

ST.JOSEPH'S COLLEGE FOR WOMEN (A) ,VISAKHAPATNAM.

**ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE –VIII-A:
VI SEMESTER**

AQUACULTURE

Cluster Elective Paper: VIII-A-1

PRINCIPLES OF AQUACULTURE

OBJECTIVES: To enable students to

- Study the food resources of aquatic environment.
- Develop awareness about the technique of aquaculture and job potential of fisheries.
- Acquire knowledge about the maintenance of Aquarium.

Unit – I

Introduction / Basics of Aquaculture

Definition, Significance and History of Aquaculture
Present status of Aquaculture – Global and National scenario
Major cultivable species for aquaculture: freshwater, brackish water and marine.
Criteria for the selection of species for culture

Unit – II

Types of Aquaculture

Freshwater, Brackishwater and Marine water.
Concept of Monoculture, Polyculture, Composite culture, Monosex culture and
Integrated fish farming

Culture systems

Ponds, Raceways, Cages, Pens, Rafts and water recirculating systems

Culture practices

Traditional, extensive, modified extensive, semi-intensive and intensive cultures of
fish and shrimp.

Unit – III

Design and construction of aquafarms

Criteria for the selection of freshwater and brackish water pond farms
Design and construction of fish and shrimp farms

Seed resources

Natural seed resources and Procurement of seed for stocking: Carp and shrimp

Nutrition and feeds

Nutritional requirements of a cultivable fish and shellfish

Natural food and Artificial feeds and their importance in fish and shrimp culture

Unit – IV

Management of carp culture ponds

Culture of Indian major carps: Pre-stocking management – Dewatering, drying, ploughing/desilting; Predators, weeds and algal blooms and their control, Liming and fertilization; Stocking management – Stocking density and stocking; Post-stocking management – Feeding, water quality, growth and health care; and Harvesting of ponds

Culture of giant freshwater prawn, *Macrobrachium rosenbergii*

Unit – V

Culture of shrimp (*Penaeus monodon* or *Litopenaeus vannamei*)

Culture of pearl oysters

Culture of ornamental fishes – Setting up and maintenance of aquarium; and breeding.

REFERENCES BOOKS

1. Bardach, JE *et al.* 1972. *Aquaculture – The farming and husbandry of freshwater and marine organisms*, John Wiley & Sons, New York.
2. Bose AN *et al.* 1991. *Coastal aquaculture Engineering*. Oxford & IBH Publ.Co.Pvt.Ltd.
3. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn*. Daya Publ. House.
4. FAO. 2007. *Manual on Freshwater Prawn Farming*.
5. Huet J. 1986. *A text Book of Fish Culture*. Fishing News Books Ltd.
6. ICAR. 2006. *Hand Book of Fisheries and Aquaculture*. ICAR.
7. Ivar LO. 2007. *Aquaculture Engineering*. Daya Publ. House.
8. Jhingran V.G. 2007. *Fish and Fisheries of India*. Hindustan Publ. Corporation, India.
9. Landau M. 1992. *Introduction to Aquaculture*. John Wiley & Sons.
10. Lovell RT. 1998. *Nutrition and Feeding of fishes*. Chapman & Hall.
11. Mcvey JP. 1983. *Handbook of Mariculture*. CRC Press.
12. MPEDA: *Handbooks on culture of carp, shrimp, etc.*
13. New MB. 2000. *Freshwater Prawn Farming*. CRC Publ.
14. Pillay TVR. 1990. *Aquaculture- Principles and Practices*, Fishing News Books Ltd., London.
15. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. 2nd Ed. Blackwell
16. Rath RK. 2000. *Freshwater Aquaculture*. Scientific Publ.
14. Stickney RR. 1979. *Principles of Warmwater Fish Culture*, John Wiley & Sons
15. Wheaton FW. 1977. *Aquacultural Engineering*. John Wiley & Sons.

REFERENCES:

1. “Aquarium fishes” (A Colourful Profile) by Harishankar J.Alappat, A.Biju Kumar – B.R.Publications. Delhi – 110052 – Edition: 1987.

2. "Fish and Fisheries of India" by V.G.Jhingran – Hindustan Publishing Corporation – Edition: 1985.
3. "Fishery Science & Indian Fisheries" by C.B.L.Srivastava – Kitab Mahal, Allahabad – Edition: 1988.
4. "An Introduction to Fishes" by S.S.Khanna – Central Book Depot, Allahabad – Edition: 1996.
5. "Ichthyology" by Karl F.Lagler; John E.Bardach, Robert R.Miller. Dora R.May Passino – John Wiley & Sons, New York.
6. "Prawn & Prawn Fisheries of India" by C.V.Kurrian & V O Sebastian – Hindustan Publishing Corporation, Delhi – Edition: 1986.
7. "A Text book of Fish Biology & Indian Fisheries" by Parihar – Cenrral Publishing House, Allahabad.
8. "Hand Book of Fish Biology and Indian Fisheries by Parihar-Central Publishing House, Allahabad. (2003)
9. The complete Aquarium guide. (Fish, plants and accessories for your aquarium) Konemann veriogs gesellschaft – mbH. Bonner stases 126 D – 5096 B cologne.

AQUACULTURE MANAGEMENT

AQUACULTURE MANAGEMENT CLUSTER ELECTIVE PAPER :VIII-A-2 Max.Marks :100

Unit – I

Breeding and Hatchery Management

1. Bundh Breeding and Induced breeding of carp by Hypophysation; and use of synthetic hormones
2. Types of fish hatcheries; Hatchery management of Indian major carps
3. Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*
4. Breeding and Hatchery management of giant freshwater prawn.

Unit – II

Water quality Management

1. Water quality and soil characteristics suitable for fish and shrimp culture
2. oxygen depletion and control mechanisms in culture ponds
3. Aeration: Principles of aeration and Emergency aeration
4. Liming materials, Organic manures and Inorganic fertilizers commonly used and their implications in fish ponds

Unit – III

Feed Management

1. Live Foods and their role in shrimp larval nutrition.
2. Supplementary feeds: Principal foods in artificial diets; Types of feeds; Feed additives and Preservatives; role of probiotics.
3. Feed formulation and manufacturing; Feed storage
4. Feeding strategies: Feeding devices, feeding schedules and ration size; Feed evaluation- feed conversion efficiencies and ratios

Unit – IV

Disease Management

1. Principles of disease diagnosis and health management;
2. Prophylaxis, Hygiene and Therapy of fish diseases
3. Specific and non-specific defense systems in fish; Fish immunization and vaccination
4. Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds
5. Etiology, Symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds

Unit – V

Economics and Marketing

1. Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis
- .2. Fish marketing methods in India; Basic concepts in demand and price analysis

Fisheries Extension

3. Fisheries Training and Education in India; Role of extension in community development.

Fish Genetics

- .4. Genetic improvement of fish stocks – Hybridization of fish.
5. Gynogenesis, Androgenesis, Polyploidy, Transgenic fish, Cryopreservation of gametes, Production of monosex and sterile fishes and their significance in aquaculture.

REFERENCE BOOKS

1. Boyd CE. 1979. *Water Quality in Warm Water Fish Ponds*. Auburn University
2. Boyd, CE. 1982. *Water Quality Management for Pond Fish Culture*. Elsevier Sci. Publ. Co.
3. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn*. Daya Publ. House
4. Conroy CA and Herman RL. 1968. *Text book of Fish Diseases*. TFH (Great Britain) Ltd, England.
- 5 Halver J & Hardy RW. 2002. *Fish Nutrition*. Academic Press.
6. Ian C. 1984. *Marketing in Fisheries and Aquaculture*. Fishing News Books.
7. ICAR. 2006. *Handbook of Fisheries and Aquaculture*. ICAR.
8. Jhingran VG. 2007. *Fish and Fisheries of India*. Hindustan Publishing Corporation, India.
9. Jhingran VG & Pullin RSV. 1985. *Hatchery Manual for the Common, Chinese and Indian Major Carps*. ICLARM, Philippines.
10. Kumar D. 1996. *Aquaculture Extension Services Review: India*. FAO Fisheries Circular No. 906, Rome.
11. Lavens P & Sorgeloos P. 1996. *Manual on the Production and Use of Live Food for Aquaculture*. FAO Fisheries Tech. Paper 361, FAO.
12. MPEDA. 1993. *Handbook on Aqua Farming - Live Feed. Micro Algal Culture*. MPEDA Publication
13. New MB. 1987. *Feed and Feeding of Fish and Shrimp. A Manual on the Preparation and Preservation of Compound Feeds for Shrimp and Fish in Aquaculture*. FAO – ADCP/REP/87/26

Cluster Elective Paper: VIII-A-3

POSTHARVEST TECHNOLOGY

Max.Marks : 100

Unit – I

Handling and Principles of fish Preservation

- 1 .Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.
2. Principles of preservation– cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to lowradiation of gamma rays.

Unit – II

Methods of fish Preservation

- 1 . Traditional methods - sun drying, salt curing, pickling and smoking.
- 2 . Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

Unit – III

Processing and preservation of fish and fish by-products

- 1.Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.
- 2 .Fish by-products – fish glue, ising glass, chitosan, pearl essence, shark fins, fish leather and fish maws.

Seaweed Products

- 1.Preparation of agar, algin and carrageen. Use of seaweeds as food for humanconsumption, in diseasetreatment and preparation of therapeutic drugs.

Unit – IV

Sanitation and Quality control

1. Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.
- 2.Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

Regulatory affairs in industries

Unit – V

Quality Assurance, Management and Certification

- 1.Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.
- 5.1.2 National and International standards – ISO 9000: 2000 Series of Quality

Assurance System, *Codex Alimentarius*.

REFERENCE BOOKS

1. Balachandran KK. 2001. *Post-harvest Technology of Fish and Fish Products*. Daya Publ.
2. Bond, et al. 1971. *Fish Inspection and Quality Control*. Fishing News Books, England.
3. Clucas IJ. 1981. *Fish Handling, Preservation and Processing in the Tropics*. Parts I, II. FAO.
4. Gopakumar K. (Ed.). 2002. *Text Book of Fish Processing Technology*. ICAR.
5. Govindan, TK. 1985. *Fish Processing Technology*, Oxford-IBH.
6. Hall GM. (Ed). 1992. *Fish Processing Technology*. Blackie.
7. Huss HH, Jakobsen M & Liston J. 1991. *Quality Assurance in the Fish Industry*. Elsevier.
8. John DEV. 1985. *Food Safety and Toxicity*. CRC Press.
9. Krenzer R. 1971. *Fish Inspection and Quality Control*. Fishing News.
10. Larousse J & Brown BE. 1997. *Food Canning Technology*. Wiley VCH.
11. Nambudiri DD. 2006. *Technology of Fishery Products*. Fishing Chimes.
12. Regenssein JM & Regenssein CE. 1991. *Introduction to Fish Technology*. VanNostrand Reinhold.
13. Rudolf K. 1969. *Freezing and Irradiation of Fish*. Fishing News (Books).