

**B.Sc. FISHERIES BIOLOGY SYLLABUS UNDER CBCS**  
(With effect from 2016-2017)  
**V- SEMESTER**  
**PAPER: GE-1**  
**AQUACULTURE (Theory)**

**Max. Marks: 80**

**Unit . I. Introduction**

- 1.1. Basics of aquaculture-definition and scope.
- 1.2. History of aquaculture: Present global and national scenario.
- 1.3. Fishery Resources in India, classification of Fishes, and classification of Fisheries.
- 1.4. Criteria for selection of candidate species for aquaculture.
- 1.5. Biology of major candidate species for freshwater aquaculture.

**Unit. II. Culture Systems**

- 2.1. Site Selection, design and construction of fish pond.
- 2.2. Seed production and transportation- Induced Breeding, and Bundh Breeding.
- 2.3. Pre-stocking and post stocking pond management.
- 2.4. Monoculture, polyculture, integrated culture, extensive, semi-intensive, intensive and super intensive aquaculture.
- 2.5. Culture of major carps: Catla catla, Labeo rohita, Cirrhanus mrugala

**Unit. III. Pond Management.**

- 3.1. Water and soil quality in relation to fish production
- 3.2. Physico-chemical and biological factors ponds.
- 3.3. Primary productivity - Energy flow.
- 3.4. Fish food organisms and supplementary food
- 3.5. Types of fish diseases and their control measures

**Unit. IV. Harvesting and Post-Harvesting Techniques**

- 4.1. Types of craft and gear used to harvest the fish.
- 4.2. Culture of Shrimp.
- 4.3. Culture of prawn
- 4.4. Marketing and cost economics of aquaculture.

**REFERENCE BOOKS**



Professor C. Chittaran  
Board of Studies in Zoology  
Department of Zoology  
Keratiya University  
Warangal - 506 000.

1. Bose AN. *et al.*, 1991. *Coastal Aquaculture Engineering*. Oxford & IBH Publishing Company, Pvt. Ltd.
2. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn*. Daya Publ. House
3. CIFE. 1993. *Training Manual on Culture of Live Food Organisms for Aqua Hatcheries*. CIFE, Versova, Mumbai
4. FAO. 2007. *Manual for Operating a Small Scale Recirculation Freshwater Prawn Hatchery*
5. Hopher B & Pruginin Y. 1981. *Commercial Fish Farming*. John-Wiley & Sons Inc.
6. ICAR. 2006. *Handbook of Fisheries and Aquaculture*. ICAR.
7. Ivar LO. 2007. *Aquaculture Engineering*. Daya Publ. House.
8. Jhingran VG & Pullin RSV. 1985. *Hatchery Manual for the Common, Chinese and Indian Major Carps*. ICLARM, Philippines.
9. MPEDA. 1993. *Handbook on Aqua Farming - Live Feed. Micro Algal Culture*. MPEDA Publication
10. Pilley, TVR & Dill, WMA. 1979. *Advances in Aquaculture*. Fishing News Books, Ltd. England.
11. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. Blackwell.
12. Stickney RR. 1979. *Principles of Warm water Aquaculture*. John-Wiley & sons Inc.
13. Thomas L. 1995. *Fundamentals of Aquacultural Engineering*. Chapman & Hall
14. Thomas PC, Rath SC & Mohapatra KD. 2003. *Breeding and Seed Production of Finfish and Shellfish*. Daya Publ.
15. Wheaton FW. 1977. *Aquacultural Engineering*. John Wiley & Sons.

#### **Practicals-40 Marks**

1. Identification of common Fresh water aquarium fishes (10 Nos.)
2. Indigenous ornamental fishes of Telangana (5Nos.)
3. Breeding of live bearers-Guppy
4. Breeding of egg layers- gold fishes
5. Breeding of bubble nest builder- Gourami
6. Control of snails in ornamental fish culture system
7. Ornamental fish farms- general description
8. Marine aquarium fishes and invertebrates

#### **Field visit:**

1. Visit to aqua farms for water and soil sample collection



Professor & Chairman  
Board of Studies in Zoology  
Department of Zoology  
Koneriya University  
Warangal - 506 009.

**B.Sc. FISHERIES BIOLOGY SYLLABUS UNDER CBCS**  
(With effect from 2016-2017)  
**V - SEMESTER**  
**PAPER V – FISH PATHOLOGY (Theory)**

**Max. Marks: 50**

**UNIT I – Viral diseases**

- 1.1. Viral **hemorrhagic septicemia**. Clinical symptoms, pathology and control measures
- 1.2. Koi Herpesvirus Clinical symptoms, pathology and control measures
- 1.3. Infectious haematopoietic necrosis virus Clinical symptoms, pathology and control measures
- 1.4. Aquabirnavirus and betadona virus Clinical symptoms, pathology and control measures

**UNIT II – Bacterial and fungal diseases**

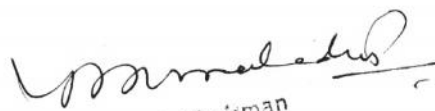
- 2.1. Gill, Tail Rot and Fin Rot, Dropsy and Red Pest disease - Clinical symptoms, pathology, prevention and control measures
- 2.2. Columnaris - Mouth Fungus Clinical symptoms, pathology, prevention and control measures
- 2.3 epizootic ulcerative syndrome (EUS), clinical symptoms and treatment of EUS.
- 2.5. Clinical symptoms, pathology, prevention and control measures of *Lagenidium* disease (Larval Mycosis) and Brown gill disease..

**UNIT III - Protozoan, Helminth and Crustacean diseases.**

- 3.1. Velvet, Rust - Gold Dust Diseases - Clinical symptoms, pathology and control measures.
- 3.2. Brooklynellosis, Hexamita and Costia Clinical symptoms, pathology and control measures.
- 3.3. Ichthyophthiriasis, Enterococcidiasis, Whirling disease and Nodular disease. Clinical symptoms, pathology and control measures.
- 3.4. Gyrodactylosis, Dactylogyrosis, Argulosis and Lernaeasis diseases - Clinical symptoms, pathology and control measures.

**UNIT II - Nutritional and Ecological diseases.**

- 4.1 Diseases of vitamin deficiency and Fatty liver degeneration.
- 4.2 Carbohydrates, proteins and lipid deficiency diseases in fish.
- 4.3 Gas bubble disease and lack of oxygen - Clinical symptoms, pathology and control measures
- 4.4. Environmental stress on outbreaks of infectious diseases of fishes

  
Professor & Chairman  
Board of Studies in Zoology  
Department of Zoology  
Kororiva University  
Warangal - 506 009.

## REFERENCE BOOKS

1. Cheng TC. 1964. *The Biology of Animal Parasites*. W.B. Saunders Company, Philadelphia, Pennsylvania, USA.
2. Conroy CA and Herman RL. 1968. *Text book of Fish Diseases*. TFH (Great Britain) Ltd, England.
3. Lightner DV. 1996. *A Handbook of Shrimp Pathology and Diagnostic Procedures for Diseases of Cultured Penaeid Shrimp*. World Aquaculture Society, Louisiana, USA.
4. Reichenbach KH. 1965. *Fish Pathology*. TFH (Gt. Britain) Ltd, England.
5. Ribelin WE and Migaki G. 1975. *The Pathology of Fishes*. The Univ. of Wisconsin Press Ltd, Great Russel Street, London, UK.
6. Shuzo Egusa. 1978. *Infectious Diseases of Fish*. Oxonian Press Pvt. Ltd. New Delhi.
7. Van Duijn, C. 1973. *Diseases of Fishes*. Cox and Wyman Ltd. London.

## Practicals-30 Marks

1. Isolation and maintenance of bacteria from fishes and water.
2. Examination of moribund fish for viral and bacteria diseases; Sampling techniques,
3. Microbial identification Enumeration of bacteria on fish by TPC method
4. Histopathological observation of diseases fish organs.
5. Identification of various finfish / shellfish disease
6. Parasite in fishes, protozoan, helminths, crustaceans
7. Prophylaxis for the prevention of outbreak of fish disease
8. Processing and study of the arthropods and their larval stages, staining and study of the protozoans Fixation and staining of protozoa, examination of biopsy material, examination of tissue sections for parasites.



Professor in Charge  
Board of Studies in Zoology  
Department of Zoology  
Kakatiya University  
Warangal - 506009.

**B.Sc. FISHERIES BIOLOGY SYLLABUS UNDER CBCS**  
(With effect from 2016-2017)  
**V - SEMESTER**  
**PAPER VI – WATER QUALITY MANAGEMENT (Theory)**

**Max. Marks: 50**

**UNIT I – Water quality, fertilizers and manures, liming**

- 1.1 Water quality:** Constituents of water, Water quality parameters – optimal levels and their management in freshwater fish .
- 1.2 Fertilizers and manures:** Different kinds of fertilizers and manures, fertilizer grade, source, rate and frequency of application; Ecological changes taking place after fertilizing;
- 1.3 Biofertilizers;** Role of inorganic, organic and biofertilizers in aquaculture practices; Utilization of bioactive compounds by microorganisms.
- 1.4 Liming:** Properties of liming materials, lime requirements and application of liming materials to ponds, effects of liming on pond ecosystem.

**UNIT II – Dynamics of dissolved oxygen and aeration**

- 2.1. **Dynamics of dissolved oxygen:** Daily changes in dissolved oxygen concentration,
- 2.2. Oxygen budget of culture ponds; algal die-off, overturns,
- 2.3. identification of oxygen problems.
- 2.4. **Aeration:** Principles of aeration, emergency aeration, destratification and practical considerations.

**UNIT III – Hatchery and aquatic weed management**

- 3.1. **Hatchery management:** Fish hatchery - Hatchery protocols, seed rearing technology;
- 3.2. Packaging and transport of seed. Shrimp hatchery – Larval rearing; culture and use of different live feed; different chemicals and drugs used; water quality and feed management.
- 3.3. Water discharge standards; Effluent treatment in hatcheries.
- 3.4. **Aquatic weed management:** Common weeds and problems in culture ponds; Chemical, biological and mechanical control methods; Algal bloom control.

**UNIT IV – Pollution during aquaculture practices.**

- 4.1. Chemical treatments: Potassium permanganate, hydrogen peroxide, calcium hydroxide;
- 4.2. Reduction of pH, control of turbidity, salinity, hardness, chlorides, water exchange, chlorine removal; rotenone, formalin and malachite green;
- 4.3. Methods of applying chemicals.
- 4.4. Pollution in relation to aquaculture practices.



**Professor & Chairman**  
Board of Studies in Zoology  
Department of Zoology  
Koraput University  
Warangal - 506 009.

## REFERENCE BOOKS

1. Adhikari S & Chatterjee DK. 2008. *Management of Tropical Freshwater Ponds*. Daya Publ.
2. Boyd CE and Tucker CS. 1992. *Water Quality and Pond Soil Analyses for Aquaculture*. Alabama Agricultural Experimental Station, Auburn University.
3. Boyd CE. 1979. *Water Quality in Warm Water Fish Ponds*. Auburn University
4. Boyd, CE. 1982. *Water Quality Management for Pond Fish Culture*. Elsevier Sci. Publ. Co.
5. Hephner B & Pruginin Y. 1981. *Commercial Fish Farming*. John-Willey & Sons Inc.
6. Jhingran VG. 1982. *Fish and Fisheries of India*. Hindustan Publishing Corporation, India.
7. Midlen & Redding TA. 1998. *Environmental Management for Aquaculture*. Kluwer.
8. Pillay TVR & Dill WMA. 1979. *Advances in Aquaculture*. Fishing News Books, Ltd. England.
9. Rajagopalsamy CBT & Ramadhas V. 2002. *Nutrient Dynamics in Freshwater Fish Culture System*. Daya Publ.
10. Sharma LL, Sharma SK, Saini VP & Sharma BK. 2008. *Management of Freshwater Ecosystems*. Agrotech Publ. Academy.
11. Stickney RR. 1979. *Principles of Warm water Aquaculture*. John-Willey & sons Inc.
12. Tucker C.S. 1985. *Channel Catfish Culture*. Elsevier.

## Practical-30 Marks

- 1 Types of Aerators.
- 2 Studies of fish breeding and gamete preservation. Method to identify quality seeds-stress test and microscopic examination.
- 3 Design and construction of fish hatcheries.
- 4 Freshwater fish identification – tagging – different types of tags.
- 5 Visit to nearest freshwater body; catching methods – catch data analysis on major freshwater resource – Estuaries - Reservoirs.
- 6 Types of weeds and treatment.



Professor & Chairman  
Board of Studies in Zoology  
Department of Zoology  
Kaxariya University  
Warangal - 506 009.