

**SWAMI RAMANAND TEERH MARATWADA UNIVERSTIY, NANDED  
SEMESTER PATTERN CURUCULUM UNDER**

**CHOICE BASED CREDIT SYSTEM (CBCS)PATTERN FOR**

**Faculty of science**

**Under graduate (UG) Programmes**

**SUBJECT FISHERY SCIENCE**

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**CURRICULUM DESIGNING COMMITTEE**

1. Dr. N.G. Popatwar                      Chairman  
D.S.M.College Jintur.

2. Dr. J.M.Gaikwad                      Member  
Shri Shivaji College Parbhani.

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**Intoduction**

From the Academic year 2016-2017 University is going to implement Choice Based Credit System (CBCS) patterns at UG levels for B.Sc. First Year, Second Year, and Third Year respectively. Revision and Updating of the curriculum is the continuous process to provide an updated education to the students.

The B.Sc. Fishery science (one of optional subject) semester pattern course is running in different affiliated colleges of this University. The course content has been designed under CBCS pattern. In India there is great scope for aquaculture and Aquaculture Techniques. Our country has the vast coastline area as well as inland water resources. These available aquatic resources are exploited only at minimum level and to achieve blue revolution we need more technologies and awareness on aquaculture. The present syllabus explains the basic concept of aquaculture and advanced technology in aquaculture. It will defiantly create awareness in the young minds.

The course content of each theory papers is divided into four units by giving appropriate titles and sub titles. For each units total number of required periods have mentioned. A list of practical's and skill enhancement course for laboratory work is mentioned and is to be completed in academic years. At last, list of reading material and common skeleton of question paper for all papers is also given.

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**SUBJECT FISHERY SCIENCE**

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**Objectives**

- 1) To provide skill oriented updated education to the students to know the scope and importance of the subject
- 2) To impart the basic education in Fishery Science
- 3) To update curriculum by introducing recent advances in the subject and enable the students and fish culturist to face skill oriented self development.
- 4) To acquaint the students with diversities in animal life.
- 5) Emphasis on ecological importance of fauna.
- 6) To develop an ability to work hard on their own and make them fit for society.
- 7) Sustainable use of animal resources for the betterment of mankind without interfering the ecosystems.
- 8) Making students and fish culturist aware about the recent trends in the development of fishery science.
- 9) To develop the skill in advanced practical work experiments, equipments and laboratory use along with collection, preservation and data interpretation of fish and fishing.

**SWAMI RAMANAND TEERH MARATWADA UNIVERSITY, NANDED**

Choice Based Credit System (CBCS) Course Structure

Faculty of Science

B. Sc Second Year (Semester- III & IV)

Distribution of credits for B.Sc. Fishery Science (optional)

Under Graduate (UG) programmes

**B. Sc. Syllabus structure effective from June 2017**

**Subject: Fishery Science**

Semester	Paper No.	Name of the Course	Instruction Hrs/ week	Total period	CA	ESE	Total Marks	Credits
CCFS-III and Semester III	CCFS- III (Section A)	Ecology & Fish Pathology P-VI	03	45	10	40	50	2
	CCFS- III (Section B)	Fish Biology P-VII	03	45	10	40	50	2
CCFS-PR-II and Annual pattern	CCFS-PR- II [CCFS III & IV (Section A)]	Practical's based on P-VI	03	07	05	20	25	1
		Practical's based on P-VIII (P-X)	03	08	05	20	25	1
SECFS I Annual pattern	SEC -I one from any optional	(A)Manufacturing of Fish byproducts (B) Fresh water fish production Technology	2+1	25	25	25	50	2
CCFS-IV and Semester IV	CCFS -IV (Section A)	Anatomy, Physiology & Microbiology P-VIII	03	45	10	40	50	2
	CCFS- IV (Section B)	Fish Technology P-IX	03	45	10	40	50	2
CCFS-PR-III and Annual pattern	CCFS-PR- III [CCFS- III & IV (Section B)]	Practical's based on P-VII	03	07	05	20	25	1
		Practical's based on P-IX (P-XI)	03	08	05	20	25	1
SECFS II Annual pattern	SEC-II one from any optional	(A) Fish Preservation and Processing Technology (B) Manufacture of fishing nets	2+1	25	25	25	50	2

CCFS- Core course fishery science, CCFS-PR- Core course fishery science practical, ESE- End of semester examination, CA- Continuous assessments. \*Elective paper, SECI- Skill enhancement course (I), SECII-Skill enhancement course II.

Note: ESE of CCFSPR II, CCFSPR III, SECFS I and SECFS II should be evaluate at annual

**SWAMI RAMANAND TEERH MARATWADA UNIVERSTIY, NANDED**  
**B.Sc. Second Year (CBCS Pattern) From June 2017**

**Semester- III**

**Subject: - Fishery Science**

**Theory Paper – VI Ecology & Fish Pathology**

**Periods – 45**

**Marks – 50**

**Unit – I**

**11 Periods**

**Fresh water Ecology**

- 1) Definition and objectives of ecology.
- 2) River ecology
  - a) Physico-chemical characters of river waters
  - b) Biotic factors- Producers, consumers and decomposers
  - c) Zonation of river- Rhithron and potamon zone
  - d) Flora and fauna of river
- 3) Ecology of Reservoir.
  - a) Introduction to reservoirs
  - b) Classification of reservoirs
  - c) Eutrophication of reservoirs.
  - d) Physico-chemical characters of reservoirs waters.
  - e) Biotic Community: -Flora and fauna of reservoirs.

**Unit – II**

**12 Periods**

**Marine Ecology**

- a) Physico-chemical characters of Sea water.
- b) Horizontal & Vertical Zonation of Sea water.
- c) Flora & Fauna.
- d) Food Web & food chain.

**Ecology of Estuaries**

Types of estuaries:-

- 1) Types of estuaries:-
  - a) Salt wedge estuaries
  - b) Partially mixed estuaries
  - c) Fjords estuaries
  - d) Bar – built estuaries
- 2) Physico – chemical characteristic of estuaries.
- 3) Biota of estuaries: - Oligohaline organism, true estuarine organism, Stenohalaline marine Organism & migrants.

**Unit III**

**10 Periods**

**Water pollution & their control.**

- 1) Introduction and definition.
- 2) Different types of pollutants.
- 3) Sewage and domestic refuge.
- 4) Pollution and treatment of sewage.
- 5) Pollution control and legislation.

6) Effect of pollutants on fishes.

**Unit IV**

**12 Periods**

**Fish Pathology (Disease causing organism, symptoms, preventives measures).**

- 1) Fungal Diseases:-Gill rot, Branchiomycosis.
- 2) Bacterial Diseases:- Dropsy and fin rot
- 3) Protozoan Diseases:-White spot and costiasis.
- 4) Helminth diseases:-Gyrodactylosis and Dactylogyrosis.
- 5) Crustacean Diseases :-Learniasis and Argulosis.

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**B.Sc. Second Year (CBCS Pattern) From June 2017**  
**Semester- III**  
**Subject: - Fishery Science**  
**Theory Paper - VII, Fish Biology**

**Periods – 45**  
**Marks – 50**

**Unit – I**

**11 Periods**

**Developmental biology**

- a) Types of eggs.
- b) Cleavage and formation of blastula.
- c) Fate map of blastula.
- d) Gastrulation.
- e) Hatching and post embryonic development.
- f) Oviparity, viviparity & ovo – viviparity.

**Unit – II**

**12 Periods**

**Reproductive biology**

- a) Sexual dimorphism in Fishes.
- b) Seasonal changes in Testes (Morphological and Histological).
- c) Seasonal change in ovary (Morphological and Histological).
- d) Study of oogenesis and spermatogenesis in fishes.
- e) Assessment of fecundity in fishes
- i) Volumetric method ii) Gravimetric method iii) Von Bayrs methods
- f) Study of Gonado Somatic Index (GSI).

**Unit – III**

**11 Periods**

**Growth studies**

- a) Introduction to growth
- b) Linear growth characteristic
- c) Estimation of length (Linear growth)
- d) Length- weight relationship
- e) Ponderal index
- f) Age and growth studies in fishes  
Different methods of age and growth determination:- Tagging method, Marking method, Scale method, otolith method, radio carbon uptake method, RNA– DNA ratio method.

**Unit – IV**

**11 Periods**

**Nutritional value and Economical importance of Fish.**

- a) Bio-chemical composition of raw fish.
- b) Medicinal value of fishes.
- c) Calorific value in fishes.
- d) Economic importance of fishes.

e) By products.

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**B. Sc. Second Year (CBCS Pattern) From June 2017**

**Semester- IV**

**Subject: - Fishery Science**

**Theory Paper – VIII, Fish Anatomy, Physiology & Fish microbiology**

**Periods: - 45**

**Marks:- 50**

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**Unit – I**

**11 Periods**

**Comparative study of –**

- i) Teeth: - Types and function.
- ii) Gill Rakers: -structure, types and function.
- iii) Food: - Types of food, Feeding habits in fishes.
- iv) Alimentary canal:- alimentary canal of herbivorous and carnivorous fish

**Unit – II**

**11 Periods**

- i) Structure and working of heart in elasmobranches and teleost.
- ii) Excretory System: - Kidney – structure types & functions.
- iii) Structure & function of air bladder in fishes.
- iv) Osmoregulation in fishes:- Osmoregulation in fresh water and marine fishes.

**Unit – III**

**12 Periods**

**Endocrine Gland : (Structure & Functions)**

- i) Pituitary gland
- ii) Thyroid gland
- iii) Adrenal gland
- iv)Gonads
- v) Thymus gland

**Unit – IV**

**11 Periods**

**Fish Microbiology**

- i) General account of harmful and useful micro-organisms in fresh water and marine water.
- ii) Fish spoilage  
Causes of fish spoilage – Bacterial, enzymatic and chemical spoilage.
- iii) Changes during fish spoilage – Rigor mortis.
- iv) Chemical test for freshness.
- v) Organoleptic test for freshness.
- vii) Sources of contamination of fish.

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**  
**B. Sc. Second Year (CBCS Pattern) From June 2017**  
**Semester- IV**  
**Subject: - Fishery Science**  
**Theory Paper –IX, Fish Technology & Processing**

**Periods: - 45**  
**Marks: - 50**

**Unit – I**

**12 Periods**

**Methods of Fishing and Fishing gear**

- i) History of fishing
- ii) Methods of fishing
  - a) Traditional methods- Catching by hands, fishing by hunting (wounding) fishing by plant poisons
  - b) Conventional methods
- iii) Nets- mode of netting
  - a) Active netting
    - Dip net, Cast net, Purse net, Drag net, Gill net, Rampani net, Bag net, Trawls, Hooks and Lines, Fishing Baited springs, Fish screens.
  - b) Passive netting
    - Gill net, Drift net, Trammel net, Fixed bag net, Fixed trap net,
- iv) Material used in manufacture of nets:- a) Natural b) Synthetic
- v) Preservation of the gear.

**Unit – II**

**11 Periods**

**Unconventional fishing and Fishing crafts**

- a) Unconventional fishing
  - i) Electric fishing-mode of site of electric fishing
  - ii) Light fishing
  - iii) Fish finder- Hydro-acoustic devices, Fishing operations by eco-sounders
- b) Fishing crafts
  - i) Inland fishing crafts
  - ii) Sea fishing crafts
  - iii) Mechanized crafts
  - iv) Material used in Boat/Craft constructions

**Unit – III**

**12 Periods**

**Fish Preservation**

Introduction

- i) Principles of preservation: -Washing, Gutting, Cleaning, lowering the temperature, rising the temperature, dehydration, use of salt, use of preservatives.
- ii) Methods of Preservation:-
  - a) Chilling with ice & salt.
  - b) Freezing & refrigeration.
  - c) Storing in cold storage.
  - d) Deep freezing & freeze drying.
  - e) Canning
  - f) Sun drying
  - g) Mechanical drying
  - h) Dry salting
  - i) Brining
  - j) Smoking
  - k) Pickling

**Unit – IV**

**10 Periods**

**i) Special Problems in fish preservation.**

- a) Denaturation due to freezing of fish.
- b) Food poisoning and allergies from fish food.
- c) Food poisoning from consumption of poisonous fish.
- d) Food poisoning of bacterial origin.

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**  
**B. Sc. Second Year (CBCS Pattern) From June 2017**  
**CCFSPR-II**  
**Semester- III & IV**  
**Subject: - Fishery Science**  
**Practical Paper based on Theory Paper VI & VIII**  
**Paper- X**

- [1] Water analysis –
  - a) Dissolved oxygen
  - b) Dissolved CO<sub>2</sub>
  - c) Chlorides
  - d) Carbonates
  - e) Ph- by Ph - meter
- [2] Collection, identification and submission of prepared slides of Fresh water phytoplankton & Zooplankton.
- [3] Collection, identification and submission of prepared slides of Marine Phytoplankton & Zooplankton.
- [4] Identification, classification & diagnostic characters of
  - a) Marine Water Fishes with adaptive characters (any 08)
  - b) Fresh Water Fishes (any 08)
  - c) Estuarine Fishes (any 05)
- [5] Identification & sexual dimorphisms in fishes. (Any five)
- [6] Study of maturity stages in teleost locally available fish (Morphological & Histological).
- [7] Assessment of fecundity of locally available fish. ( any two)
- [8] Identification, classification of fresh water aquatic insects (any three)
- [9] Identification, classification of marine water aquatic insects (any three)
- [10] Assessment of spawning periodicity by ova diameters measurement in any locally available fish.
- [11] Length weigh relationship study of locally available fish. ( any two)
- [12] Quantitative estimation of Protein/fat/carbohydrate from fish tissue (dry or wet).
- [13] Determination of fish age by scale method.
- [14] Identification of Fish Parasite
  - a) Argulus
  - b) Dactylogyrus
  - c) Gyrodactylus
  - d) Ichthyophtheris multiplis.
- [15] Excursion tour, visit to coastal / fish farm/ fish market and submission of excursion report.

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**B. Sc. Second Year (CBCS Pattern) From June 2017**  
**CCFSPR-III**  
**Semester- III & IV**  
**Subject: - Fishery Science**  
**Practical Paper based on Theory Paper VII & IX**  
**Paper- XI**

[1] **Dissection :(any locally available fish)**

- a) Digestive System.
- b) Urinogenital System.
- c) Ventral aorta.
- d) Afferent and efferent branchial arteries.
- e) Brain.

2) **Micro Technique**

Block Preparation section cutting and staining of tissue:

- a) Pituitary b) Ovary c) Testes d) Intestine e) Stomach f) Liver

3) Isolation of micro-organism (Bacteria & fungi) from fish (Streak plate method).

4) Staining – monochrome staining and Grams staining.

5) Identification of fresh fishes and spoiled fishes.

6) Study of fishing lines. (Any two).

7) Study of Fishing gears (Any five).

8) Study of fishing craft (Any five).

9) Identification, Classification and Characters of fresh water aquatic weeds.(any five)

10) Study of Organic and Inorganic fertilizers.(each two)

11) Fabrication of fishing boat model & submission (Any one).

12) Preservation of locally available fishes by Ratnagiri method.

13) Preparation of fish Preservation (Washing, gutting, cleaning, and other stages & processing).

14) Preservation of locally available fishes by mechanical drying method.

15) Excursion tour: - Visit to fish processing industries and submission of report.

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**B. Sc. Second Year (CBCS Pattern) From June 2017**

**Semester- III&IV**

**Subject: - Fishery Science**

SEC: Scheme of B. Sc Second Year (III&IV Sem.) Programme

Fishery Science under Science Faculty CBCS Pattern From June 2017

**Skill Enhancement course (any Two) (Credit: 02 each)**

**SEC I TO SEC IV: Fishery Science**

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**SEC- I**

A) Manufacturing of fish by products.

OR

B) Fresh water fish production technology

C) SEC –II

A) Fish Preservation and Processing Technology

OR

B) Manufacturing of fishing nets.

**B. Sc. Second Year (CBCS Pattern) From June 2017**  
**Semester- III**  
**Subject: - Fishery Science**  
SEC: Scheme of B. Sc Second Year (III Sem.) Programme  
Fishery Science under Science Faculty CBCS Pattern From June 2017  
**Skill Enhancement course (any One) (Credit: 02 each)**

**Syllabus: SEC –I A**

**A- Manufacturing of fish by-products. (25 theory periods)**

- 1) Sorting and grading the fish catch,
- 2) ii) Fish spoilage- causes of spoilage
- 3) Nutritional value and energy requirements: Proteins, fats, carbohydrates, vitamins and minerals, iv) Biochemical composition of raw fish, v) Calorific value in fishes, vi) Fish products and by-products
- 3) Fish by products-
  - a) Fish Oil: Composition of fish oils, Colour, un-saponifiable matter and variations in oil contents
  - b) Fish liver oil- oil extraction method    c) Fish meal    d) Fish manure
  - e) Fish flour    f) Fish silage    g) Concentrates of fish soluble
  - h) Fish protein powder    i) Fish fins    j) Fish Roe
  - k) Fish macaroni    l) Fish Sausage and Ham    m) Fish Glue
  - n) Isinglass    o) Fish skin    p) Artificial pearl
  - q) Ornamental value    r) Fish food poisoning

**Practical's based on theory syllabus**

## **Syllabus: SEC I –B**

### **Fresh water fish production technology. (25 Theory periods)**

- 1) Introduction of aquaculture
- 2) Topography
- 3) Analysis and maintenance of water quality
- 4) Analysis and maintenance of soil quality
- 5) Lay out plan of fish farm
- 6) Construction of different types of ponds
- 7) Management of fertilizers
- 8) Induced breeding technique
- 9) Fish seed identification technique
- 10) Fish seed packing and transport
- 11) Disease management

### **Practical's based on theory syllabus**

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**  
**B. Sc. Second Year (CBCS Pattern) From June 2017**

**Semester- IV**

**Subject: - Fishery Science**

SEC: Scheme of B. Sc Second Year (IV Sem.) Programme

Fishery Science under Science Faculty CBCS Pattern From June 2017

**Skill Enhancement course (any One) (Credit: 02 each)**

**Syllabus: SEC II A**

**A) Fish Preservation and Processing Technology. (25 Theory Periods)**

- 1) Study of fish spoilage- Bacterial, Enzymatic and Chemical.
- 2) Study of Rigor-mortis
  - a) Causes of Rigor-mortis, b) Factors responsible for prolongation of Rigor-mortis,
  - c) Identification of fresh and spoiled fish
- 3) Principles of Preservations
  - a) Cleaning and gutting, b) Lowering temperature, High temperature and dehydration,
  - c) Use of salts and Preservatives, d) Use of Natural Preservatives
- 4) Methods of Fish Preservations
  - a) Refrigeration, b) Deep Freezing, c) Freeze Drying,
  - d) Salting: Dry salting, Wet salting, Brine salting, Cold salting,
  - e) Smoking, f) Drying – Natural drying, Artificial Drying, g) Canning,

h) Demerits' of Fish Preservation

### **Practicals based on Theory syllabus**

## **Syllabus SEC II B**

### **Manufacturing of Fishing Nets. (25 Theory Periods)**

- i) Fishing gear materials and accessories
- ii) Fishing gear materials-
  - a) Classification of fishing gear materials, b) Natural fibers, synthetic fibers, Basic fiber forms
- iii) Properties of fibers
  - a) Physical properties, b) Chemical properties, c) Biological properties,
- iv) Identification of synthetic netting yarns
  - a) Construction of netting yarns, b) Twist- types of twists
- v) Ropes- Types and Classification of ropes
- vi) Floats- classification of floats
- vii) Sinkers- types of sinkers
- viii) Buoys- Types of buoys
- ix) Anchors- Parts and Types
- x) Fishing gear accessories
- xi) Care and Maintenance of fishing gear

xii) Fabrication of fishing gear- Braiding, Taitoring of webbing, Knots, Bends, Hitches etc.

**Practical's based on Theory syllabus.**

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**  
**B. Sc. Second Year (CBCS Pattern) From June 2017**  
**Semester- IV**

**Subject: - Fishery Science**

SEC: Scheme of B. Sc Second Year (IV Sem.) Programme  
Fishery Science under Science Faculty CBCS Pattern From June 2017

**Skill Enhancement course (any One) (Credit: 02 each)**

**SEC -CA (Continuous assessment marks Distribution)**

<b>1 – Seminar -</b>	<b>15 Marks</b>
<b>2- Test-</b>	<b>10 Marks</b>
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<b>Total-</b>	<b>25 Marks</b>
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**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**  
**B. Sc. Second Year (CBCS Pattern) From June 2017**  
**CCFSPR-II**  
**Semester- III & IV**  
**Subject: - Fishery Science**  
**Practical Paper based on Theory Paper VI & VIII**  
**Practical Paper- X**

**Time: 4 hrs**  
**Batch No:**

**Marks- 40**  
**Date:**

- 
- Q. 1) Identify, classify and comment on adaptive features (any two) 06
- Q.2) Identify and comments on (as per instruction)  
One fresh water fish, one estuarine fish, one sexual dimorphism in fish  
and one fish parasite. 08
- Q.3) Preparation of permanent slides of Phytoplankton/ Zooplankton  
Identify with comments 05
- Q. 4) Estimate the amount of -----from given sample  
Dissolved O<sub>2</sub>/ Free CO<sub>2</sub>/ Chlorides 07
- Q.5) Estimate the Fecundity of provided ovary
- OR
- Estimate length-weight relationship of fishes 07
- Q.6) Quantitative estimation of protein/ Fats/ Carbohydrates from given tissue 07

**Continuous assessments (CA)**

- |  |    |
|--|----|
| 1) Record book and viva-voce   | 05 |
| 2) Submission of permanent slides, field visit report/excursion tour | 05 |

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**B. Sc. Second Year (CBCS Pattern) From June 2017**

**CCFSPR-II**

**Semester- III & IV**

**Subject: - Fishery Science**

**Practical Paper based on Theory Paper VII & IX**

**Practical Paper- XI**

**Time: 4 hrs**

**Marks- 40**

**Batch No:**

**Date:**

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Q. 1) Dissect fish so as to expose ----- system of local available fish 10

Q.2) Dissect fish so as to expose/ dissect out its brain/ air bladder/ weberian ossicle 06

Q.3) Preparation of permanent slides of the ribbon provided

OR

Identification and staining of given microbial culture/ material 06

Q. 4) Identify and comments as per instructions  
(One fishing line, Two nets, one craft) 12

Q.5) Preserve the given fish and write the process of its preservation 06

**Continuous assessments (CA)**

- |   |    |
|---|----|
| 3) Record book and viva-voce  | 05 |
| 4) Submission of prepared models of fishing crafts and gears, field visit report/excursion tour | 05 |

### **List of reference books**

- 1] Reservoir of fisheries of India – V.V. Sugunan.
- 2] The ecology of Fisheries – G.V. Nikolovsky.
- 3] Methodology for water analysis – Indian Association of Aquatic biology.
- 4] Limnology by wilch.
- 5] Concept of ecology – N. Arumugum.
- 6] An Introduction to fishes by S.S. Khana.
- 7] A text book fishery science and Indian fisheries by C B L Shvivastava. Kitab Mahal 22. AS.N Marg Allahabad.
- 8] An Introduction to Indian fisheries by Mrs. V. Sharma & S.P. Grover.  
Bishen Singh, Mahendrapal Singh 23 – A cannaugut place, Dhrreradun India.
- 9] Fish & Fisheries of India by V.G. Jhingran.
- 10] Ichthyology - Laglar
- 11] A History of fishes by J.R. Norman.
- 12] Fish & Fisheries – Pandey & Shukla Rastogi Publication Shivaji, Road, Meerut.
- 13] A text book fish & fisheries and technology and edition Dr. K.P. Bistwas, Narendra Publishing science
- 14] Manual in fishery science By. K.R. Reday & M.G. Babre.
- 15] General topics in Fishery Science, By. K.R. Reday & M.G. Babre.

- 16] An Introduction to Fishes. By Gurudarshan Singh & Bhaskar.
- 17] Aquaculture and Aquarium keeping By Chavan S.P., M.S. Kadam, & S.D. Nitire  
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