding is similar to that of rohu and thaila. The temperature required for spawning is 20-26 °C. Fecundity rate is about 50,000 eggs/kg body weight.

Prospects in Aquaculture

Its growth rate is poor compared to other culture-able species. Therefore, it is not commonly cultured in central and southern Punjab.

iv. Torki (*Labeo dyocheilus pakistanicus*)

Geographical Distribution

Pakistan, India, Nepal, Bangladesh, Burma, Thailand, China and Sri Lanka.

Morphological Characters

It is similar to pahari rohu, however it differs from pahri rohu in having lobes on each side of snout. Snout has no groove on dorsal side as is present in case of Pahri rohu. Only two small maxillary barbels are present on the sides of the mouth.

Feeding

It is herbivorous fish and its feeding behavior is similar to other carps. It is the substitute of rohu in mountainous area.

Breeding

It spawns during July to August. The pattern of breeding is similar to that of rohu and thaila. The temperature required for reproduction is 20-26 °C. Fecundity rate is about 50,000 eggs/kg body weight.

Prospects in Aquaculture

Its growth rate is poor as compared to other culture-able species. It is not commonly cultured in central and southern Punjab.

v. Sunni (*Cirrhinus reba*)

Geographical Distribution

This fish is commonly found in Pakistan, India, Russia, Nepal, Bangladesh, Burma, Thailand and China.

Morphological Characters

It is similar to mrigal, but differ in color and size. Its body is stout and head is small. Mouth opens on ventral side. Its lips are thin there are two rostral barbels around the mouth. Dorsal fins contain 11-12 rays. Caudal fin is forked. The scales are hexagonal and are 35-37 on the lateral line. Its color is silvery and the margin of scales are bluish. Eyes are golden.

Feeding

It is mainly herbivorous fish and usually feeds on small insects and crustaceans.

Breeding

Its spawning period extends from April to late July. Breeding starts during rainy season in nature. However, in captivity, it can not be bred except through induced spawning. The optimal temperature for spawning is 17-27 °C. Fecundity rate is about 80,000 eggs/kg body weight.

Prospects in Aquaculture

It attains maximum length of 60 cm. It contains a number of intermuscular bones. As such, it has low market value and is not included in the culture system.

vi. Tilapia mossambica

Tilapia is a hardy fish belonging to Cichlidae family. The fish is endemic to Africa but during the last five decades they have been introduced to many parts of the world. Tilapia is being successfully cultured in many countries both in fresh and saline waters. Tilapia are grouped on the basis of their feeding/ breeding habits and anatomical differences under the following genera:

i) Tilapia

i) Sarotherodon i) Oreochromis

These fishes are now well known in Indo-Pak due to their hardy nature and prolific breeding in open ponds.

XXXV.

XXXVI. Geographical Distribution

They are found in Java, Malaysia, Philippines, Thailand, Sri Lanka, Pakistan, India, Vietnam, Zaire, Madagascar, Mozambique, Zimbabwe, Tanzania, & Uganda and other African countries. Since 1985 it is abundantly cultured in Pakistan, particularly in extreme climatic conditions. Tilapias were introduced in Pakistan due to their quality of growing equally well in saline and in brackish waters. Tilapia is presently growing well in Kharal Lake Okara, Khabaki Khushab, Budh Mahi Bahawalnagar, Lal Sohanra Bahawalpur, & Kalar Kahar lake Chakwal.

XXXVII.

XXXVIII. Distinguishing Characters

There are about 77 species of Tilapia in the world in which 20-25 are most important. They all have oblong body shapes with long dorsal fins, which have 23-31 fin rays. The nose has one nostril on each side. Head is upwardly concave. Their color ranges from olive grey to blackish brown and bright golden. Its size varies from 10 to 40cm.

XXXIX. Feeding

Tilapias are omnivorous fishes. Various species of Tilapia feed on variety of natural food items e.g., *S. alilaeus* are mainly herbivores, *S. mosambicus* & *T. rendalli* are phytoplankton eater whereas *S. alcalicus* mostly feeds on dead phytoplankton deposits.

Breeding

They become sexually mature at an age of just 2-3 months. They breed in standing waters. In Pakistan Tilapia breeds three to four times a year. Their optimum temperature range is between 20-30 °C. They produce several hundred sticky eggs and brood the eggs and larvae in their mouth. These fishes breed frequently in the pond resulting in over population, which can be prevented through use of suitable systems.

XL. Prospects in Aquaculture

Now-a days UNDP, A.D.B and several other agencies are taking interest in cultivation of Tilapia due to its euryhaline nature which enable them to survive even in 30,000 ppm salinity & water-logged environment. In Pakistan every year 1.601.7 million land becomes useless either due to salinity or water logging. These areas can be used for Tilapia farming because of their hardy nature. As such, the detailed scientific studies and surveys are being made by the Department of Fisheries Punjab to undertake successful culturing of this fish in the said areas.

Although Tilapia has been introduced to many brackish natural water bodies but its prospects in Pakistani polyculture system are minimum. Efforts are made to restrict the species to few natural habitat.

Experiments for mono-sex culture through sex reversal and other techniques are underway to exploit aquaculture potential of the species.

c. CULTURABLE FISHES

i. i. Rohu (*Labeo rohita*)

Geographical Distribution

This fish is commonly found in Pakistan, India, Nepal, Bangladesh, Burma, Thailand, China, Kampuchea and Sri Lanka.

Morphological Characters

Its body is deep and dorsal profile is more concave than abdomen. Snout is obtuse and compressed, projecting beyond the jaws. Lips are thick and fringed with distinct inner fold. Generally one pair of small maxillary barbels is present and sometimes a second rostral pair is present. Lateral line scales are 40-42. Color of the body is bluish or brownish along the back and silvery on the sides and beneath. Usually a red mark is present on each scale.

Feeding

Rohu is an omnivore fish and usually takes increasing quantities of decayed vegetable matter including higher plants, which might form more than half the bulk of its food. The fry usually feed on unicellular algae and zooplankton.

Breeding

Its spawning period extends from April to late July. In captivity, it can not be bred except through induced spawning. Pairing occurs during the period of spawning. There is external fertilization and no parental care. The spawning temperature is 20-26°C. Fecundity rate is about 100,000 eggs per kilogram body weight.

Prospects in Aquaculture

It is very popular and considered an excellent food. Due to high demand and price in the market, it is commonly cultured in the province of Punjab along with other species.

i. Thaila (*Catla catla*) Geographical Distribution

Pakistan, India, Nepal, Bangladesh, Burma, Thailand, China, Kampuchea and Sri Lanka.

Morphological Characters

It possesses elongated body, curved on ventral and dorsal sides. There is a pair of small barbels on upper jaw. Mouth is small. Body is scaled except mouth and head. Red spot on each scale. Dorsal side of body is bluish and silver on the side.

Feeding

It is surface-feeder. Adult usually feeds on phytoplankton, zooplankton, small insects and crustaceans. During fingerling stage, it feeds mostly on crustaceans and algae.

Breeding

Its spawning period extends from April to late July. In captivity, it can not be bred except through induced spawning. Pairing occur during the period of spawning. There is external fertilization and no parental care. The temperature required for reproduction is 20-26 °C. Fecundity rate is about 100,000 eggs per kg body weight. Eggs are hatched within 8-12 hours.

Prospects in Aquaculture

Due to reasonable price in the market, it is commonly cultured in the province of Punjab along with other species.

Mrigal (*Cirrhinus mrigala*)

Geographical Distribution

This fish is commonly found in Pakistan, India, Russia, Nepal, Bangladesh, Burma, Thailand, China, Kampuchea and Sri Lanka.

Morphological Characters

A large fish, body oblong and moderately compressed. Width of head equal to length behind the eyes which is located in the anterior half of the head. One pair of barbels present. Scales of moderate size; lateral line scales 40 to 45. caudal fin deeply forked. Color of the body is silver, dark gray along the back, sometimes copper. Pectoral, ventral and anal fins are tinged with black. Eyes are golden.

Feeding

It is bottom-feeder. It usually feeds on phytoplankton, zooplankton and other small insects. It can be angled well with live and artificial bait.

Breeding

Its spawning period extends from April to late July. In captivity, it can be bred through induced spawning. Pairing occur during the period of spawning. Fertilization external and without parental care. The optimal temperature for reproduction is 20-26 °C. Fecundity rate is about 100,000 eggs/kg body weight. Eggs are hatched within 12-18 hours.

Prospects in Aquaculture

Due to reasonable price in the market, it is commonly cultured in the province of Punjab along with other species.

iv. Common carp (*Cyprinus carpio*)

Geographical Distribution

This fish is inhabitant of China and Russia, transplanted in the middle ages to Europe and south east Asia.

Morphological Characters

Body oblong, moderately compressed. Protractile mouth with smooth simple lips. Three rows of teeth in throat. Two pairs of barbels, one pair is sometimes rudimentary. Long dorsal fin with last simple ray ossified and serrated behind. Origin of dorsal fin opposite to that of ventral. Height of body, development of fins and scales, color of body and size subject to great variation.

Feeding

It is an omnivorous fish. It is mud-strainer feeds on phytoplankton, zooplankton and other small insects. It collects food by taking bottom mud into the mouth, shifting out digestible particles and rejecting the rest. It can be angled well with live and artificial bait.

Breeding

Its spawning period extends from February to April. In captivity, it can be bred easily. Pairs occur during the period of spawning. Fertilization is external and exhibits no parental care. Reproduction temperature above 20 °C. Fecundity rate is about 100,000 eggs/kg body weight. Eggs are hatched within 12-18 hours.

Prospects in Aquaculture

In view of its popularity for taste, it is often cultured with other species.

v. Grass carp (Ctenopharyngodon idella)

Geographical Distribution

It is native of south, central and northern China and Russia, transplanted in Europe south Asia, south east Asia and Africa.

Morphological Characters

This fish has elongate and moderately compressed body, broad head with short and rounded snout. Upper jaw is slightly longer than the lower. Barbels are absent. There are two rows of compressed, comb-like teeth in throat. Scales on the body are of moderate size. The fish is dark gray above and silver on the belly.

Feeding

It is a herbivore and highly voracious fish. The adult have distinct preference for vegetable food such as leaves of tree, green fodder, weeds and other aquatic plants.

Breeding

Its spawning period extends from April to late July. In captivity, it can not be bred except through induced spawning. Pairing occurs during the period of spawning. There is external fertilization and without parental care. The breeding temperature is 20-26 °C. Fecundity rate is about 100,000 eggs per kg body weight. Eggs are hatched within 12-18 hours.

Prospects in Aquaculture

Due to high price in the market, it is commonly cultured in the Province of Punjab along with other species under prevailing poly-culture system.

vi. Silver carp (*Hypophthalmichthys molitrix*)

Geographical Distribution

It is native of south, central and northern China and Russia, transplanted in Europe south Asia, south east Asia and Africa.

Morphological Characters

This fish has elongate and moderately compressed body. Head is short and rounded snout. Upper jaw is slightly longer than the lower. Barbels are absent. Caudal fins are forked and lateral line is curved. Scales on the body are of moderate size. The color of the body is silver and fins are slightly blackish.

Feeding

It is a herbivorous fish. The adult have distinct preference for vegetable food such as plankton, leaves of tree, and crustaceans.

Breeding

Its spawning period extends from April to late July. In captivity, it can not be bred except through induced spawning. The breeding temperature is 20-26 °C. Fecundity rate is about 100,000 eggs per kg body weight. Eggs are hatched within 12-18 hours.

Prospects in Aquaculture

Due to high price in the market, it is commonly cultured in the Province of Punjab along with other species under prevailing poly-culture system.

VI. (A) ANNEXES

1. FISHERIES ORDINANCE 1961 (Amended upto 2001)

THE [PUNJAB] FISHERIES ORDINANCE, 1961
(W.P. Ordinance XXX of 1961)
(Amended upto 2001)
[13th December, 1961]

An Ordinance to amend and consolidate the law relating to fisheries in the Province of [the Punjab];

WHEREAS it is expedient to amend and consolidate the law relating to fisheries in the Province of [The Punjab]

Preamble.

NOW, THEREFORE, in pursuance of the Presidential Proclamation of the seventh day of October, 1958, and having received the previous instructions of the President, the Governor of West Pakistan is pleased, in exercise of all powers enabling him in that behalf, to make and promulgate the following Ordinance:-

- SHORT TITLE AND EXTENT 1(1) This Ordinance may be called the [The Punjab] Fisheries Ordinance, 1961.
- 1(2) It extends to the whole of the Province of [The Punjab] except the [Tribal Areas].
- DEFINITIONS 2- In this Ordinance, unless the context otherwise requires, the following expressions shall have the meanings hereby respectively assigned to them, that is to say:
- a) "Director of Fisheries" means the Director [General] of Fisheries, [Punjab], and includes any person appointed by Government to discharge the functions of the Director of Fisheries under this Ordinance;
- b) "fish" includes shell-fish;

¹This Ord. was promulgated by the Governor of W.P. on 17th Oct., 1961; published in the W.P. Gazette (Extraordinary), dated 13th Dec., 1961 paras 2945-2952 saved and given permanent effect by Article 225 of the Constitution of the Islamic Republic of Pakistan (1962).

Subs. by Pb A.O. I of 1974, for "West Pakistan".

³Subs. by W.P.A. Order, 1964, for "Special Areas".

⁴Inserted by the Punjab Gazetteer Notification No. Le^sis. 13-61/2001 dated 13-11-2001

- c) "fixed engine" means any net, cable trap, or other contrivance for taking fish fixed in the soil or made stationary in any other way;
- d) "Government" means the ⁵[Provincial Government of the Punjab];
- e) "Licence", "Permit", "Special Licence" and "Special Permit" means respectively a licence, permit, special licence and special permit, issued under this Ordinance or any rule made, there under;
⁶[EXPLANATION] Provincial licence shall be issued by the Provincial Fisheries Department.
- f) "prescribed" means prescribed by rules made under this Ordinance;
- g) "private Water" means water which is the exclusive property of any person, or a water area which is land locked by his own survey numbers] or in which any person has for the time being an exclusive right of fishery, whether as owner, lessee or in any other capacity;

Explanation

Water shall not cease to be "private Water" within the meaning of this definition by reason only that other persons may have by custom a right of fishery therein;

- h) "water" includes the sea within a distance of one marine league of the sea coast;
- i) ⁸["Provincial Water" means rivers, canals and barrages/pond areas which are not confined within the district boundary or which receives water from the river canal;]
- j) ⁸["District Water" means a water except rivers, canals, barrages/pond areas and all those waters which have no permanent or seasonal link with rivers etc;]

⁵Subs. for "Government of West Pakistan", by Pb A.O. of 1974.

⁶ The "EXPLANATION" added by the Punjab Gazetteer Notification No. Le^gis. 13-61/2001 dated 13-11-2001

⁷ Inserted vide Punjab Gazetteer Notification No. Le^gis. 13-61/2001 dated 13-11-2001

⁸ Added vide Punjab Gazetteer Notification No. Le^gis. 13-61/2001 dated 13-11-2001

⁸[Explanation

District Fisheries Officer shall be responsible for the conservation and management and development of district water areas and will be empowered to lease out fishing rights of the water areas exclusively confined within the district boundary].

Appointment
of inspectors
of fisheries

3(1) Government may by notification, appoint such persons as it thinks fit to be inspectors of Fisheries for the purposes of this Ordinance within such local limits as may be specified.

XLV (2) Inspectors of Fisheries shall be deemed to be public servants within the meaning of section 21 of the Pakistan Penal Code.

Powers of the
Director to lease
out any water other
than private water

4(1) The Director ⁹[General] of Fisheries or such other officers as he may empower in this behalf by general or special order in writing, may, for a period not exceeding three years, lease out, on such conditions as may be prescribed, the right to catch fish in any water other than private water ¹⁰[and district water].

(2) Any amount due to Government, under the provisions of sub section (i) and remaining unpaid one month after it has become so due, may be recovered as arrears of land revenue.

Powers of the
Lessee to issue
Permits

5(1) The person in whose favour a lease under section (4) is granted, may issue permits in such form, subject to such conditions and on payment of such fees, as may be prescribed, for the taking of fish in the water, the right of fish wherein has been leased to him.

(2) A permit issued under sub section (1) shall cease to be valid upon the termination or cancellation of the lease in favour of the person issuing the permit.

Destruction
of fish by
explosives.

6. No person shall use any dynamite or other explosive substance in any water with intent thereby to catch or destroy any of the fish that may be therein.

Destruction
Poisoning
water.

7. No person shall put any poison, lime or noxious of fish by material into any water with intent thereby to catch or destroy any fish that may be therein.

⁹Inserted by Punjab Gazetteer Notification No.Le^gis.13-61/2001 dated 13-11-2001

¹⁰ Inserted by Punjab Gazetteer Notification No.Le^gis.13-61/2001 dated 13-11-2001

- Fish that shall not be taken. 8. No person shall kill, capture, or possess any species of fish specified in the second column of the First Schedule of a size less than that specified in the third column of the said Schedule against such species.
- Net, fixed engine, 9(1) trap etc., shall not be employed without a permit or licence. No person shall use or employ for the capture of any species of fish specified in the First Schedule, in any water other than private water, any net, cage, trap or other contrivance for taking fish, or fixed engine, except during the period permitted in respect of such species under the fourth column of the said Schedule and under a licence or permit issued under this Ordinance.
- (2) Licences under sub-section(1) shall be issued by such authorities, on payment of such fees and on such conditions as may be prescribed.
- Duty to produce Licence or permit Demand made by employees of Fisheries Department 10. Every person in possession of any fishing licence or permit shall produce his licence or permit as the case may be, on demand made by the Inspector of Fisheries or any other person authorised in this behalf by the Director ¹¹[General] of Fisheries.
- Power to declare any water to be sanctuary for fish. 11(1) Notwithstanding anything contained in this Ordinance, Government may, by notification, declare any water to be sanctuary for fish mentioned in the First Schedule for a period which may be specified and during such period no person shall kill, capture or possess such fish without a special permit issued under this Ordinance by the Director ¹¹[General] of Fisheries.
- (2) The water in respect of which a notification under this section is made shall be demarcated in such manner as may be prescribed.
- Duty of Lambardars Vila^ge Watchmen, etc. 12. Every Lambardar, Vila^ge Watchman, Canal Patwari, Public Works Department Daro^gha, Ziladar, Revenue Patwari, Tapedar, Supervising Tapedar and Qanun^go shall be bound in the absence of reasonable excuse to give to Inspector of Fisheries or any other person authorised in this behalf by the Director ¹¹[General] of Fisheries, information in respect of any unauthorised netting, killing, or other offence under this Ordinance committed within the limits of his vila^ge or circle, as the case may be, as soon as the commission of such offence comes to his knowledge.

¹¹ Inserted by Punjab Gazetteer Notification No.Le^gis.13-61/2001 dated 13-11-2001

Powers of Ma ^g istrate to issue search warrants.	13. If a Ma ^g istrate has reasons to believe that an offence under this Ordinance has been, is bein ^g , or is likely to be committed, he may issue a warrant for the search of any ^P lace in which any fish, net, tra ^P , ca ^g e or other contrivance for takin ^g fish, or fixed en ^g ine is ke ^P t or concealed.
Power to search without warrants.	14. An Ins ^P ector of Fisheries, may without a warrant from a ma ^g istrate, search any ^P erson, vessel, rack, vehicle, shi ^P , boat, raft, ^P acka ^g e, rece ^P tacle or coverin ^g so as to satisf ^y himself as to whether or not an offence under this Ordinance has been committed.
Arrest without warrant for offences under this ordinance	<p>15(1) An Ins^Pector of Fisheries ma^y, without a warrant, arrest any ^Person commitin^g in his view any offence under section 6,7,8,9 or 11 .</p> <p>a) if the name and address of such ^Person are unknown to him; and</p> <p>b) if such ^Person declines to ^give his name and address, or there is reason to doubt the accurac^y of the name and address ^given.</p> <p>(2) A ^Person arrested under this section may be detained until his name and address have been correctl^y ascertained. Provided that no ^Person so arrested shall be detained lon^ger than may be necessar^y for brin^gin^g him before a Ma^gistrate, exce^Pt under the order of a Ma^gistrate.</p>
Power of seizure.	<p>16. An ins^Pector of Fisheries, or any ^Person authorised in this behalf by the Director ¹²[General] of Fisheries may take ^Possession of any fish, net, tra^P, ca^ge or other contrivance for takin^g ¹³[fish], or fixed en^gine used or sus^Pected to have been used in the commission of an offence under this Ordinance.</p>
Penalties	<p>17- Whoever.</p> <p>a) contravenes the ^Provisions of section 6,7, or 11 shall be ^Punished with im^Prisonment of either descri^Ption which may extend to ¹⁴[two ^years] or with fine which may extend to ¹⁵[ten thousand] ru^Pees or with both</p>

¹² Inserted by Punjab ^gazetteer Notification No.Le^gis.13-61/2001 dated 13-11-2001

¹³ Inserted vide the Punjab ^gazetteer Notification No.Le^gis. 13-61/2001 dated 13-11-2001

¹⁴ Sub., for the words "Three months" by the Punjab Fisheries (Amendment) Act 1999 (Act IV of 1999)

¹⁵ Sub., for the words "five hundred" by the Punjab Fisheries (Amendment) Act 1999 (Act IV of 1999)

b) contravenes the provisions of section 8,9,10 or 12 shall be punished with fine which may extend to ¹⁶[three thousand] rupees.

Police

18. Every Police Officer shall upon request made by Assistance.
a person employed under this Ordinance assist him in due discharge of his duties, under this Ordinance.

Person who
19.
may lodge
complaints

No court shall take cognizance of any offence under this Ordinance except on the complaint in writing of an Inspector of Fisheries.

Confiscation
20. of
any net, trap,
cage, etc.

The Court may order the confiscation of any ¹³[fish], net, trap, cage, or other contrivance for taking fish, or fixed engine employed in the commission of an offence under this Ordinance.

Justification in
21.
respect of offences
within one of
sea coast.

If an offence in respect of this Ordinance is committed within a distance of one marine league of the sea coast than such offence may be tried, punished and in all respects dealt marine league with as if it had been committed on the land abutting such coast.

Protection
22.
taken under
this Ordinance.

No suit, prosecution or other legal proceeding shall lie against any person for anything which is in good faith done or intended to be done in pursuance of any provisions of this Ordinance or the rules made there under.

Power of
23.
Govt. to add
i)
or exclude
from First Schedule
i)

Government may, by notification, add to or exclude from the First Schedule any species of fish subject to such conditions as it may impose in each case;
alter the period during which any fish specified in the First Schedule may be killed or captured.

Power to
24(1)
compound
certain offences a)

Government may, by notification empower an Inspector of Fisheries.
to accept from any person concerning whom evidence exists which if unrebutted would prove that he has committed any offence as described, in the first column of the Second Schedule a sum of money by way of composition for the offence with regard to which such

¹⁶Subs., for the words "One hundred" by the Punjab Fisheries (Amendment) Act 1999 (Act IV of 1999)

evidence exists, and on the payment of such sum to such officer such person if in custody shall be discharged and no further proceedings shall be taken against him;

- b) when any property has been seized as liable to confiscation, to release the same without further payment, or on payment of the value thereof as estimated by such officer, and on the payment of such value, such property shall be released and no further proceedings shall be taken in respect thereof.
- (2) The sum of money which may be accepted by way of composition under clause (a) of sub-section (1) for any offence shall in no case exceed the amount mentioned against such offence in the second column of the Second Schedule.

Delegation
25.
of powers

Government may by notification, delegate all or any of the powers conferred upon it under the provisions of this Ordinance to any officer subordinate to it.

Power to
26(1)
make rules

Government may make rules¹⁷ for the purpose of carrying into effect the provisions of this Ordinance.

- (2) In particular and without prejudice to the generality of the foregoing powers, such rules may prescribe.
 - a) the form in which and the terms and conditions on which, a licence or a permit or a special licence or a special permit may be granted;
 - b) the authority by which licences, under this Ordinance may be granted;
 - c) the fees to be charged for any licence or permit or special licence or special permit.
 - d) the conditions subject to which the Director¹⁸[General] of Fisheries may lease the right to catch fish under this Ordinance.
 - e) in the case of any species of fish, the number and sex that may be killed under a licence;
 - f) the rewards to persons who render help in detection of offences under this Ordinance;

¹⁷For rules, see W.P.Gazete, Part I, dated 1st October, 1965, p. 1205.

¹⁸ Inserted vide Punjab Gazetteer Notification No. Le'si. 13-61/2001 dated 13-11-2001f

- g) the utilization of receipts recovered under this Ordinance;
 - h) Prohibit or regulate all or any of the following matters .
 - i) the erection and use of fixed engines;
 - i) the construction of weirs; and
 - i) the dimension and kind of nets, cages, traps or other contrivances for taking fish to be used and the modes of using them.
- (3) Such rules may provide that a breach thereof shall be punished with a fine not exceeding fifty rupees.

Repeal and Savings.

Punjab I of 1914.

27(1) The following enactments are hereby repealed:-

- a) The Punjab Fisheries Act, 1914; and
- b) The Bahawalpur States Fisheries Act, 1951.

(2) Notwithstanding the repeal of the enactments mentioned in sub-section (1), everything done and all action taken, obligation, liability, penalty or punishment incurred, inquiry or proceedings, commenced, officer appointed or person authorised, jurisdiction or powers conferred, rule made and licence or order issued under any of the said enactments, shall, if not inconsistent with the provisions of this Ordinance, continue in force and be deemed to have been respectively done, taken, incurred, commenced, appointed, authorised, conferred, made or issued under this Ordinance.

FIRST SCHEDULE.

(Section-8)

SPECIES OF FISH AND PROHIBITIONS.

S.No	Species of Fish	Size	Period during which taking of the fish by (inches) any net, cage, trap or fixed engine is prohibited.
1	2	3	4
1-	Trout	9	10th October to 9th March.
2-	Mahaseer	12	1st June to 31st August.
3-	Rahu	12	1st June to 31st August.
4-	Mori	12	1st June to 31st August.
5-	Thaila	12	1st June to 31st August.
¹⁹ [6-	Calbans	12	1st June to 31st August.]

¹⁹ Added vide the Punjab Gazetteer Notification No. Le^g.is.13-61/2001 dated 13-11-2001

SECOND SCHEDULE

(SECTION-24)

MAXIMUM AMOUNT ACCEPTABLE BY WAY OF COMPENSATION FOR CERTAIN OFFENCES

S.No	Description of Offences	Maximum amount which may be accepted as compensation.
1-	Fishin ^g with a net havin ^g a smaler mesh than the ^P rescribed mesh.	²⁰ [Five thousand] ru ^P ees
2-	Fishin ^g without a licence.	²⁰ [Five thousand] ru ^P ees ²⁰ [Five thousand] ru ^P ees
3-	Kilin ^g fish of a size less than the ^P rescribed size.	thousand] ru ^P ees
4-	Fishin ^g with any ^g ear or method other than ^P ermitted under the rules.	²⁰ [Five thousand] ru ^P ees
5-	Usin ^g any one time more than two of either or any of the ^g ears ^P ermitted under the rules.	²⁰ [Three thousand] ru ^P ees
6-	Licence holder employin ^g or en ^g ain ^g non-licences to hel ^P him with his nets while fishin ^g .	²⁰ [Three thousand] ru ^P ees
7-	Offerin ^g or exposin ^g for sale or barter any fish in contravention of the ^P rovisions of this Ordinance.	²⁰ [Three thousand] ru ^P ees

²⁰Subs., for the words "twent^y five" by the Punjab Fisheries (Amendment) Act 1999 (Act IV of 1999).

2. FISHERIES RULES 1965 (Amended upto 2001)

GOVERNMENT OF THE WEST PAKISTAN
AGRICULTURE DEPARTMENT
NOTIFICATION
(Amended upto 2001)
The 8th September, 1965

No.4(107) S.O.(F&G)/64-In exercise of the Powers conferred by section 26 of the Punjab Fisheries Ordinance, 1961 (Ordinance No.XXX of 1961), and in supersession of all previous rules on the subject in force in any part or area of West Pakistan, the Governor of West Pakistan is pleased to make the following rules, namely :-

THE PUNJAB FISHERIES RULES, 1965

(Amended upto 2001)

PART-I PRELIMINARY

- Short title and commencement. 1. (1) These rules may be called the Punjab Fisheries Rules, 1965
(2) They shall come into force at once.
- Definition 2. In these rules, unless the context otherwise requires, the following expressions shall have the meanings hereby respectively assigned to them, that is to say –
- s .
- (a) “Appendix” means as appendix to these rules;
 - (b) “Chief Engineer” means a chief Engineer of the Irrigation Department;
 - (c) “Form” means a form appended to these rules;
 - (d) “Licence” means a person to whom a licence is granted under the Ordinance and these rules;
 - (e) “Ordinance” means the West Pakistan Fisheries Ordinance, 1961 (Ordinance No.XXX of 1961).
 - (f) “Public Water” means water other than the “Private Water” and includes—
 - (i) all natural bodies of water, such as rivers and their tributaries, creeks, brooks, lakes, bays, bays, channels, canals or lagoons or dug dredged or blasted canals;
 - (i) any water impounded by the construction of any lake or dam or other impounding device across the channel of a navigable stream;
 - (i) flowing water within which fish are free to move across property lines, and which are not by law or customs property of any person;
 - (g) “Sanctuary” means an area declared under section 11 to be a sanctuary for fish;
 - (h) “Schedule” means schedule to the Ordinance; and
 - (i) “Section” means a section of the Ordinance.

PART-II LICENCES

3. Licences to be issued by the Directors. All licences under section 9 includin^g seasonal, monthly and daily licences to fish in the waters mentioned in A^{pp}endixes I, I, I, IV and V will be issued by the Director ²¹ [General] of Fisheries or any other officer authorized by him in this behalf on p^ayment of fees p^rescribed under these rules. Provided that the Chief En^gineer or any officer authorized by him in this behalf may issue seasonal licences, not exceedin^g four in number to fish in waters mentioned in A^{pp}e nd ix I, in favour of his subordinates, free of char^ge . Provided further that no licence other than dail^y licence shall ordinaril^y be issued for fishin^g in water mentioned in A^{pp}endix IV.
4. Duration of validit^y of a licence. (1) A seasonal licence shall be valid for one ^year, and irres^pective of the date of issue shall remain in force from the 1st day of Se^ptember to the 31st day of Au^gust in the folowin^g ^year. Provided that the p^eriod from 1st June to 31st Au^gust each ^year shall be closed season durin^g which no fishin^g exce^pt with Rod and Line and Lon^g Line shall be p^ermissible. (2) A monthl^y licence shall be valid for a calendar month from the date of issue. (3) A dail^y licence shall be valid for the date mentioned in the licence from half an hour before sunrise to half an hour after sunset.
5. Area to which a licence extends. A licence shall entitle the holder to fish in any of the waters mentioned in A^{pp}endices I, I, I, IV and V: Provided that a licence for one water shall not entitle the holder to fish in another water exce^pt waters mentioned in A^{pp}e nd ix I which for the p^ur^poses of this rule shall be deemed to be one water. Provided further that a licence to fish in the waters of a river in a District mentioned in A^{pp}endix I shall entitle the holder to fish on both banks of the river u^pto the limits of that District unless the fishin^g ri^ghts in the District of the o^pposite bank; have been leased out.

²¹ Inserted vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 12-11-2001

XLI. ILLUSTRATION

A licensee of Sialkot District shall be entitled to fish on both banks of the Chenab River up to the limits of Sialkot District, and similarly a licensee from Gujrat District shall be entitled to fish on both banks of the Chenab up to the limits of Gujrat District, but shall not be entitled to fish on the opposite bank in the District of Gujrat in the former case and in the Districts of Sialkot and Gujranwala in the later case, if the fishing rights in these Districts have been leased out.

Kind of fishing gear.

6. (1) Subject to the provision of sub-rule (2), a licensee shall be entitled to fish with the following kinds of gear only:-
- (a) nets of all kinds; provided that no net shall have at any portion of it a mesh of less than 1½ inch bar measured from knot to knot, or 6 inches all round;
 - (b) Long line with hooks;
 - (c) Rod and line;
 - (d) Khurli; and
 - (e) Dhanla
- (2) Notwithstanding anything contained in sub-rule (1)—
- (a) A licensee may either use a maximum of two numbers of the same gear or of all the gears permitted to him under these rules at one time provided that when the licence entitles its holder to the use of one gear only, the licensee may use only that gear and in addition may also use a net for catching chilwa for baiting purposes only;
 - (b) No gear other than rod and line shall be used for catching fish in any river within a distance of 100 yards from any bridge or in any waters specified in Appendices I, II and IV;
 - (c) A daily licence shall not entitle its holder to fish with more than one rod in waters mentioned in clause (b).

Fees for the licences.

7. (1) The fees for various types of licences except licences specified in sub-rule (2), (3) and in Parts IV, V and VI shall be as follows :-

- (i) For all kinds of fishing gear mentioned in rule 4. Rs.²²[120.00] per season in all waters except in the tributaries of the Ravi and Chenab rivers in the Sialkot Districts, namely, Palkhu, Basantar, Aik and Deh, the fee for which shall be

²²Substituted by the Government Notification No.SO(B&P)1 1-1/88-I dated 26-12-1996

Rs.[80.00] per season.

- (i) For rod & line Fishin^g only. Rs.[60.00] per season.
- (i) For dip net or Kurli Rs.[40.00] per season.
- (iv) For hand net (Dhan^gla) fishin^g only. Rs.[60.00] per season.
- (v) For Castin^g net Fishin^g only Rs. [80.00] per season
- (vi) For lon^g line with hooks (Lan^g) onl^y. Rs. [80.00] per season

(2) A licensee holdin^g a licence to fish in the waters in the District of Gujranwala s^pecified in A^{pp}endix I, shal in addition to the fees s^pecified in sub-rule (1), ^give on demand by the lambardar of the vila^ge, half of the number of fishes as and when cau^ght from the waters located within the limits of the vila^ges Chaki Khurd, Ha^yati, Pul Shah Dola, Manj^put, Man^gal Dana Sin^gh and Ghona Ur of Gujranwala District if the licence holder is not resident of the vila^ge, within ^precincts of which fish is cau^ght.

(3) Seasonal licence fee for fishin^g in Deg Nulah in Sheikhu^pura District shal be at the folowin^g rates:-

(1)	Castin ^g net	.	Rs.
[500.00]			
(2)	Lon ^g Line	.	Rs.
[300.00]			
(3)	Kurli or Dhan ^g la	.	Rs.
[200.00]			
(4)	Rod and Line	.	Rs.
[60.00]			

(4) The licence fee for waters reserved for rod and line ^gear under clause (b) of sub-rule (2) of rule 6 shal be as under:-

	Seasonal licence	.	Rs.
(1) [100.00]	Monthl ^y licence	.	Rs.
(2) [20.00]	Dail ^y licence	.	Rs.
(3)			
(5) [10.00]	Rs shall be char ^g ed for any broken ^p eriods.		

- Free licences
8. (1) Notwithstanding anything contained in rule 7, licences not exceeding six in number for all kinds of fishing gears may be granted free of charge to the residents of each of the following in District Gujranwala:
Chaki Khurd, Hathi, Pul Shah Dola, Manjpur Manal Dana Singh and or Gunna Ur.
- (2) The licences granted under sub-rule (1) shall remain in the possession of the respective Lambardars, and shall entitle the residents of every village specified in sub-rule (1) to fish within the precincts of their own village but not beyond that. Every resident who wants to fish shall take a licence from the Lambardar of his village and must have the licence with him when fishing and shall, on demand be bound to show it to any person empowered under section 10.
- Duplicate licence 9. The authority empowered to grant licences may if the licence granted under these rules, is lost or destroyed accidentally, grant a duplicate copy of the original licence on payment of fee of one rupee or the fee for the licence, whichever is less.
- Refund of licence fee 10. The licence fees paid under rule 7 may be refunded to the licensee or his legal heirs on the presentation of a claim for refund within one week from the date of the issue of the licence if it is proved to the satisfaction of the Officers issuing the licence that the licence was not availed of under special circumstances, such as, change of residence of the licensee to a place where the licence could not be made use of, or the death of the licensee immediately after the licence was issued to him.
- Licensee to report breach of rules 11. Every licensee shall be bound to report; to the ²³[District Officer (Revenue),] Tehsildar or any officer of the Fisheries Department any breach of ordinance or rules that come to his notice.
- License not transferable 12. (I) A licence, unless otherwise provided in these rules, shall not be transferable.
- No adult to be engaged as (i) A licensee shall not employ or engage any person (other than his own children under the age of sixteen) to help him with his nets unless the person so employed is also a licensee.

²³ Substituted vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 3-11-2001

<u>Method of</u> <u>payment</u> of Fees	13. 14	<p>Payment of fees under these rules shall be made in cash or by means of non-judicial stamps of appropriate value which shall be affixed on the applications addressed to the licensing authorities.</p> <p>No licensee shall</p> <p>(a) Erect fixed engines, except stake nets temporarily fixed in conjunction with draught nets; or</p> <p>(b) Construct dams or weirs; or</p> <p>(c) Divert water for catching fish.</p>
<u>Seizures</u>	15.	<p>All apparatus erected or used for fishing in contravention of the Ordinance or these rules, when seized under section 16, shall be taken to the nearest police station by the person empowered under the said section.</p>
<u>Canceling</u> of <u>licences</u>	16. of 17.	<p>The Director General of Fisheries may cancel any licence granted under section 9, if the holder contravenes or instigates contravention of any of these rules or is convicted of an offence under the Ordinance.</p> <p>(i) Any fish of the species mentioned in the First Schedule, which is less than 12 inches in length if caught from waters mentioned in Appendix IV, shall be put back in the said waters.</p> <p>(i) A licensee shall not catch from waters mentioned in Appendix IV any species of fish mentioned in the first schedule exceeding five in number, excepting those put back in water under sub-rule (i).</p>
<u>Restriction</u> s <u>on Size</u> and <u>number of</u> <u>fish to be</u>		
<u>Caning</u> <u>Auction of</u> <u>fishing</u> <u>rights</u>		<p style="text-align: center;">PART – III – LEASES</p> <p>On or after the first of August each year the Director²⁴[General] of Fisheries or any other officer empowered by him in accordance with the provisions of section 4, may after giving it sufficient publicity, put to auction the right of fishing in any of the public waters in the Districts mentioned in Appendices VI and VI or any other public waters and shall execute a lease deed with the highest suitable bidder in respect of each public water on payment of the amount offered by him in full or by instalments in accordance with these rules: Provided that the Director²⁵[General] of Fisheries may at his discretion, lease any water located within a Union Council area to that Union Council for a period not</p>

²⁴ Inserted vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 12-11-2001

²⁵ Inserted vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 12-11-2001

exceedin^g three years without ^Putin^g it to auction. The lease money in such cases shall be fixed by the Director ²⁴[General] of Fisheries on the basis of avera^ge of fish cau^ght in the said water durin^g the ^Precedin^g five ^years and the ^Prevailin^g local market rates for such fish. ²⁶[Provided further that if at any sta^ge the nature/status of ^Provincial/district water as mentioned in section 2(i) and 2(j) of the ordinance is re^quired to be chan^ged, Director ²⁴[General] of Fisheries shall be em^Powered to make such chan^ge.]

- | | |
|---|---|
| <u>De^Partme
ntal
O^Peration.</u> | 19. In case the hi ^g hest bid at the auction is lower or the water area is bonafide re ^q uired for develo ^P ment ^P ur ^P oses, the auctionin ^g authorit ^y may reserve it for de ^P artmental o ^P erations. |
| <u>Units for
Auction.</u> | 20. River waters may be leased in smal ^P ortions coincidin ^g with the boundaries of the Districts, while the lease of Dhands, Lakes and Reservoirs (where the flood water enters), tanks and ^P onds may be auctioned unit-wise se ^P arate ^y . |
| <u>Pa^yment
of
Lease
mone^y</u> | 21. (1) The lessee shall at his o ^P tion, either pay the full amount offered by him for fishin ^g ri ^g hts, at the time of auction or by three e ^q ual instalments to be ^P aid
(i) The first, on the date of the auction;
(ii) the second, two months after execution of the lease deed; and
(iii) the third, four months after execution of the lease deed.
(2) When the lease mone ^y is to be ^P aid by instalments, the lessee shall be re ^q uired to furnish securit ^y to the satisfaction of the auctionin ^g authorit ^y for the amount to be ^P aid by him. |
| <u>Refund of
lease
mone^y.</u> | 22. The lease mone ^y or any instalment thereof ^P aid under rule 21 may be refunded to the le ^g al heirs of the lessee on ^P resentation of the claim for refund, if it is ^P roved to the satisfaction of the officer executin ^g the lease deed that the lessee died immediate ^y after execution of the lease deed. |
| <u>Re^Port of
breach of
rules.</u> | 23. The lessee or his a ^g ents or nominees shall re ^P ort to the Ins ^P ector of Fisheries any breach of the Ordinance or rules relat ^g to fishin ^g that may come to his or their notice. |

²⁶ Added vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 3-11-2001

- Cancelati
on of lease
due to non-
pa^yment of
instalmen
ts.
24. (1) If the lessee or any person holdin^g a permit under section 5 is convicted of an offence under the Ordinance of these rules, the Director ²⁷[General] of Fisheries may cancel the lease or permit, as the case may be, of the person so convicted.
If the lessee fails to pay the instalments on the due
(2) dates, the Director ⁷[General] of Fisheries may cancel the lease after givin^g the lessee an o^{pp}portunity to clear the arrears.
On cancellation of a lease under sub-rule(1) of sub-
(3) rule(2) all permits issued by the lessee shall automatical^y stand canceled, and the amount already paid by the lessee shall not be refunded to him.
(4) When a lease is canceled, the Director [General] of Fisheries may re-auction the fishin^g ri^ghts in that water in the manner herein provided and any deficienc^y in the lease mone^y shall be recovered from the first lessee as if it were an arrears of land revenue.

25. An Appeal shall lie to Government a^gainst the order of the Director ⁷[General] of Fisheries cancelin^g a lease or permit under rule 24, within one month from the date, the order cancelin^g the lease or permit, as the case may be, were communicated to the part^y concerned.

PART IV ---- DEPARTMENTAL OPERATION

26. Licences to fish in waters s^pecified in A^{pp}endices VI and VI, if reserved for De^partmental o^perations under rule 19 shall be g^ranted on pa^yment of Rs.5 by the Director ⁷[General] of Fisheries or any officer authorised by him in this behalf under section 9 .

- Validit^y of 27. A licence issued under rule 26 shall remain in force from the 1st day of Se^ptember to the 31st day of Au^gust in the folowin^g year.
licences

- Sale of 28. (1) The holder of a licence under rule 26, shall at his own
fish cost, brin^g a l catches of fish at the landin^g centres s^pecified in A^{pp}endix V I or at those fixed by the Director ⁷[General] of Fisheries or any officer authorised by the Director General of Fisheries or any officer authorized by him in that behalf. Sale of catches before these are brou^ght to the landin^g centres, shall be unlawful.

²⁷ Inserted vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 12-11-2001

(2) The fish brought to the landing centres shall be disposed off by the representative of the Fisheries Department, who shall issue a receipt for the amount to the purchaser realize the Government share of sale proceeds prescribed under rule 29 and hand over to the licensee his share of the sale proceeds.

Share of
licensees

29. The licensee shall receive such percentage of the sale proceeds of his catches, from all waters mentioned in Appendices VI and VII, as the Director²⁸[General] of Fisheries may, with the previous approval of Government, notify in this behalf in the official Gazette, and different percentages of sale proceeds of catches to be received by licensees may be notified for different waters.

Confiscati 30. All fish in possession of a licensee who has failed to deliver the same to a representative of the Fisheries Department at the prescribed landing centre or is not in possession of a receipt issued under rule 28 may be confiscated to Government.

PART V TROUT WATERS

Division 31. (1) The waters of the Khunar River and its tributaries situated between Balakot Pucca Bridge and Lolusar Lake in the Kasganj Valley shall, for the purpose of these rules, be divided into five reaches as under :-
of
Khunhar
river and
its
tributaries

- (a) Reach No. 1 from the commencement of mile one to the end of mile 42 on the Kasganj Valley Road;
- (b) Reach No.2 from the end of mile 42 to the end of mile 48 on the Kasganj Valley Road;
- (c) Reach No.3 from the end of mile 48 to the end of mile 54 on the Kasganj Valley Road;
- (d) Reach No.4 from the end of mile 54 to the end of mile 84;
- (e) Reach No. 5 Saif-ul-Maluk Lake.

(2) The Director⁸[General] of Fisheries may at any time, by notification in the official Gazette revise the limits of the reaches mentioned in sub-rule (1) or divide the entire stretch of the said waters in any other number of reaches as he may deem fit.

Licence
s for
Trout
waters.

32. (1) A licence to fish in any of the reaches specified in rule 31 may be granted by the Extra Assistant Director of Fisheries, Kasganj Valley, on payment of the prescribed fee and the licence so granted shall entitle the holder to fish only in the reach specified in the licence.

²⁸ Inserted vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 12-11-2001

- (2) A licence granted under this rule may after giving the licensee an opportunity of being heard, be canceled by the Extra Assistant Director of Fisheries, Kasthan, for breach of any condition of the licence, these rules or the provisions of the Ordinance.

Number of licences to be granted by Extra Asst: Director.

33. (1) The Assistant Director of Fisheries incharge of Kasthan Valley shall fix the number of licences that may be granted by the Extra Assistant Director of Fisheries, Kasthan, at any one time for the reaches mentioned in rule 32.
- (2) The Director ²⁹[General] of Fisheries may at any time revise the number of licences fixed, under sub-rule (1) and also fix by a notification in the official Gazettee ...
- (a) The size and weight below which no trout shall be killed; and
- (b) The maximum number of trout, of the permissible size or weight, which may be caught during the term of the licence.

34. The fee for a licence under this Part shall be charged at the following rates:-

- (a) for single rod and single licence:-
- | | | |
|---------------|---|--------------------------------|
| (i) per day | . | Six rupees |
| (i) per week | . | Thirty rupees |
| (i) per month | . | One hundred and twenty rupees. |
- (b) For double rod and family licence
- | | | |
|---------------|---|--------------------------------|
| (i) per day | . | Ten rupees |
| (i) per week | . | Sixty rupees |
| (i) per month | . | One hundred and twenty rupees. |

Explanation- For the purpose of this rule, family means husband, wife and their children below fourteen years of age in any combination not exceeding two whose names are entered in the licence.

Fees or condition of licences not to be refunded or altered.

The licence fee paid under rule 34 shall in no case be refunded nor shall the period of the licence nor the name of the reach for which the licence has been issued be varied.

Licence not to be transferred or

36. A licence granted under this Part shall be non-transferable and shall not be shared with any person.

²⁹Inserted vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 12-11-2001

shared

Duplicate 37. Where a licence granted under this Part is lost or
licences te accidental^y destroyed, the Extra Assistant Director of Fisheries, K^{as}han, ma^y, on pa^yment of a fee of one ru^pee, issue a duplicate co^{py} of such licence.

Kinds of 38. A licensee shall use either of the following lures onl^y:-
lures (a) artificial fly.
to be (b) artificial spinnin^g bait, includin^g spoons; and
used (c) artificial worm

No fish 39. No fish shall be killed in the waters to which this Part
to be a^{pp}lies durin^g the period from the 10th day of October to
killed the 9th day of March in the followin^g year (both da^ys
durin^g inclusive) exce^ptin^g under the authorit^y of the Director
the ³⁰[General] of Fisheries.

closed

season

Seizure 40. s All a^{pp}aratus erected or used for fishin^g in
contravention of these rules and the fish so cau^ght may
be seized and taken to the nearest Police Station by the
p^{er}son em^powered under section 16.

PART VI ---- PROVINCIAL ANGLING LICENCE

Grant of 41. Notwithstandin^g anythin^g contained in these rules the
An^glin^g Director General of Fisheries ma^y, on pa^yment of a fee
licence of Rs. ³¹[300/-] grant a Provincial An^glin^g Licence
which shall enable its holder to fish with Rod and Line in
any of the waters mentioned in rule 42. (Licence Fee
enhanced vide Government of the Punjab, FWF&T
De^partment Notification No.SOF(B&P) 11-1/88-I dated
26-12- 1996).

A^{pp}licatio 42. n A licensee holdin^g a licence granted under rule 41 may
for fish in the waters of rivers Sutlej, Ravi, Chenab, Jhelum,
An^glin^g Indus and their tributaries, and streams, Choha Saidan
Licences Shah and its tributaries, and all Government canals
situated in the Province and head works exce^ptin^g -
(a) Water which have been or may hereafter
be closed to fishin^g under section 11;
(b) All Government Fish Farms and Deg Nalah
in Sheikhu^pura District.

Validit^y, 43. A licence granted under rule 41 shall be non-etc. of
_____ transferable and shall remain in force from the 1st day
licences of Se^ptember in each year to the 31st day of Au^gust in
the followin^g year.

³⁰Inserted vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 12-11-2001.

³¹Substituted vide Government Notification No.SO(E-I)(FT)2-14/2001(I) dated 03-11-2001

- Licence to 44.
foreign
diplomats A foreign diplomat may be granted a licence for an^glin^g free of char^ge .
- Refund of 45.
licence fee The fee paid for a licence under rule 41 may be refunded to the licensee or his legal heir on the presentation of a claim for refund made within one week from the date the issue of licence if it is proved to the satisfaction of the officer issuing the licence that the licence could not be made use of, on account of the death of the licensee immediately after the licence was issued.
- Condition 46.
for
fishin^g. A licensee to whom a licence has been granted under this Part be entitled to fish with rod and line only and shall not use more than two rods at any one time.
- Permissio 47. n
of
owners of
private
waters
necessar^y. A licence granted under rule 41 shall be subject to the permission of the riparian owners for fishin^g in waters-
(a) which have been or may hereafter be declared as “private” waters; or
(b) which though public waters require permission for fishin^g therein according to the entries in Wajib-ul-Arz or Record of rights of the vilage concerned.
- Entrance 48. to
Headwork
s of canals
prohibited. A licence granted under this Part shall not entitle its holder to enter on the Headworks of Canal without the prior permission of the Executive Engineer or any officer authorized by the Irrigation Authorities in this behalf.

Amendments in Rule 3 , 11 , 16 , 18 , 24, 25, 26, 28, 29, 31 , 33 , 39 and 41 have been made vide Government of the Punjab, Forestr^y, Wildlife, Fisheries and Tourism De^partment Notification No.SO(E-I)(FT)2- 14/2001(I) dated 03-11-2001.

LIST OF WATERS FOR WHICH FISHING LICENCE MAY BE
ISSUED VIDE RULE 3.

1. Peshawar District—Rivers—Kabul River with branches and Adeai River, Michni or Na^guman River, Shahalam River and Budni Stream, Swat River with branches as Abazai or Jundai and Khaiyali, Bara River and Indus River. Nalas—Loe Khawar, Buddar Khawar, Ghunu Khawar, Ghaura Khawar, Takanta Beg Khawar, Palosai Khawar, Zaindai Khawar, Aza Khel Khawar, Chela Khawar, Chinkas Khawar, Naki Khawar, Natkai Khawar, Arand Khawar, Dheri Khawar, Banda Khawar, Palosin Khawar, Talab Khawar, Kahkam Khan Khawar, Jundai Khawar, Subhan Khawar, Uch Nala, Kal^ghi Nala, Naji Nala, Tur^pai Nala, Arandai Nala, Rur^pai Nala, Tur^pai Nala, Lukarai Nala, Amar Kali Nala, Mursi Nala, Shahida Nala, Juria Nala, Jina Kore Nala, Jabba Nala, Ma^gad Nala, Balos Nala, Kal^pani Nala.
2. Mardan District—River Indus, Badri Khawar and its tributaries as Zandai Khawar, Totai Nala, Ti^grai Khawar. Bada Khawar and tributaries as Kundai Khawar, Pola Khawar, Ameri Khawar, Wuch Khawar, Sar^gari Khawar, Jammu Khawar, Bud^ga Khawar. Kal^pani Nala and its tributaries, Bha^giari Khawar, Lundi Shah Khawar, Haiki Khawar, Bura Khawar, Bhar^yo Khawar and Khul Khawar. Muam Nala and its tributaries as Narai Khawar, Da^gi Khawar, Bakarai Khawar, Jua Khawar, Badami Khawar, Pacha Tan^gi Khawar and Sinawar of Mandu Kar Khawar.
3. Kohat District—Tori Toi and its branches as La^grai Toi, Narai Ober Al^gad, Fit Kirmar Al^ged, Mithan Al^ged and Lilian Al^ged. Khakh Toi, Kohat Toi as Lachi Toi, Marmazai Toi, Sumar Toi, Nasar Toi, Safi Al^ged, Jabi Toi and Sarai Toi. Shkalai Nulah as Randokha Nulah, Inzar Nalah, Khawar Al^ged, Star Al^ged, U^gda Al^ged, Shu^{gg}a Alad (Khawar).

Landa Toi, Sha^ga Toi, Gaz Dera Toi, Khanki Toi, Kurmatan^g Khawar, Akhtar Nulah, Tarkhabi Al^ged, Narai Al^ged, Roshu Al^ged, Jour Nulah, Laun^ghar Al^ged, Tukha Al^ged, River Indus.

4. Hazara District—River Sind, Kinhar River u^pto mile No.3 5 in Ka^ghan Valey u^pstream, Siran River, Daur River, Haro River, Ilchar Nulah, Booth Nala, Ila^yai Nala, Nala Darkan, Nala Kar^pani, Beeran Bali Nala, Nandi Sialkot Nala, Tirairi Nala, Nala Man^gal.
5. Cam^pbel^pur District—Indus River and its tributaries such as Ghel, Haro Rashi, Soan and their tributaries. The Chablat and its tributaries, Sa^gar, Nandara and its tributaries. Shakardara, Fetejhann^g Sil and its tributaries Wadala and Pindi^gheb Sil and its tributaries excludin^g the ^portion of the Dhamrah Stream which flows within the limits of the Wah Estate, namel^y from the brid^ge on the Grand Trunk Road down to the boundr^y of Hassan Abdal Vila^ge, Khasra No.767 of Wah Estate measurin^g 473 Kanals and 7 marlas.
6. Rawal^pindi District—Jhelum River and its tributaries, Haro and its tributaries, the Sohan River and its tributaries, Leh and its tributaries, Kuran^g and its tributaries, Lin^g situated in Rawal^pindi.
(The Kuran^g River from the Rawal water fal down to the tail of the Gan^gal Pool).
The Sohan River from the Grand Trunk Road brid^ge to the tail of the Jalalia ^pool below Shah^pur vila^ge, Kanasi Nulah and its tributaries, Sirin Nulah with its tributaries and San^g Naji Nulah with its tributaries.
7. Sialkot District—The Chenab River and its tributaries, such as nalas Palkhu, Don, Sabskot, Gad^gor and Lunda, etc.
The Ravi and its tributaries such as Basantar, Aik and De^gh.
8. Gujrat District—The Chenab River and its tributaries such as Tawi, Bhimber, Bhandar. The Jhelum River and its tributaries such as Jaba etc.

9. Jhelum District—The Jhelum River and its tributaries such as Kahan Bunha, Soha Nala and its tributaries Dharb, Two Ghabirs, Choha Saidan Shah stream excluding the portions of the Jhelum River mentioned in Appendix I.
10. Gujranwala District—The Chenab River and its tributaries such as Palkhu Nala, Aik Nala, Deg nala and their tributaries excluding that portion of the Wandho Nala which flows within the bounds of the Revenue Estate of Nassoke.
11. Lahore District—River Ravi and its tributaries which are situated in the Lahore District excluding :-
 - Twenty-nine Kanals and 14 marlas of the areas owned by one Mahanda, under the management of Bawa Ram Dass, Adjacent to the Parade Nala in Lahore District, and the portion from stone mile No.5 to half a mile down stream of the wier at Baloki in Lahore District.
12. Sheikhpura District—River Ravi and its tributaries which are situated in Sheikhpura District excluding-
 - (1) the portion from spur No.5 to half a mile downstream of the weir at Baloki in Sheikhpura District.
 - (2) The portion of Deg Nala and its tributaries situated in the Shekhpura District.

APPENDIX – I

WATERS RESERVED FOR ROD AND LINE GEAR --- VIDE TULE 6.

River Indus from Vila^ge Swabi to Turbela Jhar and River Siran from Thapⁱa vila^ge to its junction with River Indus in Tehsil Hari^pur, District Hazara, River Kabul from Atock brid^ge to Public Works De^partment Rest House, near vila^ge Kund in Tehsil Nowshera, District Peshawar, River Indus from Atock brid^ge to Khattak vila^ge in Tehsil Hari^pur, District hazara, and River Kabul from vila^ge Pir Sabak to Additional Police Trainin^g, near vila^ge Khatak Rale^y, Tehsil Nowshera, District Peshawar and Sohan River from Grand Trunk Road Brid^ge to the tail of the Jala^post Shah^pur Vila^ge.

- (i) The Dhamrah stream from the boundar^y of Wah Estate and Hassan Abadal Vila^ge down to the confluence of Kala Stream and Chabiat Stream, (i) Chablat Stream from its confluence with Kala Stream down to the Road and Railwa^y brid^ge about two miles from Hassan Abadal. (i) the Kala stream u^p to a distance of two miles from its confluence with the Chablat stream and (iv) Haro River from its junction with Shakardara Nala u^p to its confluence with Indus River.

APPENDIX – I

WATERS RESERVED FOR ROD AND LINE GEAR --- VIDE TULE 6.

Rivers at Headworks within the limits given below excluding the compartments by the fish ladders, if any constructed in the weir, and the portion of the river within 20 feet of the lower compartment of the ladder on the downward stream side :-

Jhelum River from 1 mile upstream to ½ mile downstream of the Manla Head

- (1) Regulator.
Jhelum River from 1 ½ mile upstream to ¾ mile downstream of the Rasul Weir.
- (2) Weir.
Chenab River from 1 ½ mile upstream to ¾ mile downstream of the Khanki Weir.
- (3) Weir.
Chenab River from 1 mile upstream to ½ mile downstream of the Marala Weir.
- (4) Weir.
Ravi River from 1 mile upstream to ½ mile downstream of the weir at Baloki.
- (5) Baloki.
Ravi River from ½ mile upstream to ¾ mile downstream of the Sidhani Weir.
- (6) Weir.
Sutlej River from 1 mile upstream to ¾ mile downstream of the weir Sulemanki.
- (7) Sulemanki.
Both banks of River Sutlej, Chenab, or Panjnad from 1 mile upstream of the weir at Panjnad to ¾ mile downstream.
- (8) the weir at Panjnad to ¾ mile downstream.
Both banks of River Sutlej from 1 mile upstream to ¾ mile downstream of the Weir at Islam.
- (9) the Weir at Islam.
Both banks of River Chenab and Jhelum from 1 mile upstream to ¾ mile downstream of the Emerson Barrae at Trimmu.
- (10) downstream of the Emerson Barrae at Trimmu.
Indus River from 1 mile upstream to ½ mile downstream of the centre line of the Weir at Kalabash.
- (11) of the Weir at Kalabash.
Indus River at Taunsa Barrae from 1 mile upstream to ½ mile downstream.
- (12) downstream.
(13) Indus River at Sukkur Barrae from 1 mile upstream to ½ mile downstream.
- (14) Indus River at Guddu Barrae from 1 mile upstream to ½ mile downstream.
- (15) Indus River at Ghulam Muhammad Barrae from 1 mile upstream to ½ mile downstream.
- (16) Indus River at Ghulam Muhammad Barrae from 1 mile upstream to ½ mile downstream.
- (17) River Nari from 1 mile upstream to ¾ mile downstream of the Nari Works.
- (18) River Bolan from 1 mile upstream of the Bolan Weir.
- (19) River Bolan 5 miles upstream of the Bolan Dam.

APPENDIX – IV

WATER RESERVED FOR DAILY LICENCES, VIDE RULE 6

Government Fish Farms, (I) Panjtirth, (i) Sohawa, (i) Ghorakhdibbi, (iv) Ksheshki Reservoir, (v) Chhenawan, (vi) Hiran Minar, (vi) Bansi Sa^gar, (v i) Waris Road, (ix) Santkotia, (x) Surajkund, (xi) Old Ghar Fish Farm, larkana, (vi) Old Nara Fish Farm, (x i) Pathan Vila^ge, (xiv) Dokeri, (xv) Old Sukkur Wah, Sukkur, (xvi) Mehr Fish Farm, Sukkur.

.....

APPENDIX – V

SPECIAL WATERS FOR LICENCES, VIDE RULE 7

Deg Nallah in Sheikhu^Pura District

.....

APPENDIX – VI

WATERS WHICH ARE TO BE LEASED, VIDE RULE 18

The ^Public waters (includin^g Dhands and Dhoras) in the district of Thata, H^yderabad Dadu, Mir^Purkhas, San^ghar, Nawab Shah, Khair^Pur, Sukkur, Jacobabad, Larkana, Queta, Pishin, Loralai, Zheb, Sibi, Chan^ghai, Kalat, Mekran, Kharan excludin^g S^Pecial Areas, Rahim^yar Khan and Bahawalna^gar, Muzaffar^grah, Multan, Mont^gomer^y, L^yal^Pur, Jhan^g, Sar^godha, Mianwali, and Dera Ismail Khan.

.....

APPENDIX – VII

WATERS RESERVED FOR LEASES, VIDE RULE 18.

1. All creeks, pools or other collections of waters lying upstream of the Weir in the areas between the marginal Bunds and below the upper limits on the river specified in Appendix-I and all creeks, pools and other collections of water lying in canal land downstream of the Weir, up to the down limits of the river specified therein.
2. All supply channels, escape channels and all drainage canals whether man-made or natural under the administrative control of the Irrigation Department except such waters in which the fishing rights are not controlled by the Fisheries Department.
3. All canals belonging to the Government in the West Pakistan.
4. The pond areas in the West Pakistan at Islam Headworks extending from a distance of one mile upstream from Weir to the canal lane boundaries.

.....

APPENDIX – VIII

LANDING CENTRE, VIDE RULE 30

Mancher Lake-(I) Miani Tar, (i) Carkan Tar, (i) Mandi Pur, (iv) Tehni, (v) Lal Wah Khad, (vi) Shah Kassam, (vi) Aroni, (vi) Mehji.

Jamshoro near Power House, Jamshoro.

3. Punjab Fisheries (Amendments) Rules, 1996

GOVERNMENT OF THE PUNJAB
FORESTRY, WILDLIFE, FISHERIES & TOURISM
DEPARTMENT

NOTIFICATION

No.SOF(B&P)1 1-1/88-I. In exercise of the powers conferred by Section 26 (2) c of the Punjab Fisheries Ordinance, 1961 (Ordinance No.XXX of 1961) the Governor of the Punjab is pleased to raise the licence fee prescribed under Rule 7(I) 7(3) 7(4) and 41 of Fisheries Rules, 1965 as under:-

- 7(I) i- For all kinds of Fishing gears Rs. 120/- per season in all waters mentioned in Rule,4. except in the tributaries of the Ravi and Chenab rivers in the Sialkot district, namely Palkhu, Basanter Aik and De^s, the fee for which shall be Rs.80/- per season.
- i-For Rod & Line fishing only. Rs.60/-
i-For Dip net (Kurli) Rs.40/-
iv-For hand net (Dhan^sla)fishing Rs.60/-
v-For castnet fishing only. Rs.80/-
vi-For long line (Lan^s) Rs.80/-
- 7(3)- i-Castnet. Rs.500/-
i-Long Line, Rs.300/-
i-Kurli or Dhan^sla Rs.200/-
iv-Rod and Line. Rs.60/-
- 7(4)- The licence fee for waters reserved for rod and Line gear under Clause (b) of Sub rule (2) of rule,6.
- i-Season licence. Rs. 100/-
i-Monthly licence. Rs.20/-
i-Daily licence. Rs.10/-
- Full fees shall be charged for any broken periods. 41-
Grant of Annual licence (Provincial) 3 00/-

SECRETARY
GOVERNMENT OF THE PUNJAB

No.SOF(B&P) 11-1/88-I dated 26-12-1996

Copy is forwarded for information and necessary action to:-

1. The Director General Fisheries Punjab, Lahore.
2. All Directors Fisheries in Punjab.
3. All Deputy Directors Fisheries in Punjab.
4. All Assistant Directors Fisheries in Punjab.
5. Section Officer (Taxation) Government of the Punjab Finance Department.
6. The Superintendent Government Printing Press Punjab, Lahore for publication in the next gazette.

UNDER SECRETARY FISH(B&P)

XLII. 4. Punjab Fisheries (Amendment) Act, 1999

XLI. EXTRAORDINARY ISSUE
7532

REGISTERED NO. L -

XLIV. The Punjab Gazette

PUBLISHED BY AUTHORITY

LAHORE WEDNESDAY FEBRUARY 10, 1999

PROVINCIAL ASSEMBLY OF THE PUNJAB

XLV. NOTIFICATION 9th February, 1999

No. Le^{gis}-2(36)/98/116. The Punjab Fisheries (Amendment) Bill 1999, having been passed by the Provincial Assembly of the Punjab on 1 February 1999 and assented to by the Governor of the Punjab on 4 February 1999, is hereby published as an Act of the Provincial Assembly of the Punjab.

THE PUNJAB FISHERIES (AMENDMENT) ACT 1999

ACT IV OF 1999

First published, after having received the assent of the Governor of the Punjab, in the Gazette of the Punjab (Extraordinary) dated 9 February 1999.

An

XLVI. Act

Further amend the Punjab Fisheries Ordinance, 1961 (XXX of 1961).

Preamble.-Whereas it is expedient further to amend the Punjab Fisheries Ordinance, 1961 (XXX of 1961) in the manner hereinafter appearing;

It is hereby enacted as follows-

1. Short title and commencement.

(1) This Act may be called the Punjab Fisheries (Amendment) Act 1999.

(2) It shall come into force at once.

2. Amendment of section 17 of Ordinance XXX of 1961. In the Punjab Fisheries Ordinance, 1961 (XXX of 1961), hereinafter referred to as the Ordinance, in section 17, for the words "three months", "five hundred" and "one hundred", the words "two years", "ten thousand" and "three thousand" shall respectively be substituted.

3. Amendment of Second Schedule of Ordinance XXX of 1961. In the said Ordinance, in the Second Schedule.

- (i) against Serial Numbers 1 , 2 , 3 and 4, for the words “twent^y-five”, the words “five thousand” shall be substituted; and
- (i) against Serial Numbers 5 , 6 , and 7 , for the words “twent^y-five”, the words “one thousand” shall be substituted.

4. Re^pea^l.
The Punjab Fisheries (Amendment) Ordinance, 1998 (XXXVI of 1998) is hereby re^pea^ted.

DR SYED ABUL HASSAN NAJMEE
Secretar^y

XLVII. 5. Punjab Fisheries (Amendment) Ordinance, 2001

XLVI.

XLIX. EXTRAORDINARY ISSUE

REGISTERED NO. L-7532

L. The Punjab Gazete

PUBLISHED BY AUTHORITY

LAHORE WEDNESDAY NOVEMBER 14, 2001

LI. GOVERNMENT OF THE PUNJAB

LAW & PARLIAMENTARY AFFAIRS DEPARTMENT

LI. NOTIFICATION

13th November, 2001

No. 1.e^g.is.13-61/2001. The followin^g Ordinance promul^gated by the Governor of the Punjab is hereby published for ^general information:

THE PUNJAB FISHERIES (AMENDMENT) ORDINANCE, 2001

PUNJAB ORDINANCE NO. XXXVI OF 2001

AN

ORDINANCE further

to amend the Punjab Fisheries Ordinance, 1961.

Whereas it is ex^pedient further to amend the Punjab Fisheries Ordinance 1961 (XXX of 1961), for the Pur^poses hereinafter a^ppearin^g:

And whereas under Article 4 of the Provisional Constitution (Amendment) Order No. 9 of 1999, as amended by the Chief Executive Order No. 11 of 2000 the Governor of a Province may issue and promul^gate an Ordinance:

Now, therefore, in exercise of the aforesaid ^powers and a l other ^powers enablin^g him in that behalf, the Governor of the Punjab, is ^pleased to make and promul^gate the folowin^g Ordinance:-

1. Short title and commencement:- (1) This Ordinance may be caled the Punjab Fisheries (Amendment) Ordinance, 2001.
(2) It shal come into force at once.
2. Amendment in section 2 of Ordinance XXX of 1961:- in the said Ordinance in section 2 .
 - (i) in clause (a) after the word "Director" and before the word of wherever occurin^g the word "General shal be inserted.
 - (i) after the entr^y at clause (e) the folowin^g ex^planation shal be added:
"Ex^planation
Provincial licence shal be issued by the Provincial Fisheries De^partment."

- (i) in clause (g) after the word “person” occurring for the first time and the comma and before the word “or” the following shall be inserted:
“a water area which is land locked by his own survey numbers”.
- (iv) After clause (h) the following new clauses shall be added:
- (i) “Provincial water” means rivers canals and barrages/pond areas which are not confined within the district boundary or which receives water from the river canal:
- (j) “District Water” means a water except rivers, canals, barrages/pond areas and all those waters which have no permanent or seasonal link with rivers etc:

Explanation

District Fisheries Officer shall be responsible for the conservation and management and development of district water areas and will be empowered to lease out fishing rights of the water area exclusively confined within the district boundary.”

3. Amendment in section 4 of Ordinance XXX of 1961:- In the said Ordinance in section 4 sub section (1) after the word “Director” wherever occurring the word “General” shall be inserted and after the word “water” and before the full stop at the end the words “and district water” shall be inserted.
4. Amendment in section 16, 11, 12, 16 and 26 of Ordinance XXX of 1961:-In the said Ordinance in sections 10, 11, 12, 16 and 26 after the word “Director” and before the word “of” wherever occurring the word “General shall be inserted.
5. Amendment in sections 16 and 20 of Ordinance XXX of 1961. In the said Ordinance in sections 16 and 20 after the word “an” and before the word “net” wherever occurring the word “fish” and a comma shall be inserted.
6. Amendment in the First Schedule of Ordinance XXX of 1961. In the said Ordinance in the First Schedule after the entry at serial No. 5 the following new entry shall be added:

“6 Calbans 12 1st June to 31st August.”

Dated:

LT. GEN.(RETD) KHALID MAQBOOL
GOVERNOR OF THE PUNJAB

(MUHAMMAD LATIF QURESHI)
Secretary to
Government of Punjab
Law & Parliamentary Affairs
Department

6. Punjab Fisheries (Amendment) Rules, 2001

GOVERNMENT OF THE PUNJAB
FORESTRY, WILDLIFE, FISHERIES
AND TOURISM DEPARTMENT

Dated Lahore, the 3rd November, 2001

NOTIFICATION

No.SO(E-I)(FT)2- 14/2001(I). In exercise of the powers conferred upon him under section 26 of the Punjab Fisheries Ordinance, 1961 (XXX of 1961), the Governor of the Punjab is pleased to direct that in the Punjab Fisheries Rules, 1965, the following further amendments shall be made:-

AMENDMENTS

- 1) In Rules 3, 16, 18, 24, 25, 26, 28, 29, 31, 33, 39 and 41, the words "Director of Fisheries" wherever occurring shall be substituted by the words "Director General of Fisheries.
- 2) In Rule 11 for the words "Deputy Commissioner" the words "District Officer (Revenue)" shall be substituted.
- 3) In Rule 18, after the first proviso the following new proviso shall be added:-

"Provided further that if at any stage the nature/status of provincial/district water as mentioned in Section 2(i) and 2(j) of the Ordinance is required to be changed, Director General of Fisheries changed, shall be empowered to make such change".

SHAHID HUSSAIN RAJA

SECRETARY FWF&T & DATE EVEN:

A copy is forwarded for information and necessary action to:-

1. The Secretary to Governor of the Punjab, Lahore.
2. The Secretary, Government of the Punjab, LG&RD Department.
3. The Secretary, Government of the Punjab, Law & PA Department.
4. The Secretary, Government of the Punjab, Finance Department.
5. The Secretary (I&C), Government of the Punjab, S&GAD.
6. The Director General Fisheries, Punjab, Lahore.
7. All District Coordination Officer in the Punjab.
8. All Director Fisheries in the Punjab.
9. The Director Budget & Accounts (Forests), Lahore.
10. The Incharge SMIT, 18-Signal Battalion, Lahore.
11. PRO to Secretary, FWF&T Department.
12. PS to Secretary, FWF&T Department.
13. PA to A.S., D. S. (A) & D. S. (P), FWF&T Department.
14. All U.Ss./S.Os./STOs, FWF&T Department. SECTION OFFICER (E-I)

7. DELEGATION OF FINANCIAL POWERS (1990)

<u>Sr No</u>	<u>Name of Powers</u>	<u>To whom dele^gated</u>	<u>Extent</u>
1.	Power to fix rates for disposal of fish	Director of Fisheries	Full Powers to determine rates at which fish caught on Government account may be sold.
Note:- The Director of Fisheries will ensure that rates so fixed are not below the market rates.			
2.	To sanction expenditure on the purchase of fish seed, manure, fishing implements and breed fish, etc.	i) Director General Fisheries i) Deputy Director Fisheries i) Asst. Director Fisheries	Full Powers Rs.10,000 in a year. Rs. 5,000 in a year.
3.	To sanction expenditure on purchase of chemicals, equipment and apparatus required at Research Stations, Hatcheries, Nurseries and Training Centres.	Director General Fisheries	Full Powers
4.	To sanction dismantling and selling unserviceable buildings, tanks and other civil works constructed out of department funds under minor head "works".	i) Director General Fisheries i) Deputy Director Fisheries i) Asst. Director Fisheries	RS.20,000/- Rs.10,000/- Rs. 5,000/-
5.	To accept tenders of fishing on share basis from Government forms and other public waters reserved for departmental operations.	Director General Fisheries	Full Powers
6.	Lease of land for grazing of cattle or cultivation of fruit trees in fisheries project areas.	Director General Fisheries	Full Powers by open auction or tenders for one year
7.	Sale of trees and products in fisheries project areas.	Director General Fisheries other	Full Powers by open auction or tenders for one year

- | | | | |
|----|---|--|--|
| 8. | To approve highest bid of fishing leases in open auction. | i) Director General Fisheries
i) Deputy Director Fisheries
i) Asst. Director Fisheries | Full powers
Rs.50,000/-
Rs.10,000/-
Full powers subject to condition that the highest bid is more than 10% of the last auction or average bid of last 3 years, whichever is more. |
| 9. | To auction fishing rights. | Director General Fisheries | Full powers subject to condition that open auction is held by the Auctioning Authority i.e. Assistant Director Fisheries under the Auction Committees as under:- |

D

DISTRICT AUCTION COMMITTEE

Assistant director of fisheries of the District	Chairman Auctioning Authority
---	----------------------------------

Assistant Warden of Fisheries of the respective district.	Member
---	--------

Any other Assistant Director of Fisheries of the adjoining district.	Member
--	--------

DIVISIONAL AUCTION COMMITTEE

Deputy Director Fisheries Chairman of the respective division.

Assistant Director Fisheries Auctioning Authority of the respective district. & Member

Assistant Director Fisheries Member of adjoining district.

PROVINCIAL AUCTION COMMITTEE

Any Deputy Director	Nominated as Chairman by the Director General
---------------------	---

Assistant Director Fisheries of the respective District.	Auctioning Authority and Member
--	---------------------------------

Any Assistant Director Fisheries of the Directorate.	Member
--	--------

8. Notification – Delegation of Powers of Transferring Authority

GOVERNMENT OF THE PUNJAB
FORESTRY, WILDLIFE, FISHERIES
AND TOURISM DEPARTMENT

Dated Lahore, the 15th August, 1989

NOTIFICATION

No. E&A (F&W)9-6/88... In exercise of the powers conferred upon him under Section 23 of the Punjab Civil Servants Act, 1974, the Governor of the Punjab is pleased to delegate the powers of Transferring Authority to the Officers mentioned in Column No.3 in respect of officers/officials specified against the post of such persons in Column No.2 of the attached schedule.

(S. K. KHANZADA)
SECRETARY

No. & Date Even

A copy is forwarded for information and necessary action to:-

1. The Superintendent, Government Printing Press, Lahore for publication in the official gazette.
2. The Accountant General, Punjab, Lahore.
3. The Director General Fisheries, Punjab, Lahore.
4. All Deputy Secretary/Under Secretaries/Section Officers, Forestry, Wildlife, Fisheries and Tourism Department, Government of the Punjab, Lahore.
5. The Section Officer (R-I), Services, General Administration and Information Department, Government of the Punjab, Lahore.
6. All Directors of Fisheries, Punjab, Lahore.

SECTION OFFICER (GENERAL)

SCHEDULE

S.No.	NAME OF THE POST	TRANSFERRING AUTHORITY
1.	2.	3.
1 .	Director General Fisheries	Government
2 .	Director Fisheries	Government
3 .	De ^P uty Director Fisheries	Director General Fisheries
4 .	Princi ^P al Chemist	
5 .	Senior Economist	
6 .	Assistant Director Fisheries/Zoolo ^g ist	i) Director General Fisheries throughout the Punjab. i) Director Fisheries concerned within his jurisdiction.
7 .	Assistant Director Fisheries (Chemistr ^y)	
8 .	Senior Chemist	
9 .	Botanist	
10 .	Economist/Evaluation Officer/ Statistical Officer/Research Officer	
11 .	Bud ^g et & Accounts Officer	
12 .	Chemist	
13 .	Administrative Officer	
14 .	Librarian	
15 .	Research Investi ^g ator/Statistical Investi ^g ator	
16 .	Su ^P erintendent	

MINISTERIAL AND TECHNICAL SUBORDINATE STAFF (Head ^q uarter as wel as Field)		
1 .	Senior Scale Steno ^g ra ^P her	
2 .	Steno ^g ra ^P her	
3 .	Assistant	
4 .	Assistant Warden Fisheries/Fisheries Research Assistant/Fisheries Develo ^P ment Assistant	
5 .	Overseer/Sub-En ^g ineer	
6 .	Foreman	
7 .	Draftsman	
8 .	Statistical Assistant	
9 .	Publicit ^y Assistant	
10 .	Photo ^g ra ^P her	
11 .	Mechanic (A . C . & Refri ^g eration)	
12 .	Mechanic (Auto)	
13 .	Electrician	
14 .	Photo Artist/Artist-cum-Photo ^g ra ^P her	i) Director General
15 .	Librar ^y Assistant	Fisheries throu ^g h the
16 .	Senior Clerk	Punjab.
17 .	Mason	i) Director Fisheries
18 .	Fisheries Su ^P ervisor/Field Assistant	concerned within his
19 .	Junior Clerk	jurisdiction.
20 .	Com ^P uter ^d)	De ^P ut ^y Director
21 .	Tracer	Fisheries within the
22 .	Laborator ^y Su ^P ervisor	jurisdiction
23 .	Laborator ^y Assistant	
24 .	Driver/Tracer	
25 .	Pelet Machine O ^P erator	
26 .	Tubewel Mechanic/Lift Pum ^P Mechanic/o ^P erator	
27 .	Head Fisheries Watcher	
28 .	Daftri	
29 .	Publicit ^y Assistant	
30 .	Laborator ^y Atendant	
31 .	Fisheries Watcher	
32 .	Naib Qasid/Chowkidar/Mali/Swee ^P er /Beldar/Cleaner/Fisherman/Boatman- cum- Fisherman, Boatman-cum-Beldar /Fisherman- cum-Beldar.	

1.	2.	3.
1 .	Assistant Warden Fisheries/Fisheries Research Assistant/Fisheries Development Assistant	Assistant Director Fisheries within his jurisdiction
2 .	Fisheries Supervisor	
3 .	Field Assistant	
4 .	Head Fisheries Watcher	
5 .	Tubewell Mechanic/Lift Pump Mechanic/Operator	
6 .	Fisheries Watcher	
7 .	Beldar/Fisherman/Boatman/Boatman-cum-Beldar/Fisherman-cum-Beldar	

9. Notification – Ammendment in the Punjab (Civil Service) Dele^gation of Powers, Rules, 1983.

GOVERNMENT OF THE PUNJAB
FINANCE DEPARTMENT

NOTIFICATION

No.FDSR- 1-7-1/82-1. In exercise of the ^powers conferred on him under Section 23 the Punjab Civil Servants Act, 1974, the Governor of the Punjab is ^pleased to direct that in the Punjab (Civil Services) Dele^gation of Powers Rules, 1983, the folowin^g amendment shall be made, name^ly:-

AMENDMENT

In A^{pp}endix-A for Rule 3 , the folowin^g clauses (i) a^gainst Sr. No.19 shal be added:-

Sr. No	POSTS	SANCTIONING AUTHORITY
	i) Officers holdin ^g Posts of:	
	a) Administrative Secretaries includin ^g A.C.S Chairman P&D Board & Chairman Governor's Ins ^p ection Team.	
	b) Senior Member/Members, Board of Revenue, Punjab.	Chief Minister/Governor
	c) Heads of Atached De ^p artments.	
	d) Heads of Autonomous Bodies.	
	e) District Coordination Officers.	
	f) De ^p ut ^y Ins ^p ectors General of Police.	
	g) Senior Su ^p erintendents of Police/ Su ^p erintendents of Police in the Districts.	Chief Secretary
	i) Officers of Bs- 18 & above belon ^g in ^g to APUG (SG/DMG/PSP) ex-PCS, ex-PSS and PP Cadres. Such dele ^g ation of ^p owers wil, however, exclude the officers workin ^g a ^g ainst ^p ost mentioned at Sr. No. (i) above.	Additional Chief Secretar ^y Administrative Secretar ^y concerned
	i) Officers of Bs-17, belon ^g in ^g to DMG, ex-PCS & ex- PSS.	
	iv) Bs-17 and above officers belon ^g in ^g to the De ^p artment concerned.	

GOVERNMENT OF THE PUNJAB
FORESTRY, WILDLIFE, FISHERIES
AND TOURISM DEPARTMENT

No.E&A(F&W) 10-12/98.... Dated Lahore, the 6th December, 2001.

A copy is forwarded for information and necessary action/future compliance to:-

1. All the CCF's in the Province of Punjab.
2. The Director General Fisheries, Punjab.
3. The Director General, Wildlife & Parks.
4. The Managing Director, TDCP, Lahore.
5. The Director (B&A), Forests, 24-Cooper Road, Lahore.
6. All the Uss/Sos/STOs, in the FWF&T Department.

(CH. MUHAMMAD AN WAR)
UNDER SECRETARY (GENERAL)

No. 3(9)E-1/18392-95 _____ Dated

_____ 24-12-2001 _____

Copy to:-

All Director Fisheries in the Punjab for information and necessary action.

(MUHAMMAD IQBAL BHATTI)
DEPUTY DIRECTOR (ADMN)
HEADQUARTER, LAHORE

10. ADMINISTRATIVE AND FINANCIAL POWERS DEVOLVED
TO DISTRICTS & PROVINCE AFTER DEVOLUTION OF
DIVISIONAL SETUP

LIII. Existing

Administrative Powers

1. Empowered to appoint officials in BS-1 to BS-5 in his own divisional office and BS-4 & BS-5 within his respective division.
2. Empowered to transfer Technical and Ministerial staff in BS-1 to BS-11 from one district to other within his functional respective division.
3. Empowered to sanction grant of earned leave as under:-
 - i) Full powers in respect of officials in BS-1 to BS-5
 - ii) 75 days earned leave in respect of officials BS-6 to BS-12.

Financial Powers

1. All powers already delegated vide financial powers rules 1990 being category-I officer and special powers delegated under fisheries wing.

Proposed

Administrative Powers

1. After abolishing divisional setup the Deputy Director Fisheries is shifted to seed production units/hatcheries in their respective unit. Powers to appoint officials in BS-1 to BS-5 will be exercised by the Deputy Director Fisheries in the respective unit.
2. After abolishing the division setup the transfer of Technical and Ministerial staff in BS-1 to BS-15 from one district will be exercised by the Director Fisheries (P&D, Ext. & Admn.) at Provincial level.
3. Empowered to sanction grant of earned leave as under:-
 - i) Full powers in respect of officials in BS-1 to BS-5
 - ii) 75 days earned leave in respect of officials BS-6 to BS-12.

Financial Powers

1. All powers already delegated vide financial powers rules 1990 being category-I officer and special powers delegated under fisheries wing.

TERMS AND CONDITIONS
OF
AUCTION OF FISHING RIGHTS FOR THE YEAR 2002-03

- 1- Duration of lease will be from the date of issue of licence to 31st Au^gust 2003.
- 2- The acce^ptance of bid will be subject to a^pp^roval by the Director General Fisheries Punjab. In case of unsatisfactory bid Director General Fisheries, Punjab will be com^petent to issue order for re-auction of that water area.
- 3- To ^partici^pate in the auctions bidder wil have to de^posite 20% of the avera^ge bid of last three ^years as securit^y with the auctionin^g officer, which wil be returned after obtainin^g the recei^pt exce^pt to the hi^ghest bidder. In such case securit^y amount wil be adjusted in the lease amount.
- 4- A l the amount of hi^ghest bid offered wil be received at the time of auction, either in the sha^pe of cash or Bank draft which wil be retained til the acce^ptance of the bid by the Director General Fisheries Punjab and in case the bid is rejected the amount de^posited in the sha^pe of cash or bank draft wil be returned on his writen re^quest. The concerned bidder wil have no ri^ght to claim ^profit/interest on this amount.
- 5- At the end of auction the hi^ghest bidder wil have to de^posite offered amount in ful either in the sha^pe of cash or Bank draft, otherwise the amount de^posited by him would be forfeited, the bid offered wil stand canceled and the water area wil be re-auctioned.
- 6- The hi^ghest bidder wil be bound to stick to his bid til the a^pp^roval of the contract bid.
- 7- Any contractor who is a defaulter or has been black listed by the Fisheries De^partment are any other Government De^partment durin^g the current or last ^years or who has failed to de^posit the offered amount wil not be allowed to ^partici^pate in the auctions.
- 8- The lessee wil be bound to receive licence and ^permit book from the concerned Assistant Director Fisheries/De^put^y Director Fisheries who is a re^presentative of Director General Fisheries after ^presentin^g si^gned a^greement deed to him within seven da^ys. The lessee wil be res^ponsible for any dela^y in this context.
- 9- U^pon violation of any term or condition of auction or Fisheries Rules Director General Fisheries Punjab wil have the ri^ght to cancel the contract and forfeit the whole de^posited amount by the lessee, cancel al the ^permits issued and order for re-auction of the water area. In such cases the lessee wil be res^ponsible for a l the losses caused to the Government and Director General Fisheries can blacklist him after issuin^g a show cause notice.

15. Terms and Conditions for Lease of Public Waters (2002-03)
- 10- The contractor has no right to sublet the contract of water area as a whole or in parts to any other.
 - 11- The lessee is not authorized to stop any angler having provincial licence from fishing in the leased out water area with the help of Rod & Line, which is issued by the Fisheries Department under prevailing rules.
 - 12- The mesh size of net to be used for fishing should not be less than 1 ½" from knot to knot and 6" in total.
 - 13- Fishing within one hundred yards of any bridge and other prohibited areas mentioned in Punjab, Fisheries Rules, 1965 is not allowed.
 - 14- The contractor will only be allowed to use fixed net at that place and time while fishing with the help of Draught net. Use of fixed net at any other place will be unlawful.
 - 15- Under Fisheries Ordinance fishing with any kind of net is not allowed in close season i.e. 1st June to 31st August.
 - 16- Lease of fishing rights will be leased out "AS IS WHERE IS" basis. The Department of Fisheries will not be responsible for, any interference by any Private/Government Institute, change in water or fish catch due to defense purposes/natural calamities, emergency or any other reason.
 - 17- In case of any dispute the decision of the Director General Fisheries will be the final.

DIRECTOR GENERAL FISHERIES
PUNJAB, LAHORE

(B) REPEALS

i. Indian Fisheries Act No.IV of 1897

THE INDIAN FISHERIES ACT

ACT No. IV OF 1897

PASSED BY THE GOVERNOR GENERAL OF INDIA IN
COUNCIL

(RECEIVED THE ASSENT OF THE GOVERNOR GENERAL ON
THE 4TH FEBRUARY, 1897)

LIV. An act to provide for certain matters relating to Fisheries in British India

Whereas it is expedient to provide for certain matters relating to fisheries in British India; it is hereby enacted as follows:-

- | | | |
|--|----|---|
| Title, extent and commencement. | 1. | (1) This act may be called the Indian Fisheries Act, 1897.
(2) It extends to the whole of British India; and
(3) It shall come into force at once. |
| Act to be read as supplemental to other Fisheries Law. | 2. | Subject to the provisions of sections 8 and 10 of the General Clause Act, 1887, this Act shall be read as supplemental to any other enactment for the time being in force relating to fisheries in any part of British India. |
| Definitions. | 3. | In this Act, unless there is anything repugnant in the subject or context:-
(1) "fish" includes shell-fish;
(2) "fixed engine" means any net, cage, trap, or other contrivance for taking fish, fixed in the soil or made stationary in any other way; and
(3) "private water" means water which is exclusive property of any person, or in which any person has for the time being an exclusive right of fishery whether as owner, lessee or in any other capacity.
Explanation-Water shall not cease to be "private water" within the meaning of this definition by reason only that other persons may have by custom a right of fishery therein. |
| Destruction of fish in | 4. | (1) If any person uses any dynamite or other explosive by explosives |

inland waters and on coasts.

substances in any water with intent thereby to catch or destroy any of the fish that may be therein, he shall be punishable with imprisonment for a term which may extend to two months, or with fine which may extend to two hundred rupees.

(2) In sub-section (1) the word "water" includes the sea within a distance of one marine league of the sea-coast and an offence committed under that sub-section in such seas may be tried, punished and in all respects dealt with as if it had been committed on the land but in such cases.

Destruction of fish by poisoning of waters.

5. (1) If any person puts any poison, lime or noxious material into any water with intent thereby to catch or destroy any fish, he shall be punishable with imprisonment for a term which may extend to two months, or with fine which may extend to two hundred rupees.

(2) The Provincial Government may by notification in the official gazette, suspend the operation of this section in any specified area, and may in like manner modify or cancel any such notification.

Protection of fish in selected waters by rules of Provincial Government.

(1) The Provincial Government may make rules for the purpose hereinafter in this section mentioned, and may by a notification in the official Gazette apply all or any of such rules to such waters, not being private waters, as the Provincial Government may specify in the said notification.

The Provincial Government may also, by a like notification, apply such rules or any of them to any private water with the consent in writing of the owner thereof and of all persons having for the time being any exclusive right of fishery therein.

Such rules may prohibit or regulate all or any of the following matters, that is to say:-

- (a) the erection and use of fixed engines;
- (b) the construction of weirs; and
- (c) the dimension and kind of the nets to be used and the modes of using them.

Such rules may also prohibit all fishing in any specified water for a period not exceeding two years.

In making any rule under this section the Provincial Government may-

- (a) direct that a breach of it shall be punishable with fine which may extend to one hundred rupees, and, when the breach is a continuing breach, with a further fine which may extend to ten rupees for every day after the date of

the first conviction during which the breach is proved to have been persisted in; and (b) Provide for-
(i) the seizure, forfeiture and removal of fixed engines erected, or used or nets used, in contravention of rule, and

(i) The forfeiture of any fish taken by means of any such fixed engine or net.

(6) The power to make rules under this section is subject to the condition that they shall be made after previous publication.

Arrest without warrants for offences under this Act.

7.

(1) Any police officer or other person specially empowered by the Provincial Government in this behalf either by name or as holding any office, for the time being made, without an order from a Magistrate and without warrant, arrest any person committing in his view any offence punishable under section 4 or 5 under any rule under section 6-

(a) if the name and address of the person are unknown to him, and

(b) if the person declines to give his name and address, or if there is reason to doubt the

accuracy of the name and address if given (2) A person arrested under this section may be detained until his name and address have been correctly ascertained;

Provided that no person so arrested shall be detained longer than may be necessary for bringing him before a Magistrate, except under the order of a Magistrate for his detention.

i. The Punjab Fisheries Act 1914

THE PUNJAB FISHERIES ACT, 1914

(As modified upto the 30th November 1923)

Punjab Act No.II OF 1914

PASSED BY THE LIEUTENANT GOVERNOR OF THE
PUNJAB IN COUNCIL

(Received the assent of His Honour the Lieutenant Governor on the 15th January 1914
and that of His Excellency the Viceroy and Governor General on the 29th January
1914, and was first Published in the Gazette of the 13th February 1914)

LV. AN ACT TO EXTEND THE LAW RELATING TO FISHERIES IN
THE PUNJAB

WHEREAS it is expedient to extend the Law relating to Fisheries in the
Punjab;

It is hereby enacted as follows:-

Title	1	(1) This Act may be called the Punjab Fisheries Act, 1914 (2) It extends to the whole of the Punjab.
Meaning of terms	2.	In this Act and the Rules there under unless there is something repugnant in subject or context, the expressions, "fish" and "private water" shall have the meanings assigned to them in section 3 of the Indian Fisheries Act, 1897.
Definitions.	[(2-A)	In this Act, unless there is anything repugnant in the subject or context—
In India Act IV of 1897	(1)	"Fishery Officer" means any person whom the Provincial Government or any Officer empowered by the Provincial Government in this behalf may from time to time appoint by name, or as holding an office, to carry out all or any of the purposes of this Act or to do anything required by this Act or any rule made there under to be done by a Fishery Officer: Provided that no police officer below the rank of Sub Inspector shall be so empowered.

- Prohibition and
licensing of fishing in
selected waters by
rules of Provincial
Government
- (2) “fishing offence” means an offence punishable under Act or under any rule made there under.]
- 3.
- (1) The Provincial Government may make rules for the purposes hereinafter in this section mentioned, and, shall in such rules declare the waters, not being private waters, to which all or any of them shall apply.
- (2) The Provincial Government may by notification apply such rules or any of them to any private water with the consent in writing of the owner of the water thereof and of all persons having for the time being any exclusive right of fishery therein.
- (3) Such rules may—
- (a) prohibit fishing except under licence and regulate the granting of such licenses, the fees payable therefore, and the conditions to be inserted therein;
- (b) prescribe seasons in which the killing of any fish of any prescribed species shall be prohibited; and
- (c) prescribe a minimum size or weight below which no fish of any prescribed species shall be killed.
- (4) In making any rule under this section the Provincial Government may provide for—
- (a) the seizure, forfeiture and removal of any apparatus erected or used for fishing in contravention of the rules, and
- (b) the forfeiture of any fish taken by means of any such apparatus.
- (5) The power to make rules under this section is subject to the condition that they shall be made after previous publication.
- Power to prohibit
sale of fish.
- 4 The Provincial Government may by notification prohibit in any specified areas the offering or exposing for sale or barter of any fish killed in contravention of any rule made under section 3(3)(b) and (c) (1) of this Act.
- Penalty
5. The breach of any rule made under section 3 or any prohibition notified under section 4 shall be punishable with fine which may extend to one hundred rupees, and when the breach is a continuing breach, with a further fine which may extend to ten rupees for every day after the date of the first conviction during which the breach is proved to have been persisted in.
- Arrest without
6. (1) Any Police Officer, or other person specially

warrant for offences under the Act.

empowered by the Provincial Government in this behalf, may without warrant arrest any person committing in his view a breach of any rule made under section 3 or of any prohibition notified under section 4:-

- (a) of the name and address of the person are unknown to him, and
- (b) if the person declines to give his name and address, or if there is reason to doubt the accuracy of the name and address, if given.

(2) A person arrested under this section may be detained until his name and address have been correctly ascertained.

Provided that no person so arrested shall be detained longer than may be necessary for bringing him before a Magistrate, except under the order of a Magistrate for his detention.

Saving of powers under Indian Fisheries Act.

7. Nothing in this Act shall be deemed to limit the powers of the Provincial Government to make rules under section 6 of the Indian Fisheries Act, 1897.

(India Act IV of 1847)

India Act IV of 1997.

Power to compound certain offences.

8. (1) The Provincial Government may by notification empower a fishery officer by name or as holding an office—

(a) To accept from any person concerning whom evidence exists which if un-rebutted would prove that he has committed any fishing offence as described in the first column of the Schedule a sum of money by way of compensation for the offence with regard to which such evidence exists and on the payment of such sum to such officer such person if in custody shall be discharged and no further proceedings shall be taken against him;

(b) when any property has been seized as liable to confiscation, to release the same without further payment, or on payment of the value thereof as estimated by such officer, and on the payment of such value such property shall be released and no further proceedings shall be taken in respect thereof.

(2) The sum of money acceptable as compensation under clause (a) of sub-section (1) shall in no case exceed the amount mentioned in the second column of the Schedule as the amount acceptable as compensation for the particular offence described in the first column of the Schedule.

THE SCHEDULE

(See SECTION 8)

Description of offence	Maximum amount acceptable as compensation
1 . Fishin ^g with a net havin ^g a smaler mesh than that ^p rescribed under the rules made under the act.	Ru ^p ees ten.
2 . Fishin ^g without licence	Ru ^p ees ten.
3 . Kilin ^g fish of a size or wei ^g ht less than the standard ^p rescribed under this Act.	Ru ^p ees ten.
4 . Kilin ^g any fish of a ^p rohibited s ^p ecies durin ^g a close season	Ru ^p ees ten.
5 . Fishin ^g with any ^g ear or method other than that ^p ermitted under the rules.	Ru ^p ees ten.
6 . Usin ^g at any one time more than two of either or any of the ^g ears ^p ermitted under the rules.	Ru ^p ees ten.
7 . Licence holders em ^p lo ^y in ^g or en ^g a ^g in ^g non licences to hel ^p them with their nets while fishin ^g .	Ru ^p ees ten.
8 . Fishin ^g ^p rohibited waters.	Ru ^p ees ten.
9. Offerin ^g or ex ^p osin ^g for sale or barter any fish, the sale of which is ^p rohibited in any s ^p ecified area by a notification issue under section of the Act.	Ru ^p ees ten.

iv. a) The Punjab Fisheries (Amendment) Ordinance 1998

LVI. EXTRAORDINARY ISSUE

REGISTERED NO. L-7532

L V I .

L V I . The Punjab Gazete

PUBLISHED BY AUTHORITY

LAHORE TUESDAY SEPTEMBER 8, 1998

LIX. GOVERNMENT OF THE PUNJAB LAW &
PARLIAMENTARY AFFAIRS DEPARTMENT

LX. NOTIFICATION

8th Se^ptember, 1998

No.Le^gis.3(XXXIV)/98- The folowin^g Ordinance ^promul^gated by the Governor of the Punjab is hereby ^published for ^general information:

THE PUNJAB FISHERIES (AMENDMENT) ORDINANCE, 1998

PUNJAB ORDINANCE NO. XXV OF 1998

AN

ORDINANCE

further to amend the Punjab Fisheries Ordinance, 1961 (XXX OF 1961).

Preamble-WHEREAS it is ex^pedient further to amend the Punjab Fisheries Ordinance, 1961 (XXX of 1961) in the manner hereinafter a^ppearin^g;

AND WHEREAS the Provincial Assembl^y of the Punjab is not in session and the Governor of the Punjab is satisfied that immediate action is necessar^y;

NOW, THEREFORE, in exercise of the ^powers conferred on him under Article 128 of the Constitution of the Islamic Re^public of Pakistan, the Governor of the Punjab is ^pleased to make and ^promul^gate the folowin^g Ordinance:-

1. Short title and commencement:-
 - (1) This Ordinance may be caled the Punjab Fisheries (Amendment) Ordinance 1998.
 - (2) It shal come into force at once.
2. Amendment of section 17 of Ordinance XXX of 1961:- In the Punjab Fisheries Ordinance 1961 (XXX of 1961) hereinafter referred to as the said Ordinance in section 17 for the words “three months”, “five hundred” and “one hundred”, the words “two ^years”, “ten thousand” and “three thousand” shal res^pectivel^y be substituted.
3. Amendment of Second Schedule of Ordinance XXX of 1961:- In the said Ordinance in the Second Schedule:-

- (i) against Serials Number 1,2,3 & 4 for the words “Twenty five” the words “Five thousand” shall be substituted; and
(i) against Serials Number 5 , 6 & 7 for the words “Twenty five” the words “One thousand” shall be substituted.

SHAHID HAMID
GOVERNOR OF THE PUNJAB Dated: 3rd September,
1998

SHEIKH ABDUL RASHID
Secretary to
Government of the Punjab
Law & Parliamentary Affairs
Department

iv. b) The Punjab Fisheries (Amendment) Ordinance 1998
LXI.
LXI. EXTRAORDINARY ISSUE REGISTERED NO. L-7532

L X I .

LXIV. The Punjab Gazete

PUBLISHED BY AUTHORITY

LAHORE WEDNESDAY DECEMBER 30, 1998

LXV. GOVERNMENT OF THE PUNJAB

LAW & PARLIAMENTARY AFFAIRS DEPARTMENT

LXVI. NOTIFICATION

30th December, 1998

No. Le^gis. 3 (XXXVI)/98- The folowin^g Ordinance ^promul^gated by the Governor of the Punjab is hereby ^published for ^general information:

THE PUNJAB FISHERIES (AMENDMENT) ORDINANCE, 1998

PUNJAB ORDINANCE NO. XXXVI OF 1998

AN

ORDINANCE

further to amend the Punjab Fisheries Ordinance, 1961 (XXX OF 1961).

Preamble-WHEREAS it is ex^pedient further to amend the Punjab Fisheries Ordinance, 1961 (XXX of 1961) in the manner hereinafter a^ppearin^g;

AND WHEREAS the Provincial Assembl^y of the Punjab is not in session and the Governor of the Punjab is satisfied that immediate action is necessar^y;

NOW, THEREFORE, in exercise of the ^powers conferred on him under Article 128 of the Constitution of the Islamic Re^public of Pakistan, the Governor of the Punjab is ^pleased to make and ^promul^gate the folowin^g Ordinance:-

1. Short title and commencement:-

- (1) This Ordinance may be caled the Punjab Fisheries (Amendment) Ordinance 1998.
- (2) It shal come into force at once and shal be deemed to have taken effect on the day the Punjab Fisheries (Amendment) Ordinance 1998 (XXV of 1998) stands re^pealed under Article 128(2) of the Constitution.

2. Amendment of section 17 of Ordinance XXX of 1961:- In the Punjab Fisheries Ordinance 1961 (XXX of 1961) hereinafter referred to as the said Ordinance in section 17 for the words “three months”, “five hundred” and

“one hundred”, the words “two years”, “ten thousand” and “three thousand” shall respectively be substituted.

3 . Amendment of Second Schedule of Ordinance XXX of 1961:- In the said Ordinance in the Second Schedule:-

(i) against Serials Number 1,2,3 & 4 for the words “Twenty five” the words “Five thousand” shall be substituted; and

(i) against Serials Number 5 , 6 & 7 for the words “Twenty five” the words “One thousand” shall be substituted.

SHAHID HAMID
GOVERNOR OF THE PUNJAB Dated: 15th December,
1998

SHEIKH ABDUL RASHID
Secretary to
Government of the Punjab
Law & Parliamentary Affairs
Department

No.A-7/319-22 _____ / Dated 09-01-1999 _____ /

Co^{py} forwarded to a l Director of Fisheries in Punjab for information and circulation to the field formation under their control.

(HABIB AHMED)
EVALUATION OFFICER For
DIRECTOR GENERAL

13 . GLOSSARY OF COMMONLY USED TERMS IN FISHERIES

Acclimatization	The adaptation of fishes to a new environment or habitat or to different climatic conditions.
Acre Foot	A water volume equivalent to that covering a surface area of one acre to a depth of one foot; equal to 326,000 gallons or 2,71,18,000 pounds of water.
Activated Sludge Process	A system in which organic waste continually is circulated in the presence of oxygen and digested by aerobic bacteria.
Acute	Having a short and relatively severe course; for example, acute inflammation.
Acute Toxicity	Causing death or severe damage to an organism by poisoning during a brief exposure period, normally 96 hours or less.
Adaptation	The process by which individuals (or parts of individuals), populations, or species change in form or function in order to better survive under given or changed environmental conditions. Also the results of this process.
Aerated Lagoon	A waste treatment pond in which the oxygen required for biological oxidation is supplied by mechanical aerators.
Aeration	The mixing of air and water by wind action or by air forced through water; generally refers to a process by which oxygen is added to water.
Aerobic	Referring to a process (for example, respiration) or organism (for example, a bacterium) that requires oxygen.
Air Bladder (Swim bladder).	An internal, inflatable gas bladder that enables a fish to regulate its buoyancy.
Air Stripping	Removal of dissolved gases from water to air by agitation of the water to increase the area of air-water contact.
Algal Bloom	A high density or rapid increase in abundance of algae.
Algal Toxicosis	A poisoning resulting from the uptake or ingestion of toxins or toxin-producing algae; usually associated with blue-green algae or dinoflagellate blooms in fresh or marine water.
Alimentary Tract	The digestive tract, including all organs from the mouth to the anal opening.
Alkalinity	The power of a mineral solution to neutralize hydrogen ions; usually expressed as equivalent of calcium carbonate.
Amino Acid	A building block for proteins; an organic acid containing one or more amino groups (NH ₂) and at least one carboxylic acid group (–COOH).

Ammonia	The Gas NH ₃ ; highly soluble in water; toxic to fish in the unionized form, especially at low oxygen tensions.
Anabolism	Constructive metabolic processes in living organisms: tissue building and growth.
Anadromous Fish	Fish that leave the sea and migrate up freshwater rivers to spawn.
Anaerobic	Referring to a process or organism not requiring oxygen.
Anal	Pertaining to the anus or vent.
Anemia	A condition characterized by a deficiency of hemoglobin, packed cell volume, or erythrocytes. The more important anaemias in fish are (1) normocytic anemia caused by acute hemorrhaging, bacterial and viral infection, or metabolic disease; (2) microcytic anemia due to chronic hemorrhaging, iron deficiency, or deficiency of certain hemopoietic factors; (3) microcytic anemia resulting from an increase in hemopoietic activity in the spleen and kidney.
Anesthetics Chemicals	used to relax fish and facilitate the handling and spawning of fish. Commonly used agents include tricaine methane sulfonate (MS-222), benzocain, quinaldine, and carbon dioxide.
Anoxia	Reduction of oxygen in the body to levels that can result in tissue damage.
Anterior	In front of; toward the head end.
Antibiotic	A chemical produced by living organisms, usually molds or bacteria, capable of inhibiting other organisms.
Antibody	A specific protein produced by an organism in response to a foreign chemical (antigen) with which it reacts.
Antigen	A large protein or complex sugar that stimulates the formation of an antibody. Generally, pathogens produce antigens and the host protects itself by producing antibodies.
Antimicrobial	Chemical that inhibits microorganisms.
Antioxidant	A substance that chemically protects other compounds against oxidation; for example, vitamin E prevents oxidation and rancidity of fats.
Antiseptic	A compound that kills or inhibits microorganisms, especially those infecting living tissues.
Antivitamin	Substance chemically similar to a vitamin that can replace the vitamin or an essential compound, but cannot perform its role.
Anus	The external posterior opening of the alimentary tract; the vent.

Aquaculture	Culture or husbandry of aquatic organisms.
Artery	A blood vessel carrying blood away from the heart.
Ascorbic Acid	Vitamin C, a water-soluble antioxidant important for the production of connective tissue; deficiencies cause spinal abnormalities and reduce wound-healing capabilities.
Asphyxia	Suffocation caused by too little oxygen or too much carbon dioxide in the blood.
Atmosphere	The envelope of gases surrounding the earth; also, pressure equal to air pressure at sea level, approximately 14.7 pounds per square inch.
Atrophy	A degeneration or diminution of a cell or body part due to disuse, defect, or nutritional deficiency.
Auditory	Referring to the ear or to hearing.
Available Energy	Energy available from nutrients after food is digested and absorbed.
Avirulent	Not capable of producing disease.
Axilla	The region just behind the pectoral fin base.
Bacterial Gill Disease	A disease usually associated with unfavorable environmental conditions followed by secondary invasion of opportunistic bacteria.
Bacterial Hemorrhagic Septicemia	A disease caused by many of the gram-negative rod-shaped bacteria (usually of the genera <i>Aeromonas</i> or <i>Pseudomonas</i>) that invade all tissues and blood of the fish. Synonyms: infectious dropsy; red pest; fresh water eel disease; red mouth disease; motile aeromonad septicemia (MAS).
Bacterial Kidney Disease	An acute to chronic disease of salmonids caused by <i>Renibacterium salminiarum</i> . Synonyms: columnar bacterial kidney disease; Dee's disease; kidney disease.
Bacterin	A vaccine prepared from bacteria and inactivated by heat or chemicals in a manner that does not alter the cell antigens.
Bacteriocidal	Having the ability to kill bacteria.
Bacteriostatic	Having the ability to inhibit or retard the growth or reproduction of bacteria.
Bacterium (Plural; bacteria)	One of a large, widely distributed group of typical one-celled microorganisms, often parasitic or pathogenic.
Balanced Diet (feed)	A diet that provides adequate nutrients for normal growth and reproduction.
Barbell	An elongated fleshy projection, usually of the lips.
Basal Metabolic Rate	The oxygen consumed by a completely resting animal per unit weight and time.

Basal Metabolism	Minimum energy requirements to maintain vital body processes.
Bath	A solution of therapeutic or prophylactic chemicals in which fish are immersed. See Dip; Short Bath; Flush; Long Bath; Constant-Flow Treatment.
Bioassay	Any test in which organisms are used to detect or measure the presence or effect of a chemical or condition.
Biochemical Oxygen Demand (BOD)	The quantity of dissolved oxygen taken up by nonliving or organic matter in the water.
Biological Control	Control of undesirable animals or plants by means of predators, parasites, pathogens, or genetic diseases (including sterilization).
Biological Oxidation	Oxidation of organic matter by organisms in the presence of oxygen.
Biotin	Vitamin H, one of the B-complex vitamins.
Black Grub	Black spots in the skin of fishes caused by metacercaria (larval stages) of the trematodes <i>Uvilifer ambloplitis</i> , <i>Cryptocotyle lingua</i> , and others. Synonym: black-spot disease.
Black Spot	Usually refers to black cysts of intermediate stages of trematodes in fish. See Black Grub.
Black-Spot Disease	See Black Grub.
Black-Tail Disease	See Whirling Disease.
Blank Egg	An unfertilized egg.
Blood Flagellates	Flagellated protozoan parasites of the blood.
Blue-Sac Disease	A disease of sac fry characterized by opalescence and distension of the yolk sac with fluid and caused by previous partial asphyxia.
Blue Slime	Excessive mucus accumulation on fish, usually caused by skin irritation due to ectoparasites or malnutrition.
Blue-Slime Disease	A skin condition associated with a deficiency of biotin in the diet.
Boil	A localized infection of skin and subcutaneous tissue developing into a solitary abscess that drains externally.
Brackish Water	A mixture of fresh and seawater; or water with total salt concentrations between 0.05% and 3.0%.
Branchiae (Synonym: Branchia)	Gills, the respiratory organs of fishes.
Branchiomycosis	A fungal infection of the gills caused by <i>Branchiomyces</i> sp. Synonyms: gil rot; European gil rot.
Brood Stock	Adult fish retained for spawning.
Buccal Cavity	Mouth cavity.

Buffer	Chemical that, by taking up or giving up hydrogen ions, sustains pH within a narrow range .
Calcium Carbonate	A relatively insoluble salt, CaCO ₃ , the primary constituent of limestone and a common constituent of hard water.
Calorie	The amount of heat required to raise the temperature of one gram of water one degree centigrade.
Carbohydrate	Any of the various neutral compounds of carbon, hydrogen, and oxygen, such as sugars, starches, and celluloses, most of which can be utilized as an energy source by animals.
Carbon Dioxide	A colorless, odorless gas, CO ₂ , resulting from the oxidation of carbon-containing substances; highly soluble in water. Toxic to fish at high levels, Toxicity to fish increases at low levels of oxygen. May be used as an anesthetic.
Carbonate	The CO ₃ ⁻ ion, or any salt formed with it (such as calcium carbonate, CaCO ₃).
Carcinogen	Any agent or substance that produces cancer or accelerates the development of cancer.
Carnivorous	Feeding or preying on animals.
Carrier	An individual harboring a pathogen without indicating signs of the disease.
Carrier Host (Transport Host)	An animal in which the larval stage of a parasite will live but not develop.
Carrying Capacity	The population, number, or weight of a species that a given environment can support for a given time.
Cartilage	A substance more flexible than bone but serving the same purpose.
Catabolism	The metabolic breakdown of materials with a resultant release of energy .
Catadromous	Fish that leave fresh water and migrate to the sea to spawn.
Catalyst	A substance that speeds up the rate of chemical reaction but is not itself used up in the reaction.
Catfish Virus Disease	See Channel Catfish Virus Disease.
Caudal	Pertaining to the posterior end. The
Caudal Fin	tail fin of fish.
Caudal Peduncle	The relatively thin posterior section of the body to which the caudal fin is attached; region between base of caudal fin and base of the last ray of the anal fin.
CCVD	Channel Catfish Virus Disease.
Channel Catfish Virus Disease (CCVD)	A disease caused by a herpes virus that is infectious to channel catfish and blue catfish.

Chemical Oxygen Demand (COD)	A measure of the chemically oxidizable components in water, determined by the quantity of oxygen consumed.
Chemotherapy	Cure or control of disease by the use of chemicals (drugs).
Chromatophores	Colored pigment cells.
Chromosomes	Structural units of heredity in the nuclei of cells.
Chronic	Occurring or recurring over a long time.
Chronic Inflammation	Long-lasting inflammation.
Circuli	The more or less concentric growth marks in fish scale.
Cloaca	The common cavity into which rectal, urinary, and genital ducts open. Common opening of intestine and reproductive system of male nematodes.
Coelomic Cavity	The body cavity containing the internal organs.
Cold Water Species	Generally, fish that spawn in water temperatures below 55°F. The main cultured species are trout and salmon.
Colloid	A substance so finely divided that it stays in suspension in water, but does not pass through animal membranes.
Columnaris Disease	An infection, usually of the skin and gills, by <i>Flexibacter columnaris</i> , a myxobacterium.
Communicable Disease	A disease that naturally is transmitted directly or indirectly from one individual to another.
Compensation Point	That depth at which incident light penetration is just sufficient for plankton to photosynthetically produce enough oxygen to balance their respiration requirements.
Complete Diet (Complete Feed)	See Balanced Diet.
Complicated Disease	A disease supervening during the course of an already existing ailment.
Compressed	Applied to fish, flattened from side to side, as in the case of a sunfish. See Depressed.
Conditioned Response	Behavior that is the result of experience or training.
Congenital Disease	A disease that is present at birth; may be infectious, nutritional, genetic, or developmental.
Congestion	Unusual accumulation of blood in tissue; may be active (often called hyperemia) or passive. Passive congestion is the result of abnormal venous return and is characterized by dark cyanotic blood.
Constant Flow Treatment	Continuous automatic metering of a chemical to flowing water.
Contamination	The presence of material or microorganisms making something impure or unclean.

Control (Disease)	Reduction of mortality or morbidity in a population, usually by use of drugs .
Control (Experimental)	Similar test specimens subjected to the same conditions as the experimental specimens except for the treatment variable under study.
Cool Water Species	Generally, fish that spawn in temperatures between 40° and 60°F.
Copper Sulfate (Blue Stone)	Blue stone is copper sulfate pentahydrate (CuSO ₄ ·5H ₂ O). Effective in the prevention and control of external protozoan parasites, fungal infections, and external bacterial diseases. <u>Highly</u> toxic to fish.
Cornea	Outer covering of the eye .
Cranium	The part of the skull enclosing the brain.
Cyst, Host	A connective tissue capsule, liquid or semi-solid, produced around a parasite by the host.
Cytoplasm	The contents of a cell, exclusive of the nucleus.
Dechlorination	Removal of the residual hypochlorite or chloramine from water to allow its use in fish culture. Charcoal is used frequently because it removes much of the hypochlorite and fluoride. Charcoal is inadequate for removing chloramine.
Deficiency	A shortage of substance necessary for health.
Deficiency Disease	A disease resulting from the lack of one or more essential constituents of the diet.
Dentary Bones	The principal or anterior bones of the lower jaw or mandible. They usually bear teeth.
Depressed	Flattened in the vertical direction, as a flounder.
Depth of Fish	The greatest vertical dimension; usually measured just in front of the dorsal fin.
Dermal	Pertaining to the skin.
Diarrhea	Profuse discharge of fluid feces.
Diet	Food regularly provided and consumed.
Dietary Fiber	Non-digestible carbohydrate.
Digestion	The hydrolysis of foods in the digestive tract to simple substances that may be absorbed by the body.
Diluent	A substance used to dissolve and dilute another substance.
Dilution Water	Refers to the water used to dilute toxicants in aquatic toxicity studies.
Dip	Brief immersion of fish into a concentrated solution of a treatment, usually for one minute or less.
Disease	Any departure from health; a particular destructive process in an organ or organism with a specific cause and symptoms.

Disease Agent	A physical, chemical, or biological factor that causes disease. Synonyms: etiologic agent; pathogenic agent.
Disinfectant	An agent that destroys infective agents.
Dissolved Oxygen	The amount of elemental oxygen, O ₂ , in solution under existing atmospheric pressure and temperature.
Dissolved Solids	The residue of a dissolved material when water is evaporated to dryness. See Salinity.
Distal	The remote or extreme end of a structure.
Diurnal	Relative to daylight; opposite of nocturnal.
Dorsal Fin	The fin on the back or dorsal side, in front of the adipose fin if the latter is present.
Dose	A quantity of medication administered at one time.
Dropsy	See Edema.
Dry Ration	A diet prepared from air-dried ingredients, formed into distinct particles and fed to fish.
Dysentery	Liquid feces containing blood and mucus. Inflammation of the colon.
Ectoparasite	Parasite that lives on the surface of the host.
Edema	Excessive accumulation of fluid in tissue spaces.
Efficacy	Ability to produce effects or intended results.
Effluent	The discharge from a rearing facility, treatment plant, or industry.
Egg	The mature female germ cell, ovum.
Emaciation	Wasting of the body.
Embryo	Developing organism before it is hatched or born.
Endocrine	A ductless gland or the hormone produced therein.
Endoparasite	A parasite that lives in the host.
Endoskeleton	The skeleton proper; the inner bony and cartilaginous framework.
Energy	Capacity to do work.
Environment	The sum total of the external conditions that affect growth and development of an organism.
Enzootic	A disease that is present in an animal population at all times but occurs in few individuals at any given time.
Enzyme	A protein that catalyzes biochemical reactions in living organisms.
Epidermis	The outer layer of the skin.
Epidemic	A disease attacking many animals in a population at the same time; widely diffused and rapidly spreading.
Eradication	Removal of all recognizable units of an infectious agent from the environment.

Eso ^p ha ^s us.	The ^s ulet; a muscular, membranous tube between the ^p harynx and the stomach.
Essential Amino Acids	Those amino acids that must be su ^{pp} lied by the diet and cannot be s ^y nthesized within the bod ^y .
Essential Fatty Acid	A fat ^y acid that must be su ^{pp} lied by the diet.
Estuary	Water mass where fresh water and sea water mix.
Etiolo ^g y	The study of the causes of a disease, both direct and ^p redis ^p osin ^g , and the mode of their o ^p eration; not synonymous with cause or ^p atho ^g enesis of disease, but often used to mean ^p atho ^g enesis.
Excretion	The ^p rocess of ^g etin ^g rid or throwin ^g off metabolic waste ^p roducts by an or ^g anism.
Exoskeleton	The hard ^p arts on the exterior surfaces, such as scales, scutes, and bon ^y ^p lates.
Extensive Culture	Rearin ^g of fish in ^p onds with low water exchan ^g e and at low densities; the fish utilize ^p rimaril ^y natural foods.
F ₁	The first ^g eneration of a cross.
Fauna	The animals <u>inhabitin^g</u> any re ^g ion, taken colectivel ^y .
Fecundity	Number of e ^{gg} s in a female s ^p awner
Feedin ^g Level	The amount of feed offered to fish over a unit time, usual ^y ^g iven as ^p ercent of fish bod ^y wei ^g ht per da ^y .
Fertility	Abilit ^y to ^p roduce viable offs ^p rin ^g .
Fertilization	(1) The union of s ^p erm and e ^{gg} ; (2) addition of nutrients to a ^p ond to stimulate natural food ^p roduction.
Fin Ray	One of the cartila ^g inous rods that su ^{pp} ort the membranes of the fin.
Fin Rot Disease	A chronic, necrotic disease of the fins caused by invasion of a m ^y cobacterium into the fin tissue of an unhealth ^y fish.
Fin ^g erlin ^g	Youn ^g fish measurin ^g a ^{pp} roximatel ^y from 2.5 to 13 cm in total len ^g th. Sometimes s ^p lit into earl ^y and late or advanced fin ^g erlin ^g sta ^g es.
Fixative	A chemical a ^g ent chosen to ^p enetrates tissues ver ^y soon after death and ^p reserve the celular components in an insoluble state as nearl ^y life-like as ^p ossible.
Fla ^g ellum	Whi ^p -like locomotion or ^g anele of sin ^g le (usual ^y free-livin ^g)
(^p lural: Fla ^g ella)	cels.
Flush	A short bath in which the flow of water is not sto ^{pp} ed, but a hi ^g h concentration of chemical is added at the inlet and ^p assed throu ^g h the s ^y stem as ^p ulse.
Folic Acid (Folacin).	A vitamin of the B com ^p lex that is necessar ^y for maturation of red blood cels and s ^y nthesis of nucleo ^p roteins; deficienc ^y results in anemia.

Food Conversion	A ratio of food intake to body weight gain; more generally, the total weight of all feed given to a lot of fish divided by the total weight gain of the fish lot. The units of weight and the time interval over which they are measured must be the same. The better the conversion, the lower the ratio.
Fork Length	The distance from the tip of the snout to the fork of the caudal fin.
Formalin	Solution of approximately 37% by weight of formaldehyde gas in water. Effective in the control of external parasites and fungal infections on fish and eggs. Also used as a tissue fixative.
Fortification	Addition of nutrients to foods.
Free Living	Not dependent on a host organism.
Fresh Water	Water containing less than 0.05% total dissolved salts by weight.
Fry	The stage in a fish's life from the time it hatches until it reaches 1 inch in length.
Fungus	Any of a group of primitive plants lacking chlorophyll, including molds, rusts, mildews, smuts, and mushrooms. Some kinds are parasitic on fishes.
Fungus Disease	See Saprolegniasis.
Gall Bladder	The body vessel containing bile.
Gametes	Sexual cells: eggs and sperm.
Gape	The opening of the mouth.
Gas Bladder	See Air Bladder.
Gas Bubble Disease	Gas embolism in various organs and cavities of the fish, caused by supersaturation of gas (mainly nitrogen) in the blood fish, caused by supersaturation of gas (mainly nitrogen) in the blood.
Gastric	Relating to the stomach.
Gene	The unit of inheritance. Genes are located at fixed loci in chromosomes and can exist in a series of alternative forms called alleles.
Genetic Dominant	Character donated by one parent that masks in the progeny the recessive character derived from the other parent.
Genital	Pertaining to the reproductive organs.
Genus	A unit of scientific classification that includes one or several closely related species. The scientific name for each organism includes designations for genus and species.
Geographic Distribution	The geographic area in which a condition or organism is known to occur.
Gill Rot	See Branchiomycosis.
Glycogen	Animal starch, a carbohydrate storage product of animals.
Gonads	The reproductive organs; testes or ovaries.

Grading of Fish	Sorting of fish by size, usually by some mechanical device.
Gram-negative Bacteria	Bacteria that lose the purple stain of crystal violet and retain the counterstain, in the Gram staining process.
Gram-positive Bacteria	Bacteria that retain the purple stain of crystal violet in the Gram staining process.
Gullet	The esophagus.
Habitat	Those plants, animals, and physical components of the environment that constitute the natural food, physical-chemical conditions, and cover requirements of an organism.
Hardness	The power of water to neutralize soap, due to the presence of cations such as calcium and magnesium; usually expressed as parts per million equivalents of calcium carbonate. Refers to the calcium and magnesium ion concentration in water on a scale of very soft (0-20 ppm as CaCO ₃), soft (20-50 ppm), hard (50-500 ppm) and very hard (500 + ppm).
Hemoglobin	The respiratory pigment of red blood cells that takes up oxygen at the gills or lungs and releases it at the tissues.
Hemorrhage	An escape of blood from its vessels, through either intact or ruptured walls.
Hepatic	Pertaining to the liver.
Hepatitis	Inflammation of the liver.
Heterotrophic Bacteria	Bacteria that oxidize organic material (carbohydrate, protein, fats) to CO ₂ , NH ₃ ~N, and water for their energy source.
Histology	Microscopic study of cells, tissues, and organs.
Histopathology	The study of microscopically visible changes in diseased tissues.
Homing	Return of fish to their stream or lake of origin to spawn.
Hormone	A chemical product of living cells affecting organs that do not secrete it.
Hybrid	Progeny resulting from a cross between parents that are genetically unlike.
Hybrid Vigor	Condition in which the offspring perform better than the parents. Synonym: heterosis.
Hydrogen Ion Concentration (Activity)	The cause of acidity in water. see pH.
Hydrogen Sulfide	An odorous, soluble gas, H ₂ S, resulting from anaerobic decomposition of sulfur-containing compounds, especially proteins.
Hyper	A prefix denoting excessive, above normal, or situated above.

Hyperemia	Increased blood resultin ^g in distension of the blood vessels.
Hy ^p o	A ^p refix denotin ^g deficienc ^y , lack, below, beneath.
Immune Immunity	Unsusce ^p tible to a disease. Lack of susce ^p tibility; resistance. An inherited or ac ^q uired status.
Immunization	Process or ^p rocedure by which an individual is made resistant to disease, s ^p ecifically infectious disease.
Im ^p rintin ^g	The im ^p osition of a behaviour ^p attern in a ^y oun ^g animal by ex ^p osure to stimuli.
Inbred Line	A line ^p roduced by continued matin ^g of brothers to sisters and ^p ro ^g eny to ^p arents over several ^g enerations.
Incubation (Disease)	Period of time between the ex ^p osure of an individual to a ^p atho ^g en and the a ^p pearance of the disease it causes.
Incubation (E ^{ggs})	Period from fertilization of the egg until it hatches.
Incubator	Device for artificial rearin ^g of fertilized fish e ^{ggs} and newl ^y hatched fr ^y .
Infection	Contamination (external or internal) with a disease-causin ^g or ^g anism or material, whether or not overt disease results.
Inferior Mouth	Mouth on the under side of the head, o ^p enin ^g downward.
Inflammation	The reaction of the tissues to injur ^y ; characterized clinical ^y by heat, swelin ^g , redness, and ^p ain.
Inoculation	The introduction of an or ^g anism into the tissue of a livin ^g or ^g anism or into a culture medium.
Instinct	Inherited behavioral res ^p onse.
Intensive Culture	Rearin ^g of fish at densities ^g reater than can be su ^{pp} orted in the natural environment; utilizes hi ^g h water flow or exchan ^g e rates and re ^q uires the feedin ^g of formulated feeds.
Inters ^p inals	Bones to which the ra ^y s of the fins are attached.
Intestine	The lower ^p art of the alimentar ^y tract from the ^p yloric end of the stomach to the anus.
Intra ^g ravel Water	Water occu ^{py} in ^g interstitial s ^p aces within ^g ravel.
Intramuscular Injection	Administration of a substance into the muscles of an animal.
Intra ^p eritoneal Injection	Administration of a substance into the ^p eritoneal cavit ^y (bod ^y cavit ^y). Used in reference to tests or ex ^p eriments conducted in an artificial environment, includin ^g c e l or tissue culture.
In Vitro	Used in reference to tests or ex ^p eriments conducted in or on intact, livin ^g or ^g anisms.
In Vivo	

Ion Exchange	A process of exchanging certain cations or anions in water for sodium, hydrogen, or hydroxyl (OH ⁻) ions in a resinous material.
Isotonic	No osmotic difference; one solution having the same osmotic pressure as another.
Kidney	One of the pair of glandular organs in the abdominal cavity that produces urine.
Kilogram Calorie	The amount of heat required to raise the temperature of one kilogram of water one degree centigrade, also called kilocalorie (kcal), or large calorie.
Larva (Plural: Larvae)	An immature form, which must undergo change of appearance or pass through a metamorphic stage to reach the adults state.
Lateral Band	A horizontal pigmented band along the sides of a fish.
Lateral Line	A series of pores, sensitive to low-frequency vibrations, located laterally along both sides of the body.
Length	May refer to the total length, fork length, or standard length (see under each item).
Lesion	Any visible alteration in the normal structure of organs, tissues, or cells.
Leucocyte	A white blood corpuscle.
Lime (Calcium Oxide, Produces Quicklime, Burnt Lime)	CaO; used as a disinfectant for fish-holding facilities. heat and extreme alkaline conditions.
Line Breeding	Mating individual so that their descendants will be kept closely related to an ancestor that is regarded as unusually desirable.
Lipid	Any of a group of organic compounds consisting of the fats and other substances of similar properties. They are insoluble in water, but soluble in fat solvents and alcohol.
Long Bath	A type of bath frequently used in ponds. Low concentration of chemical are applied and allowed to disperse by natural processes.
Malignant	Progressive growth of certain tumors that may spread to distant sites or invade surrounding tissue and kill the host.
Malnutrition	Faulty or inadequate nutrition.
Mandible	Lower jaw.
Mass Selection	Selection of individuals from a general population for use as parents in the next generation.
Mating System	Any of a number of schemes by which individuals are assorted in pairs leading to sexual reproduction.

Melanophore	A black pigment of cell; large numbers of these give fish a dark color.
Metabolic Rate	The amount of oxygen used for total metabolism per unit of time per unit of body weight.
Metabolism	Vital processes involved in the release of body energy, the building and repair of body tissue, and the excretion of waste materials; combination of anabolism and catabolism.
Methylene Blue	3,7-bis-Dimethylamino-phenazathionium chloride; a quinoneimine dye effective against external protozoans and superficial bacterial infections.
Microbe	Microorganism, such as a virus, bacterium, fungus, or protozoan.
Migration	Movement of fish populations.
Milt	Sperm-bearing fluid.
Mitosis	The process by which the nucleus is divided into two daughter nuclei with equivalent chromosome complements.
Morphology	The science of the form and structure of animals and plants.
Mortality	The ratio of dead to living individuals in a population.
Mortality Rate	The number of deaths per unit of population during a specified period. Synonyms: death rate; crude mortality rate; fatality rate.
Motile	Said of a living organism, such as spermatozoa, or a structure: capable of independent, spontaneous movement.
Muckin ^g (Eggs)	The addition of an inert substance such as clay or starch to adhesive eggs to prevent them from sticking together during spawn taking. Most commonly used with ecocide and wale ^y eggs.
Mucus	A viscid or slimy substance secreted by the mucous glands of fish.
Mutation	A sudden heritable variation in a gene or in a chromosome structure.
Mycology	The study of fungi.
Mycosis	Any disease caused by an infectious fungus.
Myotome	Muscle segment.
Necrosis	Dying of cells or tissues within the living body.
Nematoda	A diverse phylum of roundworms, many of which are plant or animal parasites.
Nitrogenous Wastes	Simple nitrogen compounds produced by the metabolism of proteins, such as ammonia, urea and uric acid.
Nonpathogenic	Refers to an organism that may infect but causes no disease.

Nutrient	A chemical used for growth and maintenance of an organism.
Nutrition	The sum of the processes in which an animal (or plant) takes in and utilizes food.
Ocean Ranching	Type of aquaculture involving the release of juvenile aquatic animals into marine waters to grow in natural foods to harvestable size.
Open-Formula Feed	A diet in which all the ingredients and their proportions are public (nonproprietary).
Operculum	A bony flap-like protective gill covering.
Optic	Referring to the eye.
Osmoregulation	The process by which organisms maintain stable osmotic pressures in their blood, tissues, and cells in the face of differing chemical properties among tissues and cells, and between the organism and the external environments.
Osmosis	The diffusion of liquid that takes place through a semipermeable membrane between solutions starting at different osmotic pressures, and that tends to equalize those pressures. Water always will move toward the more concentrated solution, regardless of the substances dissolved, until the concentration of dissolved particle is equalized, regardless of electric charge.
Osmotic Pressure	The pressure needed to prevent water from flowing into a more concentrated solution from a less concentrated one across a semipermeable membrane.
Outfall	Wastewater at its point of effluence or its entry into a river or other body of water.
Ovarian Fluid	Fluid surrounding eggs inside the female's body.
Ovaries	The female reproductive organs.
Oviduct	The tube that carries eggs from the ovary to the exterior.
Oviparous	Producing eggs that are fertilized, develop, and hatch outside the female body.
Ovoviviparous	Producing eggs, usually with much yolk, that are fertilized internally. Little or no nourishment is furnished by the mother during development; hatching may occur before or after expulsion.
Ovulate	Process of producing mature eggs capable of being fertilized.
Ovum (Plural: Ova)	Egg cell or single egg.
Oxidation	Combination with oxygen; removal of electrons to increase positive charge.

Parasite	An organism that lives in or on another organism (the host) and that depends on the host for its food, has a higher reproductive potential than the host, and may harm the host when present in large numbers.
Parasite, Obligate	An organism that cannot lead an independent, non-parasitic existence.
Parasiticide	Anti parasite chemical (added to water) or drug (fed or injected).
Parasitology	The study of parasites.
Parr	A life stage of salmonid fishes that extends from the time feeding begins until the fish become sufficiently pigmented to obliterate the parr marks, usually ending during the first year.
Parr Mark	One of the vertical color bars found on young salmonids and certain other fishes.
Part Per Billion (ppb)	A concentration at which one unit is contained in a total of a billion units. Equivalent to one microgram per kilogram ($1 \mu\text{g}/\text{kg}$) or one nanoliter per liter (1nl/liter).
Part Per Million (ppm)	A concentration at which one unit is contained in a total of a million units. Equivalent to one milligram per kilogram ($1 \text{mg}/\text{kg}$) or one microliter per liter ($1 \mu\text{l}/\text{liter}$).
Part Per Thousand (ppt or ‰)	A concentration at which one unit is contained in a thousand units. Equivalent to one gram per kilogram ($1 \text{g}/\text{kg}$) or one milliliter per liter (1 ml/liter). Normally, this term is used to specify the salinity of estuarine or sea waters.
Pathogen, Opportunistic	An organism capable of causing disease only when the host's resistance is lowered. Compare with Secondary Invader.
Pathology	The study of diseases and the structural and functional changes produced by them.
Pectoral Fins	The anterior and ventrally located fins whose principle function is locomotor maneuvering.
Pelvic Fins Paired fins	corresponding to the posterior limbs of the higher vertebrates (sometimes called ventral fins), located below or behind the pectoral fins.
Peritoneum	The membrane lining the abdominal cavity.
Perivitelline Fluid	Fluid lying between the yolk and outer shell (chorion) of an egg.
Permanganate, Potassium KMnO_4 ;	strong oxidizing agent used as a disinfectant and to control external parasites.

pH	An expression of the acid-base relationship designated as the logarithm of the reciprocal of the hydrogen-ion activity; the value of 7.0 expresses neutral solutions; values decreasing below 7.0 represent increasing acidity; those increasing above 7.0 represent increasing basic solutions.
Phenotype	Appearance of an individual as contrasted with its genetic makeup or genotype. Also used to designate a group of individuals with similar appearance but not necessarily identical genotypes.
Photoperiod	The number of daylight hours best suited to the growth and maturation of an organism.
Photosynthesis	The formation of carbohydrates from carbon dioxide and water that takes place in the chlorophyll-containing tissues of plants exposed to light; oxygen is produced as a by-product.
Phytoplankton	Minute plants suspended in water with little or no capability for controlling their position in the water mass; frequently referred to as algae.
Pigmentation	Disposition of coloring matter in an organ or tissue.
Pituitary	Small endocrine organ located near the brain.
Planting of Fish	The act of releasing fish from a hatchery into a specific lake or river. Synonyms: distribution; stocking.
Plasma	The fluid fraction of the blood, as distinguished from corpuscles. Plasma contains dissolved salts and proteins. Compare with Serum.
Poikilothermic	Having a body temperature that fluctuates with that of the environment.
Pollutant	A term referring to a wide range of toxic chemicals and organic materials introduced into waterways from industrial plants and sewage wastes.
Pollution	The addition of any substance not normally found in or occurring in a material or ecosystem.
Population	A coexisting and interbreeding group of individuals of the same species in a particular locality.
Population Density	The number of individuals of one population in a given area or volume.
Portal of Entry	The pathway by which pathogens or parasites enter the host.
Portal of Exit	The pathway by which pathogens or parasites leave or are shed by the host.
Post-treatment	Treatment of hatchery wastewater before it is discharged into the receiving water (pollution abatement).
Pretreatment	Treatment of water before it enters the hatchery.

Prevention, disease	Steps taken to stop a disease outbreak before it occurs; may include environmental manipulation, immunization, administration of drugs, etc.
Progeny	Offspring.
Progeny Test	A test of the value of an individual based on the performance of its offspring produced in some definite system of mating.
Prophylactic	Activity or agent that prevents the occurrence of disease.
Protein	Any of the numerous naturally occurring complex combinations of amino acids that contain the elements carbon, hydrogen, nitrogen, oxygen and occasional sulfur, phosphorus or other elements.
Protozoa	The phylum of mostly microscopic animals made up of a single cell or a group of more or less identical cells and living chiefly in water; includes many parasitic forms.
Random Mating	Mating without consideration of definable characteristics of the brood fish; nonselective mating.
Ration	A fixed allowance of food for a day or other unit of time.
Ray	A supporting rod for a fin. There are two kinds: hard (spines) and soft rays.
Rearing Unit	Any facility in which fish are held during the rearing process, such as rectangular raceways, circular ponds, circulation raceways, and earth ponds.
Recessive	Character possessed by one parent that is masked in the progeny by the corresponding alternative or dominant character derived from the other parent.
Residue, Tissue	Quantity of a drug or other chemical remaining in body tissues after treatment or exposure is stopped.
Resistance	The natural ability of an organism to withstand the effects of various physical, chemical, and biological agents that potentially are harmful to the organism.
Reuse, Recycle	The use of water more than one time for fish production. There may or may not be water treatment between uses and different rearing units may be involved.
Roe	The eggs of fishes.
Sac Fry	A fish with an external yolk sac.
Safe Concentration	The maximum concentration of a material that produces no adverse sub-lethal or chronic effect.
Salinity	Concentration of sodium, potassium, magnesium, calcium, bicarbonate, carbonate, sulfate and halides (chloride, fluoride, bromide) in water. See Dissolved Solids.

Sam ^p le	A ^p art, ^p iece, item, or observation taken or shown as re ^p resentative of a total ^p o ^p ulation.
Sam ^p le Count	A method of estimatin ^g fish ^p o ^p ulation wei ^g ht from individual wei ^g hts of a smal ^p ortion of the ^p o ^p ulation.
Sanitizer	A chemical that reduces microbial contamination on e ^q ui ^p ment.
Sa ^p role ^g niasis	An infection by fun ^g i of the ^g enus saprole ^g nia, usual ^y on the external surfaces of fish bod ^y or on dead or d ^y in ^g fish e ^g gs .
Saturation	In solutions, the maximum amount of a substance that can be dissolved in a li ^q uid without it bein ^g ^p reci ^p itated or released into the air.
Sea Water	Water containin ^g from 3.0 to 3.5% total salts.
Secchi Disk	A circular metal ^p late with the u ^{pp} er surface divided into four ^q uadrants, two ^p ainted white and two ^p ainted black. It is lowered into the water on a ^g raduated line, and the de ^p th at which it disa ^{pp} ears is noted as the limit of visibilit ^y .
Sediment	Settleable solids that form botom de ^p osits.
Sedimentation Pond are (Settlin ^g Basin)	A wastewater treatment facilit ^y in which settleable solids removed from the hatcher ^y effluent.
Selective Breedin ^g	Selection of mates in a breedin ^g ^p ro ^g ram to ^p roduce offs ^p rinn ^g ^p ossessin ^g certain defined characteristics.
Serum	The fluid ^p ortion of blood that remains after the blood is allowed to clot and the cels are removed.
Settleable Solids	That fraction of the sus ^p ended solids that wil settle out of sus ^p ension under ^q uiescent conditions.
Shockin ^g (E ^g gs)	Act of mechanical ^y a ^g itatin ^g e ^g gs, which ru ^p tures the ^p eriviteline membranes and turns infertile e ^g gs white.
Short Bath	A t ^y pe of bath most useful in facilities havin ^g a controlable ra ^p id exchan ^g e of water. The water flow is sto ^{pp} ed, and a relativ ^y hi ^g h concentration of chemical is thoru ^g hl ^y mixed in and retained for about I hour.
Side Effect	An effect of a chemical or treatment other than that intended.
Si ^g n	Any manifestation of disease, such as an aberration in structure, ^p hysiol ^g y, or behavior, as inter ^p reted by an observer. Note the term “sym ^p tom” is only a ^p ro ^p riate for human medicine because it includes the ^p atient’s feelin ^g s (sensations) about the disease.
Silt	Soil ^p articles carried or de ^p osited by movin ^g water.
Sin ^g le- ^p ass System	A s ^y stem in which water is ^p assed throu ^g h fish rearin ^g units without bein ^g rec ^y clcd and then dischar ^g ed from the hatcher ^y .

Slud ^g e	The mixture of solids and water that is drawn off a settlin ^g chamber.
Smolt	Juvenile salmonid at the time of ^p hysiolo ^g ical ada ^p tation to life in the marine environment.
Snout	The ^p ortion of the head in front of the e ^y es. The snout is measured from its most anterior tip to the anterior mar ^g in of the eye socket.
Soft-e ^{gg} Disease	Patholo ^g ical softenin ^g of fish e ^{gg} s durin ^g incubation, the etiolo ^g ical a ^g ent(s) bein ^g unknown but ^p ossibl ^y a bacterium.
Solubilit ^y	The de ^g ree to which a substance can be dissolved in a li ^q uid; usually ex ^p ressed as milli ^g rams per liter or ^p ercent.
S ^p awnin ^g (hatcher ^y context)	Act of obtainin ^g e ^{gg} s from female fish and s ^p erm from male (hatchery context) fish.
S ^p ecies	The lar ^g est ^g rou ^p of similar individuals that actual ^y or ^p otential ^y can successful ^y interbreed with one another but not with other such ^g rou ^p s; a s ^y stematic unit includin ^g ^g eo ^g ra ^p hic races and varieties, and included in a ^g enus.
S ^p ecific Dru ^g	A dru ^g that has thera ^p eutic effect on one disease but not on others.
S ^p ent	S ^p awned out.
S ^p ermatozoon	A male re ^p roductive cel, consistin ^g usual ^y of head, middle ^p iece, and locomotor ^y fla ^g elum.
S ^p inal Cord	The c ^y lindrical structure within the s ^p inal canal, a ^p art of the central nervous s ^y stem.
S ^p ines	Unse ^g mented rays, commonly hard and ^p ointed.
S ^p in ^y Ra ^y s	Stiff or non cross-striated fin rays.
Stabilization Pond	A sim ^p le waste-water treatment facilit ^y in which or ^g anic mater is oxidized and stabilized (converted to inert residue).
Standard Len ^g th	The distance from the most anterior ^p ortion of the bod ^y to the junction of the caudal ^p eduncle and anal fin.
Standard Metabolic Rate	The metabolic rate of ^p oikilothermic animals under conditions of minimum activit ^y , measured per unit time and bod ^y wei ^g ht at a ^p articular tem ^p erature. Close to basal metabolic rate, but animals rare ^y are at com ^p lete rest. See Basal Metobolism.
Sterilant	An a ^g ent that kills all microor ^g anisms.
Sterilize	To destro ^y al microor ^g anisms and their s ^p ores in or about an object.
Stock	^p ool. Grou ^p of fish that share a common environment and ^g ene

Stomach	The expansion of the alimentary tract between the oesophageous and the pyloric valve.
Strains	Group of fish with presumed common ancestry.
Stress	A state manifested by a syndrome or bodily change caused by some force, condition, or circumstances (i.e., by a stressor) in or on an organism or on one of its physiological or anatomical systems. Any condition that forces an organism to expend more energy to maintain stability.
Supersaturation	Greater-than-normal solubility of a chemical as a result of unusual temperatures or pressures.
Supplemental Diet	A diet used to augment available natural foods. Generally used in extensive fish culture.
Susceptible	Having little resistance to disease or to injurious agents.
Suspended Solids	Particles retained in suspension in the water column.
Swim Bladder	See Air Bladder.
Swim-up	Term used to describe fry when they begin active swimming in search of food.
Syndrome	A group of signs that together characterize a disease.
Temperature Shock	Physiological stress induced by sudden or rapid changes in temperature, defined by some as any change greater than 3 degrees per hour.
Tender Stage	Period of early development, from a few hours after fertilization to the time pigmentation of the eyes becomes evident, during which the embryo is highly sensitive to shock. Also called green-egg stage, sensitive stage.
Testes	The male reproductive organs.
Titration	A method of determining the strength (concentration) of a solution by adding known amounts of a reacting chemical until a color change is detected.
Topical	Local application of concentrated treatment directly on to a lesion.
Total Dissolved solids (TDS)	See Dissolved Solids.
Total Length	The distance from the most anterior point to the most posterior tip of the fish tail.
Total Solids	All of the solids in the water, including dissolved, suspended, and settleable components.
Toxicity	A relative measure of the ability of a chemical to be toxic. Usually refers to the ability of a substance to kill or cause an adverse effect. High toxicity means that small amounts are capable of causing death or ill health.

TOXIN	A particular class of poisons, usually albuminous proteins of high molecular weight produced by animals or plants, to which the body may respond by the production of antitoxins.
Transmission	The transfer of a disease agent from one individual to another.
Transmission, Horizontal	Any transfer of a disease agent between individuals except for the special case of parent-to-progeny transfer via reproductive processes.
Transmission, Vertical	The parent-to-progeny transfer of disease agents via eggs or sperm.
Trauma	An injury caused by a mechanical or physical agent.
Trematoda	The flukes. Subclass Monoeneae: ectoparasitic in general, one host; subclass Dineae: endoparasitic in general, two hosts or more.
Tumor	An abnormal mass of tissue, the growth of which exceeds and is uncoordinated with that of the tissues and persists in the same excessive manner after the disappearance of the stimuli that evoked the change.
Turbidity	Presence of suspended or colloidal matter or planktonic organisms that reduces light penetration of water.
Turbulence	Agitation of liquids by currents, jetting actions, winds, or stirring forces.
Ubiquitous	Existing everywhere at the same time.
Ulcer	A break in the skin or mucous membrane with loss of surface tissue; disintegration and necrosis of epithelial tissue.
Urea	One of the compounds in which nitrogen is excreted from fish in the urine. Most nitrogen is eliminated as ammonia through the gills.
Urinary Bladder	The bladder attached caudally to the kidneys; the kidneys drain into it.
Vaccine	A preparation of non-virulent disease organism (dead or alive) that retains the capacity to stimulate production of antibodies against it. See Antigen.
Vector	A living organism that carries an infectious agent from an infected individual to another, directly or indirectly.
Vein	A tubular vessel that carries blood to the heart.

LXVII.	Vent	The external posterior opening of the alimentary canal; the anus.
LXVI.	Ventral Fins	Pelvic fins.
LXIX. Viable		Alive.
LXX. Vibriosis		An infectious disease caused by the bacterium <i>Vibrio anguillarum</i> . Synonyms: Pike Pest; eel Pest; red sore.
LXXI. Virulence		The relative capacity of a pathogen to produce disease.
Vitamin Premix		A mixture of crystalline vitamins or concentrates used to fortify a formulated feed.
Viviparous		Bringing forth living young; the mother contributes food toward the development of the embryos.
<u>Warmwater Species</u>		<u>Generally, fish that spawn at temperatures above 60°F. The chief cultured warmwater species are basses, sunfish, catfish, and minnows. See Coldwater Species; Coolwater Species.</u>
Water Hardening		Process by which an egg absorbs water that accumulates in the perivitelline space.
Water Quality		As it relates to fish nutrition, involves dissolved mineral needs of fishes inhabiting that water (ionic strength).
Water Treatment		Primary: removal of a substantial amount of suspended matter, but little or no removal of colloidal and dissolved matter. Secondary: biological treatment methods (for example, by contact stabilization, extended aeration). Tertiary (advanced): removal of chemicals and dissolved solids.
Weir		A structure for measuring water flow.
Whirling disease		A disease of trout caused by the sporozoan, protozoan, <i>Myxosoma cerebralis</i> .
Yolk		The food part of an egg.
Zooplankton		Minute animals in water, chiefly rotifers and crustaceans, that depend upon water movement to carry them about, having only weak capabilities for movement. They are important prey for young fish.
Zoospores		Motile spores of fungi.
Zygote		Cell formed by the union of two gametes, and the individual developing from this cell.

12. JOB DESCRIPTION

HOW TO CONSERVE FISH AND PROMOTE FISHERIES DUTIES AND ROLE OF OFFICERS/OFFICIALS

LXXII.	Name BS	<u>Job Description of the Post</u>
Director General Fisheries	20	<p><u>Responsibilities:</u></p> <ol style="list-style-type: none">1. Conservation, management, development, research & training and promotion of aquaculture practices in the Province.2. To advise Government on fisheries policy matters3. Supervision and coordination of all technical and administrative matters of the Fisheries Department. <p><u>Duties:</u></p> <ol style="list-style-type: none">1. To ensure judicious Management and development of Fisheries on scientific lines.2. To maintain professional liaison with national and international organization in connection with promotion/ conservation of Fisheries/Aquaculture.3. To plan developmental project on Fisheries and its monitoring.4. To prepare the budget of Fisheries Department and its monitoring.5. To sub-offices in the Province.6. To undertake tour at least 8-10 days in a month.7. Visit one, Nursery Unit/Govt. Fish Farm/Private Fish Farm and Hatcheries in each tour.8. Visit development project at least once in a month.9. To carry out inspection of Hatchery/District/ Project offices on monthly basis.10. To arrange of fishing rights of public water areas of the Province as per Fisheries Ordinance.11. Inspection of subordinate offices once a month.12. To direct and supervise the Natural stock replenishment in tapped/untapped water areas, conservation of Fisheries in the Province.13. To supervise the execution of developmental projects.

14. To supervise research into hydrobiological
Nutrition requirements Physio-chemical factors, bio

diversity degradation due to pollution effect and other field connected fisheries management.

15. To supervise the strict enforcement of the Punjab Fisheries Ordinance, 1961 and Rules, 1965 amended from time to time.

16. To exchange technical knowledge and expertise in fish and fisheries.

17. To maintain professional liaison with National and International Fisheries Conservation Agencies.

18. To supervise the work of subordinate staff by spot inspection, data collection and monthly progress reports etc.

POWERS:

a) Financial

To exercise Financial powers delegated as officer of Category-I under the Delegation of Financial Powers Rules, 1990 and other Rules.

b) Administrative

i) To exercise powers as delegated under Fisheries Department (Delegation of Powers) Rules 1980 as well as under the provision of General clauses.

ii) To exercise the powers as delegated under the provision of Punjab Fisheries Ordinances, 1961 and Punjab Fisheries Rules, 1965.

iii) Appointing and punishing authority with regard to the officials in BS-1 to 15 in all cadres.

iv) Transferring authority in respect of officers/officials of all cadres in BS-1 to 18.

v) Pension sanctioning authority of officials in BS-1 to 16.

vi) Sanction of earned leave to officials in BS-1 to 17 (for BS-17 up to 90 days)

vii) Reserve any public water for development and Research purpose.

viii) To fix rates of sale of fish at Government shops and rates of fish seed.

LXXIII.	Name	<u>Job Description</u>
of the Post	18	<p data-bbox="768 285 854 312"><u>Duties</u></p> <ol style="list-style-type: none"> <li data-bbox="768 317 1276 386">1. To assist the D. G. F. regarding all administrative matters. <li data-bbox="768 390 1377 531">2. To keep liaison with the Admn. Department and all Directorate of Fisheries for proper compliance on policies and administrative matters. <li data-bbox="768 535 1403 604">3. To maintain proper record of staff strength, vacancy position and service records etc. <li data-bbox="768 609 1344 678">4. To deal with all administrative matter in accordance with Law and regulation. <li data-bbox="768 682 1344 785">5. Preparation of service record of non-gazeted staff, maintenance of service books & ACR record. <li data-bbox="768 789 1393 858">6. Disposal of day-to-day matter relating to disciplinary, leaves pension, and gratuity cases etc. <li data-bbox="768 863 1393 932">7. Supervision of the attendance and disposal of work by subordinate staff. <li data-bbox="768 936 1289 963">8. Supervision of store and vehicles. <li data-bbox="768 968 1349 995">Maintenance of building, furniture and fixture. <li data-bbox="768 999 1312 1079">9. Maintenance and preparation of old record files for disposal. <li data-bbox="768 1083 1252 1152">10. Preparation of proposals for the amendments in rules and regulations. <li data-bbox="768 1157 1377 1297">11. To prepare working papers for the departmental selection/promotion committees of condemnation of surplus and un-serviceable store articles etc. <p data-bbox="768 1331 865 1358"><u>Powers</u></p> <ol style="list-style-type: none"> <li data-bbox="854 1373 1068 1442">a) Financial N. A. <li data-bbox="854 1446 1143 1516">b) Administrative N. A.

LXXIV. Name BS
the Post

Job Description of

Deputy Director 18
Fisheries (P&D)

Duties

1. To supervise the budget preparation and financial periodicals.
2. Reconcile the department's income/receipt and expenditure reports.
3. To supervise the preparation of working papers for DAC/SDAC and PAC to act the audit paras settled.
4. Coordination in Development schemes with the respective officers, Preparation and Achievement of Targets for Income, fish seed and stock etc.
5. Preparation of working paper on various technical aspects of department's activities.
6. Coordination of fish farming, seed production, distribution, research/training programme and management of resources and collection of data etc.
7. Coordination with P&D department, Finance Department and other planning and research institution for future planning and implementation of ongoing development projects.

Powers

- a) Financial
Not applicable.
- b) Administrative
Not applicable.

LXXV. Name BS
of the Post

Job Description

Senior Economist 1 8 Duties

1. Progress monitoring, evaluation, appraisal and feedback of project management.
2. Preparation of reports and working papers etc.
3. Management, co-ordination and scrutiny of statistical data on Fish and Fisheries.
4. Streamline of Evaluation and Monitoring efforts through co-ordination and arranging facilities of the personnel working in the department.

LXXVI. Name BS
the Post

Job Description of

Budget & Accounts 17 Duties
Officer

- 1 . Preparation of Budget estimates of permanent and non-development expenditure.
- 2 . Co-ordination of development and non-development budget including its distribution, expenditure and income cases etc.
- 3 . Drawing and disbursing officer for office of the Director General of Fisheries, Punjab, Lahore.
- 4 . Internal Audit of offices subordinate to Director General Fisheries, Punjab, and correspondence on miscellaneous accounts matters with various organizations.
- 5 . Reconciliation of income and expenditure statements, WAPDA, Sui Gas.
- 6 . Preparation of working paper for DAC and PAC meeting, settle the audit paras etc.

LXXVII. Name BS
the Post
Evaluation Officer 17 Duties

Job Description of

1. Monitoring and Evaluation work of development non-development projects of the department, identification of bottlenecks in their implementation and to devise suitable ways and means for the achievement of stipulated targets.
2. Consolidation and submission of various progress reports to Government and other regarding development/non-development projects.
3. Spot inspection of various projects for monitoring and evaluation purposes.
4. To assist the Director General Fisheries and Senior Economist in monitoring and evaluation of various development and non-development project.
5. Processing of auction papers etc.
6. Assistance in legislation and court matters.

LXXVIII. Name BS
of the Post
Economist

Job Description

17 Duties

1. To supervise the work of Research officers/statistical officer as well as establishment and administration.
2. Analysis of financial and economical aspects of short, medium and long terms plans.
3. Determination of economically value strategies programmes on the basis of feasibility studies of identification projects.
4. Appraisal of projects through different analytical techniques viz; sensitivity, analysis, benefit cost ratio, net present worth, IRP tests of projects etc., from financial as well as economical aspects.
5. Identification of bottlenecks in implementation and measures/strategies for smooth implementation of development projects.
6. Scrutiny of statistical data by the application of applied operational research aspects.
7. Processing of auction papers at headquarter level.
8. Liaison with P&D department, Finance Department and other related institutions for monitoring and evaluation purposes reports.

LXXIX. Name BS
of the Post
Research Officer

Job Description

17 Duties

1. Liaison with P&D Department and other related institutions for monitoring and evaluation purposes.
2. Monitoring and evaluation of the reports, received from the field and its consolidation/submission to the concerned agencies.
3. Identification of constraints, problems in the implementation of the scheme and initiative for timely recommendations/suggestion for remedial measure/solution thereof.

LXXX. Name BS
of the Post

Job Description

Statistical Officer 17

Duties

1. Collection/coordination of statistical data on fish catches marketing, fishery resources and other economic aspects of fish and fisheries, fishing tackles and gears.
2. Formulation of suitable projects to regulate and improved fish marketing and other socio-economic aspects of fish industry/Fishermen community.
3. Coordination of work regarding grant of credit facilities to fish farmers/fishermen from various Government agencies for establishment of fish farms and purchase of fishing implements etc.
4. Collection of data for preparing projects for fish marketing provision of facilities for fishermen and people and supply of fresh fish at reasonable rate of the Government fish shop.

LXXXI.	Name BS	<u>Job Description</u>
of the Post	Administrative Officer	<p data-bbox="613 306 647 333">17</p> <p data-bbox="695 338 781 365">Duties</p> <ol data-bbox="683 375 1419 789" style="list-style-type: none"> <li data-bbox="683 375 1419 506">1 . To assist the De^put^y Director Fisheries (Administration) re^gardin^g corres^pondence on al basic service maters of ^gazeted/non-^gazeted staff and other administrative issues. <li data-bbox="683 512 1300 539">2 . Maintenance of office buildin^g and ^premises. <li data-bbox="683 546 1406 615">3. Vi^gilance and coordination of work of Ministerial staff atached with different sections at Head^qarter level. <li data-bbox="683 621 1406 690">4. Maintenance of vehicles and other ^government store at Head^qarter, Lahore. <li data-bbox="683 697 1419 789">5. Pre^paration of ^periodical re^ports on administrative and miscelaneous maters for submission to Government and other or^ganizations.

LXXXII. Name BS
of the Post Director
Fisheries 19
(Extension)

Job Description

Responsibilities

Conservation, management and development of Fisheries in natural water bodies and aquaculture development in private sector.

Duties

1. To plan the development of Fish and Fisheries.
2. To assist the Director General Fisheries in conservational and extension activities.
3. Administrative, coordination, development and extension work of Fisheries resources in public as well as private sector.
4. Arrange for the auctioning of public water areas in the Province.
5. To achieve the stipulated targets i.e. Revenue, Fish Seed Production, Stocking and Licensing etc.
6. To undertake touring at least for 5-7 days in a month.
7. To carry out inspection of two natural water bodies every month.
8. To prepare the development projects for promotion of fish and fisheries in their respective field.
9. To plan research into the natural water resources, enhancement per Acre yield through application of Organic/inorganic manure.
10. Management and supervision of all operational activities.
11. Dissemination of technical know how through mass media.
12. Transfer of technology, preparation of feasibility reports for establishment fish culture

Powers
units.

- a) Financial
 - To exercise financial powers delegated under the “Delegation of Financial Powers Rules, 1990”
- b) Administrative
 - i) To exercise powers delegated under the Provisions of Fisheries Department (Delegation of Powers) Rules 1980 as well as the provisions of general clauses.
 - i) To exercise powers as delegated under the Provisions of Punjab Fisheries Ordinance, 1961 and Punjab Fisheries Rules, 1965.
 - i) Transferring authority in respect of officers/officials BS-1 to BS-17 in all cadres within their respective jurisdiction.

LXXXIII. Name BS
the Post

Job Description of

Director Fisheries
(R&T)

19

Res^ponsibilities

To su^pervise & coordinate the R&D activities at Provincial level under the direct su^pervision of D. G. Fisheries.

Duties

1. To assist D. G. F. re^sardin^g the affairs of Research & Trainin^g.
2. To maintain close Coordination between Research & Trainin^g disci^plines.
3. Su^pervision and evaluation of on^goin^g research activities at the institute.
4. To p^roduce beter result throu^gh the a^pplication of latest technical and scientific advancement in fish and Fisheries.
5. Kee^p close liaison with national and International Or^ganizations and Institute about the recent advances in research and Trainin^g methods.
6. To maintain disci^pline and harmon^y amon^g the different research sections.
7. Su^pervision and Coordination of Research and Trainin^g Pro^grammes at the Institute.
8. To arran^ge/or^ganize Trainin^g worksho^ps, seminars, s^ymposiums on different as^pects of fish and fisheries.
9. Dissemination of modern a^quaculture technolo^{gy} throu^gh com^prehensive Pro^gramme in p^rivate as wel as p^ublic sector.
10. To identif^y, dia^gnose and su^ggest control measures for the diseases eru^pted in p^rivate and p^ublic sector.
11. To arran^ge research ex^perimentation on p^eriodical basis.
12. To dis^pose of the Administrative and lo^gistic p^roblems and p^rovision of trainin^g facilities/re^quirement.
13. Pre^paration of conce^pt Pa^pers for research p^rojects.
14. To facilitate the ambitious fish culturist, masses and students from other cole^ges and universities.
15. Periodical studies on endan^gerin^g p^roblem i.e. no conta^gious diseases.
16. Publish research Pa^pers in renowned journals

Powers

a) Financial
To exercise financial Powers delegated under the Provisions of delegation of financial Powers Rules, 1990.

b) Administrative

i) To exercise Powers delegated under the Provision of Fisheries Department (Delegation of Powers) Rules, 1980.

i) To appoint persons against posts in BS-1 to 5.

i) Pension sanctioning authority for officials in BS-1 to 5 .

LXXXIV. Name BS of
the Post

Director Fisheries 19
(HM)

Job Description

Responsibilities

Streamlining the functioning of hatcheries in Punjab & technical guidance to the Public for establishment of fish seed hatcheries in Private sector.

1. To assist D. G. F. in Hatcher^y Mana^gement affair in the P^rovince.
2. Administrative/Technical su^pervision and coordination in fish seed P^roduction P^ro^gramme at the Hatcher^y/ Brood Stock Farm and Nursin^g P^onds as per tar^gets.
3. To P^rocure and P^roduce ^genetical^y im^proved brood stock at the hatcher^y.
4. Efficient and administrative control over the mana^gement of hatcher^yes.
5. Annual administrative and technical ins^pection of at least 3 hatcher^yes.
6. To under take at least 2-3 tours of hatcher^yes in a month.
7. Test netin^g of P^onds to asses the brood stock and fish seed.
8. Annual stock (consumable & non consumable) verification.
9. Provision of ^qualit^y fish seed to P^rivate as wel as P^ublic sector.
10. Re^plenishment of natural water bodies throu^gh P^eriodical ^qualit^y fish seed stockin^g.
11. Raisin^g of brood stock, to ensure the P^roduction of ade^quate nos of fish seed of culturable s^pecies.
12. Efficient mana^gement and maintenance of hatcher^yes/ brood farms instalations to take P^ro^per care of machiner^y and e^qui^pments etc.
13. Guidance to P^rivate sector on desi^gnin^g the hatcher^yes, and dissemination of technical knowled^ge of fish seed P^roduction, nursin^g/rearin^g etc.
14. Administrative and miscelaneous maters relatin^g to staff workin^g at hatcher^yes.
15. Ado^ption of modern techni^ques on h^yp^oh^ysation P^ractice.

Powers

- a) Financial
 - To exercise financial P^owers under the “Dele^gation of Financial Powers Rules, 1990”
- b) Administrative
 - i) To exercise P^owers dele^gated under the P^rovision of Fisheries De^partment (Dele^gation of Powers) Rules 1980 as wel as the P^rovisions under other ^general clauses.
 - i) The Punjab Fisheries Ordinance, 1961 and the Punjab Fisheries Rules, 1965.
 - i) Transferrin^g authorit^y in res^pect of officers/officials in BS-1 to BS-17 in their res^pective jurisdiction.

LXXXV.	Name	<u>Job Description</u>
of the Post		
Director Fisheries (A ^{qua})	19	<p data-bbox="768 281 967 312"><u>Res^ponsibilities</u></p> <p data-bbox="683 327 1352 394">Promotion of a^quaculture ^practices in Public & Private sectors.</p> <p data-bbox="768 405 854 436"><u>Duties</u></p> <ol data-bbox="768 443 1412 1419" style="list-style-type: none"> <li data-bbox="768 443 1370 541">1. To assist the Director General Fisheries on technical as^pects re^sardin^g ^promotion of a^quaculture. <li data-bbox="768 548 1390 653">2. Mana^gement and su^pervision of A^quaculture ^projects i.e. Nurser^y Unit and Trainin^g Centers. <li data-bbox="768 659 1377 764">3. Production of ^genetical^y im^proved brood stock and ^qualit^y fish seed throu^gh modern h^yp^oph^ysation techni^ques. <li data-bbox="768 770 1382 837">4. Administrative & technical ins^pection of at least 2-3 sub-offices. <li data-bbox="768 844 1390 911">5. Administrative and technical su^pervision and coordination amon^gst the a^quaculture units. <li data-bbox="768 917 1409 1022">6. Introduction of modern technical/scientific a^pproaches for the enhancement of fish ^production. <li data-bbox="768 1029 1370 1134">7. To conduct visits of A^quaculture unit to monitor or evaluate their ^performance and functionin^g. <li data-bbox="768 1140 1300 1207">8. Promotion of a^quaculture ^practices es^pecial^y in ^priate sector. <li data-bbox="768 1213 1409 1318">9. Extend maximum coo^peration to exchan^ge the ex^pertise and know how amon^g other win^gs of de^partment. <li data-bbox="768 1325 1382 1356">10. Ensure the ^genetical^y stock im^provement. <li data-bbox="768 1362 1344 1419">11. Introduction of new exotic s^pecies for better cro^p. <p data-bbox="768 1455 865 1486"><u>Powers</u></p>

- a) Financial
To exercise financial Powers as Prescribed under "Delegation of Financial Powers Rules, 1990"
- b) Administrative
 - i) To exercise Powers delegated under the Provisions of Fisheries Department (Delegation of Powers) Rules 1980 as well as the Provisions of other general clauses.
 - i) Transferring authority in respects of officers/officials BS-1 to BS-17 in all cadres in their respective jurisdiction.
 - i) Appointing and punishing authority of officials in BS-1 to BS-5.

LXXXVI. Name BS
the Post

Job Description of

Deputy Director
Fisheries (District)

18 Responsibilities

1. Conservation and management of natural Fisheries resources in respective District/Projects.
2. Enforcement of Fisheries enactment.
3. Development/extension work of the Fisheries resources in respective Districts/Projects.
4. Development of sport fishing.

Duties

1. Statistical work on fish and fisheries.
2. Preparation of proposals regarding Planning and Development Project for different areas/regions/projects.
3. Administrative matters of the officials working under him.
4. Coordination of Development works in various Districts and with other Nation Building Departments.
5. Management and Judicious exploitation of existing resources for increasing fish production.
6. To conduct auctions for the fishing rights of public water areas.
7. Stock replenishment through stocking of Major and Chinese carp.
8. To achieve the targets fixed for production of seed, fish and income from Nursery Units under their control.

Powers

a. Financial

To exercise financial powers prescribed under the Delegation of Financial Powers Rules, 1990.

b. Administrative

- i) To exercise power as delegated under Fisheries Department (Delegation of Power Rules), 1980 as well as under the Provision of General clauses.
- ii) To exercise the power as delegated under the Provision of Punjab Fisheries Ordinance 1961 and Rules, 1965.
- iii) Transferring and punishing authority in respect of official from BS-1 to BS-5 in their respective jurisdiction.
- iv) Appointing, Pension sanctioning authority in respect of posts in BS-1 to 5.

LXXXVII. Name BS
of the Post

Job Description

Deputy Director 18
Fisheries (Training)

Duties

- 1 . Conduct, supervise and coordinate the various training Programme/courses on various aspects of fish and fisheries at Fisheries Training Institute for the technical staff and fish farmers.
- 2 . To deliver lecturer to the trainees on various disciplines of Fisheries science.
- 3 . Organize mass motivation Programme for Promotion of fisheries through various information media.
- 4 . To organize practical training workshop Seminar, Symposium on Fisheries and Aquaculture.
- 5 . Coordination of extension Programme with the District Officers including publication of literature for the guidance of technical staff and farmer.
- 6 . Liaison with Agriculture University Faisalabad and other Institutes for the improvement of Training Programme in Fisheries Science.
- 7 . Training of professional staff for the promotion of fish culture and to motivate the public through publicity.

LXXXVIII. Name BS
of the Post

Job Description

Deputy Director
Fisheries (Hatcher)

18

Responsibilities

1. To supervise and coordinate the work of breeding, rearing of fish seed of economic value under natural, semi natural and controlled conditions.
2. Management and supervision of the operation of hatching, rearing, fattening and other tanks and installations so as to regulate their functions on scientific line.
3. Distribution and supply of fish seed to fish culture units in public and private sectors.

Duties

1. Technical guidance to field staff on fish culture.
2. Research work on problems related to seed production techniques and technical guidance to public on designing of hatcheries.
3. To maintain liaison with research Institute's staff and aquaculture Development Project for promotion of fish culture practices.
4. To cater the large scale requirement of fish seed of cultureable species, to meet the development requirements of the resources in public and private sector.

Powers

a. Financial

To exercise financial powers prescribed under the Delegation of Financial Powers Rules, 1990.

b. Administrative

i) To exercise power as delegated under Fisheries Department (Delegation of Power Rules, 1980 as well as under Provision of General clauses.

i) To exercise the power as delegated under the provision of Punjab Fisheries Rules, 1965.

i) Appointing and punishing to officials BS-1 to BS-5 in their respective jurisdiction.

LXXXIX. Name BS
of the Post
Principal Chemist

Job Description

18 Duties

1. Monitoring of physico chemical parameters of soil and water suitability as related to Fisheries and Aquaculture.
2. Hydrology of ponds, especially water quality criteria for fish culture.
3. Changes in water chemistry through fertilization of ponds on hatching of fish eggs, rearing of fry/finerlings and raising adult fishes.
4. Effect of water pollution on fauna flora and chemical means for control of macro vegetation and algal bloom
5. Study of primary productivity effect of fluctuation in biotic and abiotic factors on the physico-chemical characteristics of soil sediments.
6. Technical and advisory assistance to the fish farmers on the related fields.
7. Technical guidance to field staff on fish culture.
8. Research work on problems related to seed production techniques and technical guidance to public on designing of hatcheries.
9. To maintain liaison with research Institute's staff and aquaculture Development project for promotion of fish culture practices.
10. To cater to the large scale requirement of fish seed of cultureable species to meet the development requirements of the resources in public and private sector.

XC. Name of the Post Senior Chemist	BS	<u>Job Description</u>
	17 Duties	<ol style="list-style-type: none"> 1. Bio-chemical and Ph^ysio-chemical as^pects of fish seed P^roduction and rearin^g and fish culture at the fish seed Hatcher^y. 2. Soil and water analysis, study of various weeds in water in relation to tem^perature, soil densities and other interactin^g, environmental factors. 3. Determination of water ^quality criteria for fish culture. 4. Anal^ysis of feed for fry and fin^gerlin^gs . 5. Pre^paration of suitable artificial feed for fish seed. 6. To boost up fish P^roduction of the P^rovince by findin^g solution of P^roblems which ham^per the ra^pid develo^pment of fisheries resources.

XCI. Name of the Post BS

Job Description

Assistant Director 17
Fisheries (District)

Responsibilities

1. Conservation and management of natural fisheries resources in respective District/Projects.
2. Enforcement of Fisheries enactment.
3. Development extension work of the Fisheries resources in respective Districts/Projects.
4. Development of sport fishing.

Duties

1. Statistical work on fish and fisheries.
2. Preparation of proposals regarding Planning of Development Project for different areas/regions/projects.
3. Administrative matters of the working under him.
4. Coordination of development in various districts with other nation building departments.
5. Management and judicious exploitation of existing resources for increasing fish production.
6. To conduct/auction for the fishing right of public water areas.
7. Stock replenishment through stocking of M. carp and Chinese carp.

Powers

- a) Financial
To exercise financial powers prescribed under the Delegation of Financial Powers rules 1990.
- b) Administrative
 - i) To exercise power as delegated under Fisheries Department (Delegation of Power Rules 1980 as well as under Provision of General Clauses).
 - i) To exercise the power as delegated under the provision of Punjab Fisheries Ordinance 1961 and Punjab Fisheries Rules, 1965.
 - i) Appointing and punishing authority in respect of official BS-1 to BS-3 in their respective jurisdiction.

XCII. Name of the Post	BS	<u>Job Description</u>
Assistant Director	17	<u>Responsibilities</u>
Fisheries	(Publicity)	<ol style="list-style-type: none"> 1 . To organize publicity work on various aspects of Fisheries and departmental activities, through various other publicity media. 2 . To organize exhibitions on the occasion of important national functions such as Awami Mela etc. <p data-bbox="662 543 748 573">Duties</p> <ol style="list-style-type: none"> 1. To assist the Zoologist, Fisheries Training Institute in the preparation of leaflets, posters etc. for motivating the public on fish culture. 2. Motivation for fish culture to inculcate public interest in Fish Farming.

XCIII. Name of the Post	BS	<u>Job Description</u> 17
Assistant Director Fisheries (Trainin ^g)	Duties	<ol style="list-style-type: none"> 1. To deliver lectures to the trainees at the Fisheries Trainin^g Centre on various Biolo^gical and Cultural as^pects of Fish and Fisheries. 2. Demonstration work in the Laboratory. 3. Mana^gement of A^quaria, Library and Laboratory e^qui^pment of the Fisheries Trainin^g Centre. 4. To assist the Zoolo^gist in technical and administrative functions of the Fisheries Trainin^g Centre. 5. Welfare activities of trainees. 6. To p^rovide trainin^g in Fish Culture to the newl^y trainees in fish culture, to the newl^y recruited staff, inservice em^plo^yees and ^general p^ublic. <p>Powers</p> <ol style="list-style-type: none"> a) <u>Financial</u> To exercise financial p^owers p^rescribed under the Dele^gation of Financial Powers Rules, 1990. b) <u>Administrative</u> <ol style="list-style-type: none"> i) To exercise p^ower as dele^gated under Fisheries De^partment (Dele^gation of p^ower Rules 1980 as well as under p^rovision of General clauses. i) To exercise the p^ower as dele^gated under the p^rovision of Punjab Fisheries Ordinance 1961 and Punjab Fisheries Rules, 1965 <ol style="list-style-type: none"> i) A^ppoin^tin^g and p^unishin^g authorit^y in res^pect of officials BS-1 to BS-3.

XCIV. Name of the Post	BS	<u>Job Description</u>
Zoolo ^g ist	17 Duties	<ol style="list-style-type: none"> 1. To or^ganize trainin^g courses for P^reservice and inservice P^ersonnel of De^partment. 2. Vocational trainin^g to fish farmers, em^ployees of other Nation Buildin^g De^partments on fish farmin^g. 3. Publicity of de^partmental P^olicies and achievements throu^gh leaflets, radio, T.V. P^ro^gramme and audio visual media. 4. Dissemination of technical advice on fish culture to P^ublic. 5. Mana^gement of the boardin^g and joinin^g of trainees. 6. Trainin^g of P^rofessional staff for the P^romotion of fish culture and to motivate the P^ublic throu^gh P^ublicit^y.

XCV. Name of **BS**
the Post

Job Description

Chemist

16 **Duties**

1. Ph^ysio-chemical studies of fresh and saline water under various ecolo^gical conditions.
2. Study of P^ollution of streams and rivers by sewa^ge and industrial effluents and other alied P^roblems.
3. Soil and water analysis under various limnolo^gical conditions.
4. To boost up Fish P^roduction of the Province throu^gh research.
5. Anal^ysis of water and soil sam^ples in the laborator^y as wel on s^pot.
6. Disease dia^gnosis etc.

XCVI. Name of the Post	BS	<u>Job Description</u>
Librarian	16 <u>Duties</u>	<ol style="list-style-type: none"> 1. Or^ganization and administration of Library affairs. 2. Classification of Books. 3. Catalo^gin^g of Books. 4. Circulation. 5. Maintenance of Record. 6. Up kee^pin^g of latest research references. 7. Liaison with other institutional libraries. 8. Arran^gement of latest scientific and technical books on fish and fisheries.

XCVII.	Name BS of the Post	<u>Job Description</u>
Overseer	11 Duties	<ol style="list-style-type: none"> 1- Surve^y of site. 2- Pre^paration of lay-out. 3- Pre^paration of rou^gh cost estimates. 4- Finalization of detailed estimates. 5- Su^pervision, ^guidance and execution of de^partmental work accordin^g to estimates and ^plans. 6- Technical ^guidance to farmer for construction of fish farms etc.
Photo-Artist/ Artist-cum- Photo ^g rapher	11 Duties	<ol style="list-style-type: none"> 1- Takin^g of Photo^graphs of various fisheries resources, exhibition, tournament and other ceremonial functions re^gardin^g fish and fisheries. 2- Processin^g and enlar^gement of Photo^graphs. 3- Maintenance of dark room and Photo^graphic e^qui^pment. 4- Paintin^g slo^gans titles for folders, charts, ^placards, calendar and other ^publicit^y material. 5- Decoration and art work in fisheries stal at exhibitions. 6- Pre^paration of micro Photo^graphs & scientific dia^grams.
Publicit ^y Assistant	11 Duties	<ol style="list-style-type: none"> 1- Pre^paration of Pam^phlets, hand books, Booklets on fish and fisheries for ^printin^g and their distribution. 2- Writin^g of ^general articles on fisheries in news^pa^per, ma^gazines and journals. 3- Pre^paration and deliver^y of Radio talks on fisheries. 4- Arran^gement of fisheries stals at various melas/ exhibitions of the ^province. 5- To deliver talks for the mass motivation of rural ^po^pulation towards fish culture. 6- To travel with the ^publicit^y van with audio visual aids. 7- To or^ganize an^glin^g tournaments for the ^publicit^y and ^promotion of s^port fishin^g in the ^province. 8- To hel^p in Pre^paration of slides and films on fish and fisheries. 9- To o^perate the Audio visual aids includin^g ^generator.

XCVIII.	Name BS of the Post	<u>Job Description</u>
AWF/FRA/FDA	11	<p>Res^ponsibilities Conservation, mana^gement & develo^pment of Fisheries in Natural resources & A^quaculture Develo^pment in ^public & ^pri^vate sector.</p> <p>Duties</p> <ol style="list-style-type: none"> 1- Surve^y of fisher^y resources. 2- Colection of statistical data on fish and fisheries. 3- Recover^y of lease mone^y. 4- Introductions of im^proved fishin^g ^gears and tackles. 5- Research on various ^problems of fish and fisheries. 6- Pro^pa^ganda and ^publicit^y for mass motivation throu^gh audio-visual.Coordination of work in his jurisdiction with other nation buildin^gs de^partment.
Draftsman	10	<p>Duties</p> <ol style="list-style-type: none"> 1- Pre^paration of final sketches and desi^gns on the basis of the rou^gh sketches ^pre^pared by overseer. 2- Pre^paration of desi^gns of fish ^ponds, nurseries, hatcheries tanks, water reservoirs channels mo^ghas etc. 1- Pre^paration of detailed estimates. 2- Pre^paration of drawin^gs and ma^ps of sites ^plan etc.
Electrician (M.T)	7	<p>Duties</p> <ol style="list-style-type: none"> 1- Res^ponsible for the maintenance and minor re^pairs of al electrical fitin^gs and bateries in the vehicles, bater^y char^gin^g and also maintenance of other alied a^ppliances. 2- Guidance to the Driver for ^pro^per handlin^g of the electrical fitin^gs, batteries in the vehicles. 3- ^pro^per maintenance of electrical fitin^gs/ batteries of vehicle.
Laborator ^y Cum Farm Su ^p ervisor.	6	<p>Duties</p> <ol style="list-style-type: none"> 1- Mana^gement of fish stock/e^qui^pment maintained in the Pond Com^plex and Laborator^y attached with the Hatcher^y. 2- To assist his su^periors in execution and co-ordination of technical work re^gardin^g ^production, rearin^g and nursin^g of fish seed. 3- General su^pervisor^y function of instalations/roads/tracks etc. of the hatcher^y and water re^gulation arran^gements of the tanks. 4- Production and rearin^g of fish seed and its su^pply to the Fish farmer, so as to ^produce lar^ge ^quantit^y of fish seed annual^y under semi-natural and controled conditions and its distribution for develo^pment ^programme launched under various schemes.

XCIX. Name of the Post	BS	Job Description
Fisheries Supervisor.	6	<p>Duties</p> <ol style="list-style-type: none"> 1 - To survey Fisheries Resources. 2 - To conduct salvage and conservation work. 3 - To enforce Fisheries Ordinance and Rules made there under 4 - To assist his seniors in management, production and exploitation of Fisheries resources. 5 - To maintain fish seed stock and its supply/stocking. 6 - To provide technical guidance to fish farmer. 7 - Proper management, conservation and development of Fisheries resources.
Computer	5	<p>Duties</p> <ol style="list-style-type: none"> 1- To provide necessary assistance to the staff working in the cell in handling of calculator, maintenance of record and type work. 2- To provide necessary assistance to the staff working in the cell.
Tracer	5	<p>Duties</p> <ol style="list-style-type: none"> 1- Tracing of maps, drawing of charts. 2- Ferro printing. 3- Preparation of charts and sketches. 4- Enlargement and education of drawing with photo-graph. 5- To assist Draftsman in technical works. 6- Technical Drawing.
Laboratory Assistant	5	<p>Duties</p> <ol style="list-style-type: none"> 1- Maintenance and handling of Laboratory store. 2- Recording of scientific data for research work. 3- Collection of samples for research work. 4- Minor repair of Laboratory Instruments. 5- To provide assistance to research workers.
Driver	4/6	<p><u>Responsibilities</u></p> <ol style="list-style-type: none"> 1- Operation and maintenance of vehicle. 2- Maintenance of the log book and P.O.L record. <p>Duties</p> <ol style="list-style-type: none"> 1- Transportation of fish seed in the Province. 2- Other logistic duties.

C. Name of the Post	BS	<u>Job Description</u>
Head Fisheries Watcher	3	<p>Res^Ponsibilities</p> <ol style="list-style-type: none"> 1- To su^Pervise work of Fisheries Watcher and other Class IV establishment under him. 2- To ^guide ^Pro^gressive farmers for construction of fish farms. 3- To colect and trans^Port fish seed to nursery/^Pri^vate/^government fish farms. <p>Duties</p> <ol style="list-style-type: none"> 1- To assist his su^Periors in other activities re^gardin^g fish and fisheries. 2- Assists his su^Perior in the ^Pro^Per mana^gement, conservation and develo^Pment of Fisheries Resources.
Tube-wel Mechanic/Lift Pum ^P Mechanic	3	<p>Res^Ponsibilities</p> <ol style="list-style-type: none"> 1- Maintenance and o^Peration of Tube-wel/Lift Pum^P. 2- Minor re^Pair of Tube-wel/Lift ^Pum^P. <p>Duties</p> <ol style="list-style-type: none"> 1- Maintenance of record of P.O.L and re^Pair. 2- To ensure ade^quate su^{pp}ly of water to fish nurseries and fish farms.
Daftri	2	<p>Res^Ponsibilities</p> <ol style="list-style-type: none"> 1- Maintenance and u^Pkee^P of office files. 2- Handlin^g of Du^Plicatin^g Machine. <p>Duties</p> <ol style="list-style-type: none"> 1- To maintain office articles in need and tid^y order. 2- To maintain and u^Pkee^P office record and handlin^g of du^Plicatin^g machine.
Publicit ^y Atendant	1	<p>Res^Ponsibilities</p> <ol style="list-style-type: none"> 1 - Instalation of stal in exhibitions. 2- Handlin^g and fixin^g audio-visual e^qui^Pment. 3- Or^ganization of ^Publicit^y material includin^g, hand books leaflets, booklets, forms etc. to the ^Public in mela/ exhibitions and other functions. <p>Duties</p> <p>Promotion of fish culture throu^gh ^Publicit^y media.</p>

CI. Name of the Post	<u>Job Description</u>
Fisheries Watcher	<p>BS</p> <p>Res^ponsibilities</p> <p>1 1 - Performs watch and ward functions under Fisheries Ordinance, 1961.</p> <p>2- Assist his su^perisors in:</p> <p>3- Surveyin^g Fisheries Resources.</p> <p>4- Salva^gin^g youn^g fish of culturab^le s^pecies.</p> <p>5- Locatin^g s^pawnin^g s^grounds & fish seed colection centers.</p> <p>Duties</p> <p>1- Colectin^g of fish seed and stockin^g of Private/^government fish farms.</p> <p>2- Develo^pment extension work.</p> <p>3- Pro^per mana^gement, conservation and develo^pment of</p>
Laborator ^y Atendant	<p>1 Res^ponsibilities</p> <p>1- Handlin^g of Laborator^y e^qui^pment.</p> <p>2- Cleanin^g and maintenance of laborator^y articles.</p> <p>3- Maintenance of a^quaria.</p> <p>Duties</p> <p>1- Pre^paration of fish food for ex^periments.</p> <p>2- Colection of sam^ples and routine data etc.</p> <p>3- To ^provide assistance to research work.</p>
Beldar/Boatman/ Fishermen	<p>Res^ponsibilities</p> <p>1 1 - Maintenance and minor re^pair of nurseries, tanks, hatcheries, farms, atached ^plots and landsca^pin^g.</p> <p>2- Removal of a^quatic weeds and colection of fish seeds.</p> <p>3- Catchin^g and trans^port of fish.</p> <p>Duties</p> <p>1- Maintenance and o^peration of Boats.</p> <p>2- Colection of research material.</p> <p>3- To ^provide necessar^y normal labour for different ^project.</p>