

ADIKAVI NANNAYA UNIVERSITY

B.SC. FISHERIES

CURRICULUM

2018-19

SYLLABUS OUTLINE: OUT COMES

YEA R	SEME- STER	PAPER	TITLE	MARKS	CREDITS		
I	I	I	BIOLOGY OF FIN FISH	100	03		
			PRACTICAL - I	50	02		
	II	II	BIOLOGY OF SHELL FISH	100	03		
			PRACTICAL - II	50	02		
II	III	III	CAPTURE FISHERIES-I	100	03		
			PRACTICAL - III	50	02		
	IV	IV	CAPTURE FISHERIES-II	100	03		
			PRACTICAL - IV	50	02		
III	V	V	FIN FISH CULTURE	100	03		
			PRACTICAL - V	50	02		
		VI	SHELL FISH CULTURE	100	03		
			PRACTICAL - VI	50	02		
	VI	VII A	FISH HEALTH MANAGEMENT	100	03		
			PRACTICAL VII	50	02		
		VII B	COASTAL AQUA CULTURE	100	03		
			PRACTICAL VIII	50	02		
		VIII 1*	CLUSTER : A FISHERIES EXTENSION				
			1. FISHERIES EXTENSION	100	03		
			PRACTICAL	50	02		
			2.FIHSEY ENGINEERING	100	03		
			PRACTICAL	50	02		
			3.PROJECT INDUSTRY BASED	50	02		
			VIII 2*	CLUSTER B: ECONOMIC FISHERIES			
				1.ORNAMENTAL FISHERIES	100	03	
	PRACTICAL			50	02		
	2. POST HARVEST TECHNOLGY			100	03		
	PRACTICAL	50		02			
	3.PROJECT CULTURE BASED	50		02			
					52		

VIIA & VIIB are core electives student can opt any one of the above two.

VIII & VIII 2 are clusters

SYLLABUS FOR B.Sc. Fisheries

Paper – I semester I : Biology of Fin Fish

Unit – I: (General Characters and Classification of Cultivable Fin Fish)

- 1.1 General characters and classification of fishes up to the level of classes.
- 1.2 Morphology of a teleost. Variation in the form and structure, skin, colouration, scales, mouth, jaws & teeth, fins.
- 1.3 Anatomy of a teleost fish. Alimentary canal and associated structures like gills, swim bladder, accessory respiratory organs, heart and circulation of blood.
- 1.4 Osmotic regulation and ion regulation – mechanism and general account.

Unit – II: (Food & Feeding and Growth)

- 2.1 General account and functional morphology of digestive system, natural fish food, feeding habits, feeding adaptations, digestion and absorption of food.
- 2.2 Age and growth of fish – absolute and relative growth, isometric and allometric growth.
- 2.3 Methods for determination of growth – length frequency analysis. Estimation of growth by direct methods – known age methods. Mark and recapture method, marking and tagging.

Unit – III (Reproductive Biology)

- 3.1 Breeding in fishes, breeding places, breeding habits.
- 3.2. Induced breeding technique, bandh breeding,
- 3.3 sexual maturity, testicular cycle, ovarian cycle, estimation of fecundity, ova diameter, frequency.
- 3.4 Fecundity in relation to length, weight, age and food supply.

Unit – IV (Development)

- 1.1 Parental care in fishes, oviparity, viviparity,
- 1.2 Embryonic and larval development of fishes.

- 1.3 Environmental factors affecting reproduction and development of cultivable aquatic fin fish.

Unit – V (Locomotion)

5.1 Fish Migration -

5.2 Locomotion

5.3 Classification of fishes based on degree of movement, zones inhabited, manner of reproduction.

Reference Books:

1. Jhingran, V.G. Fish and Fisheries of India. Hindustan Publishing Co., 1975.
2. Howar, W.S. & D.S. Randal Fish Physiology, Vols.: 1 to 4.
3. Moyle Peterb, Fishes: An Introduction to Ichthyology. Prentice Hall, 1974.
4. Meyer & Ashlock. Principles of systematic zoology.
5. Turnor – Text book of endocrinology.

SYLLABUS FOR B.Sc. Fisheries

Part – II FISHERIES

Paper – I : Biology of Fin Fish

Fisheries Practical Syllabus

1. Identification of commercially important fishes.
2. Identification of fish scales.
3. Study of mouth parts of herbivorous and carnivorous fishes.
4. Comparative study of digestive system of herbivorous and carnivorous fishes.
5. Gut content analysis.
6. Embryonic larval development of fishes.
7. Study of gonadal maturity and fertility.
8. Study of nest building and brooding of fishes.
9. Induced breeding technique.
10. Morphometric and meristic characters.
11. Study of Weberian Ossicles in cat fish.
12. Lateral line nerve of Trichiurus.

Semester – I; Paper - I
Biology of Fin Fish
(CBCS Model Question Paper)

Time: 3 Hrs.

Max. Marks: 75

SECTION – A

I. Write short notes on any FIVE of the following.

5X5=25

1. Types of fins.
2. Placoid scale.
3. Feeding habits.
4. Breeding habits.
5. Viviparous.
6. Manner of reproduction.
7. Hilsa ilisha
8. Marking.

SECTION – B

I. Write any FIVE of the following question. Draw diagrams wherever necessary.

5X10=50

9. (a) Write an essay on accessory respiratory organs in fishes.
(OR)
(b) Give an account on colouration in fishes
10. (a) Give an account of feeding adaptations in fishes.
(OR)
(b) Write about methods for determination of growth in fishes.
11. (a) Write an essay on induced breeding technique.
(OR)
(b) Explain Testicular cycle in male fishes.
12. (a) Describe parental care in fishes.
(OR)
(b) Give an account on factors affecting reproduction.
13. (a) Classification of fishes based on zones inhabited.
(OR)
(b) Write an essay on Migration.

Blue Print

Unit	Short Answer questions	Essay questions
I	2	2
II	2	2
III	1	2
IV	1	2
V	2	2

SYLLABUS FOR B.Sc. Fisheries

Semester-II

Paper – II : Biology of Shell Fish

Unit – I: (General Characters and Classification of Cultivable Shell Fish)

- 1.1 General characters and classification of crustaceans and molluscs up to the level of class.
- 1.2 Commercial importance of crustaceans and molluscs.
- 1.3 Prawn external parts and appendages, exoskeleton and integument.
- 1.4 Respiration and circulatory systems of prawn. Structure of gills, mechanism of respiration.
- 1.5 Nervous and excretory system of crustacean molluscs.
- 1.6 Sense organs in crustaceans and molluscs.

Unit – II: (Food, Feeding and Growth)

- 2.1 Natural food, feeding habits, feeding intensity utilization of food, gut content analysis.
- 2.2 Digestive system of shrimp, crab and molluscs.
- 2.3 Integument and exoskeleton of crustaceans, their structure and functions.

Unit – III: (Reproductive Biology)

- 3.1 Induced maturation in shrimp – induced maturation technology physiological changes after induced maturation.
- 3.2 Breeding in Oysters, Mussel, Clams, Pearl Oyster, Pila, Fresh water Mussel and Cephalopods.
- 3.3 Reproductive organs in Shrimp.
- 3.4 Life cycle of Shrimp.

Unit – IV: (Development)

- 4.1 Embryonic and larval development of Shrimp, Crab and Molluscs.
- 4.2 Environmental factors affecting reproduction and development of cultivable shell fish.

Unit – V: (Hormones & Growth)

- 5.1 Endocrine system of Prawn and Crab, Oyster.
- 5.2 Neurosecretary cells Androgenic gland, ovary, cuticle.
- 5.3 Moulting, Moulting stages, Metamorphosis in Crustaceans.

Reference Books:

1. Borrardile & R.A. Potts. The Invertebrates. Asia Publishing House, 1962.
2. Kaestner, A. Invertebrate Zoology. Vol. I – III, John Wiley & Sons, 1967.
3. Barrington, F.J.W. Invertebrates : Structure and Functions. EIBS, 1971.
4. Kurian, C.V. & V.O. Sabastian. Prawns and Prawn Fisheries of India. Hindustan Pub. Co., 1976.
5. Parker, J. & W.A. Haswell. The Textbook of Zoology. Vol. I. Invertebrates (eds. A.J. Marshall & W.D. Williams), ELBS & McMillan & Co., 1992.

SYLLABUS FOR B.Sc. Fisheries

Paper – II : Biology of Shell Fish

Fisheries Practical Syllabus

1. Identification of commercially important shell fishes.
2. Induced maturation technique in shrimp.
3. Study of different larval stages of shrimp.
4. Mouth parts and appendages of cultivable prawns, shrimp and other crustaceans.
5. Study of eggs of shrimps, prawns and other crustaceans.
6. Observations of Molluscan larva.
7. Study of visceral organs of fresh water mussels.
8. Demonstration of digestive system of Pila.

SYLLABUS FOR B.Sc. Fisheries

Part – II FISHERIES Biology of Shell Fish

(CBCS Model Question Paper)

Time: 3 Hrs.

Max.

Marks: 75

SECTION – A

I. Write short notes on any FIVE of the following.

5X5=25

1. Sense organs in crustaceans.
2. Gastropoda
3. Feeding intensity.
4. Radula
5. Pearl Oyster
6. Megalopa
7. Neuro secretory cells
8. Androgenic glands

SECTION – B

II. Write any FIVE of the following Essay Questions. Draw diagrams wherever necessary.

5X10=50

9. (a) Describe respiratory system in Prawn.

(OR)

(b) Give a detailed account on Cephalic appendages of Prawn.

10. (a) Write an essay on integument in Crustaceans.

(OR)

(b) Explain digestive system of Crab.

11. (a) Give a detailed account on induced maturation in Shrimp.

(OR)

(b) Write an essay on breeding in Oysters.

12. (a) Write an essay on different larval stages of Shrimp.
(OR)
(b) Give an account on development of molluscs.
13. (a) Describe endocrine glands in Prawn.
(OR)
(b) Describe the moulting stages in Crustaceans.
-

Blue Print

Unit	Short Answer questions	Essay questions
I	2	2
II	2	2
III	1	2
IV	1	2
V	2	2

SYLLABUS FOR B.Sc. Fisheries

CAPTURE FISHERY -I

SEMESTER - III

Unit I : Fish Catch Statistics :-

- 1.1 Fish production of the world both inland and marine, contribution of different countries, position of India in the Fish Catches .
- 1.2 The EEZ concept & its implementation in fisheries. The Indian EEZ, Fishery survey in India

Unit II : Fish Distribution .

- 2.1 General account of the distribution,
- 2.2 Biology and fishery of important fishes and other aquatic animals of India,
- 2.3. Economically Important Fresh Water Fishes of Andhra Pradesh.

Unit-III Riverine Fishery :-

- 3.1 Important characters of Streams.
- 3.2 Different riverine systems in India, and their fishery: The Ganga River System, the Brahmaputra river system,

Unit-IV Riverine Fishery :-

- 4.1 The East Coast River System.
- 4.2 The West Coast River System, River Jhelum of the Indus River System, Fisheries of trout and Mahseer, Problems and management.

Unit-V Reservoir Fishery (Lacustrine Fishery) :-

- 5.1 Definition of a Lake, Origin and classification of lakes.
- 5.2 Kolleru Lake and its fishery.
- 5.3 Different reservoirs of River systems in India with special reference to Nagarjuna Sagar,

Reference Books :-

Jhingram, V.G. Fish and Fisheries of India. Second edition 1983, Hindustan Pub.Co.

Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970

Bal, D.V. and Veerabhadra Rao, K. Marine Fisheries, Tata MC Grawhill Publications, New Delhi.

Srivastava, U.K. et.al. Freshwater aquaculture in India, Oxford and IBH Publ. Co. New Delhi 1980.

C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.

PRACTICALS

SEMESTER - III

1. Identification of Freshwater fishes based on colour, Pigmentation, morphometric and meristic characters and other characters relevant to the group.
2. Identification of fry and fingerlings of Indian Major Crops.
3. Examination of Commercially Important Freshwater fishes and prawns, from the point of view of ecology and fishery.
4. Knowledge of common types of Freshwater craft and gear on models provided in the department.

Field Work : Visit to fish landing centers of rivers, lakes and reservoirs.

SYLLABUS FOR B.Sc. Fisheries

CAPTURE FISHERY -II

SEMESTER - IV

Unit-I Estuarine Fishery :-

- 1.1 Definition of an estuary, Origin and Classification
- 1.2 Divergent estuaries in India, their location and species composition
- 1.3 Hooghly – Matlah Estuary, Mahanadi estuary, Godavari Estuary, Krishna Estuary

Unit-II Marine Fishery :-

- 2.1 Marine Environment. Marine Fishery resources in India, Pelagic fishery resources.
- 2.2 Taxonomy, general description, distribution, food and feeding habits, reproduction, craft and gear, fish utilization of the following.
Sardines, Bombay Duck, Mackerel, Hilsa, Mulletts, Sharks and Rays, Pomfrets, Tuna, Seer Fish and Prawns,

UNIT-III Craft

- 3.1 Main types of the traditional crafts employed in Marine, fresh water fisheries of Andhra Pradesh.
- 3.2 Coracle, Dhoni, Sangadam, Canoes, Catamaran, Masula type boats, Fiber Glass boats
- 3.3 Techniques for the maintenance of the craft
- 3.4 Modern fishing crafts- trawlers, BLC. Mechanized Crafts

UNIT-IV Gear

- 4.1 Traditional gear
- 4.2 Dip & Lift Nets, Cast nets, gill nets, Shore seines, Boat Seines, Hand Lines, Long Lines, Conical Set nets, Drag nets, Trawl nets and Basket traps.
- 4.3 Fish Finding Equipment (Echo sounder and sonar)
- 4.4 Modern gear- Techniques for the maintenance of the gear

Unit- V Fishery Management :-

- 5.1 Principles of conservation, and management.
- 5.2 Population dynamics – Overfishing, Maximum Sustainable yield (MSY), Maximum Economic Yield (MEY), Optimum Sustainable Yield (OSY).

Reference Books :-

Jhingram, V.G. Fish and Fisheries of India. Second edition 1983, Hindustan Pub.Co. Picker, W.E. Methods for assessment of Fish Production in Fresh Waters. Blackwell Scient. Publ. 1970

Bal, D.V. and Veerabhadra Rao, K. Marine Fisheries, Tata MC Grawhill Publications, New Delhi.

Srivastava, U.K. et.al. Freshwater aquaculture in India, Oxford and IBH Publ. Co. New Delhi 1980.

C.B.L. Srivastava – A text book of Fishery Science and Indian Fisheries. Kitab Mahal Agencies, Patna.

Maintenance of field work note book to be evaluated at the time of examination.

PRACTICALS

SEMESTER - IV

1. Identification of Marine and Estuarine water fishes based on colour, Pigmentation, morphometric and meristic characters and other characters relevant to the group.
2. Examination of Commercially Important Marine and Estuarine fishes and prawns, from the point of view of ecology and fishery.
3. Knowledge of common types of Marine and Estuarine craft and gear on models provided in the department.

Field Work :

Visit to Coastal region to observe marine fish landing centers, different types of traditional boats, mechanized boats and various types of traditional and modern nets used in the fish capture.

Demonstration of fish collection and operation of nets, observing different instruments used in Fisheries.

Maintenance of field work note book to be evaluated at the time of examination.

B.Sc. – Fisheries
Semester-V
Paper-V – Fin Fish Culture
Theory – Syllabus

Unit – I (Introduction)

- 1.1 Basics of aquaculture – Scope and definition, history of aquaculture origin and growth, General principles underlying the practices of aquaculture.
- 1.2. Major cultivable Indian Carps, Chinese carps and Air Breathing fishes.
- 1.3. Different fresh water Aquaculture systems – Monoculture, Polyculture, Integrated culture, Cage culture, Pen culture, Monosex culture system.

Unit – II (Types of fish ponds)

- 2.1. Classification of ponds based upon water resources – Spring, Rain water, Flood water, Well water and Water course ponds.
- 2.2. Classification of ponds based upon functions – Hatchery, Nursery, Rearing, Production, Stocking and Quarantine ponds.
- 2.3. Criteria for the selection of species for culture.

Unit – III (Pond Preparation)

- 3.1. Important factors in construction of ideal fish pond – site selection, topography, nature of soil, water resources – quantity and quality of water, sources of pollution.
- 3.2. Design and construction of pond – layout of farm, size of farm, shape and depth of pond, dike design, pond bottom preparation, inlet, outlet, aerators and method of construction.

Unit – IV (Pond Management)

- 4.1. Liming – properties of liming material, lime requirement and application to ponds, effect of liming on pond ecosystem.
- 4.2. Need of fertilizers and manures in culture ponds, role of nutrients, precautions in their application.
- 4.3. Physics – Chemical conditions of soil and water optimum culture – Temperature, depth, turbidity light water currents, pH, Dissolved oxygen, CO₂, Hardness, Nutrients.
- 4.4. Eradication of predator, and weed control – advantages and disadvantages of weed, types of weeds in culture pond, weed fish, toxins used for weed control and control of predators.

Unit – V (Hatchery)

- 5.1 Hatchery – Design and construction of hatchery;
- 5.2 water quality monitoring and management
- 5.3 Selection of brood stock and brood stock management
- 5.4 Different types of hatcheries.

References :

1. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi.
2. Pillay TVR, 1996. Aquaculture principles and practices, fishing news books ltd., London.
3. Pillay TVR & Dill, WMA, 1979. Advances in Aquaculture. Fishing news books ltd., England.
4. Pillay TVR & Kutty MN 2005. Aquaculture – Principles and practices, Blackwell.
5. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company.
4. Bose AN et.al., 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt. Ltd.
6. Pillay TVR, 1996. Aquaculture Principles and Practices, Fishing News Books Ltd., London

Semester-V
Paper-V – Fin Fish Culture
Theory – Model Question Paper
Time : 3 Hrs.
Max. Marks : 75

I. **Answer any FIVE of the following. Draw diagrams wherever necessary.**
5x5=25 M

1. Polyculture
2. Cage culture
3. Nursery pond
4. Topography
5. Liming
6. Aquatic weeds
7. Bundh breeding
8. Chinese circular trough

II. **Answer any FIVE of the following. Draw diagrams wherever necessary.**
5x10=50 M

9. (a) Give an account on two Indian major carps identification and breeding habits.
(or)
(b) Explain about any three fresh water aquaculture systems.
10. (a) Classify ponds based upon water resources availability.
(or)
(b) Based upon functional aspect what are the different types of fish ponds?
11. (a) Describe about important factors to be considered while constructing Fish pond.
(or)
(b) Write an essay on design and construction of a Fish pond.
12. (a) Describe physical factors present in water required for fish culture.
(or)
(b) Write briefly about aquatic weeds. Mention the methods employed to control Aquatic weeds.
13. (a) Define Hypophysation. Explain how this technique is employed in carps for breeding.
(or)
(b) Discuss about construction and management of any one type of fish hatchery in detail.

B.Sc. – Fisheries
Semester-V
Paper-V – Fin Fish Culture
Practical Syllabus

I. Experiments

1. Estimation of dissolved oxygen.
2. Estimation of chlorides
3. Estimation of carbonates and bicarbonates

II. Breeding Techniques

Induced breeding techniques in carps – Dissection of pituitary gland preparation of hormone extract, dosage fixation, breeders selection.
Study of Gonadial maturity and fecundity in carps.
Identification of life history stages of fish.

III. Hatchery

Study of water treatment and management in fish hatchery.
Application of different chemicals and drugs used in hatchery.

IV. Field Trips

Field visit to fish hatchery.
Field visit to different fish ponds.

B.Sc. – Fisheries
Semester-V
Paper-V – Fin Fish Culture
Practical Model Question Paper

Time : 3 Hrs.

Max. Marks : 50

- | | | |
|----|---|----|
| 1. | Estimate amount of dissolved oxygen in the given sample. | 15 |
| 2. | Dissect pituitary gland and prepare pituitary extract. | 10 |
| 3. | Study of Gonadial maturity and fecundity in the given fish. | 10 |
| 4. | Field visit report | 05 |
| 5. | Vivavoce | 05 |
| 6. | Record | 05 |

B.Sc. – Fisheries
Semester-V
Paper-VI – Shell Fish Culture
Theory – Syllabus

Unit – I (Introduction)

- 1.1 Introduction, History, Development and present status of brackish water farming in India.
- 1.2 Brackish water as a medium for aquaculture, ecological factors – Abiotic and biotic factors.
- 1.3 Types of culture systems – Traditional, extensive, semi-intensive and intensive culture systems of shrimp, their management and economics.

Unit – II (Culture of Fresh water prawn)

- 2.1 Life cycle of fresh water prawn.
- 2.2 Fresh water prawns of India – Commercial value.
- 2.3 *Macrobrachium rosenbergii*, *M.malcomsonii* – Biology, seed production
- 2.4 Pond preparation, stocking, management of nursery, grow-out ponds, feeding, morphotypes and harvesting.

Unit – III (Culture and Shrimp)

- 3.1 *Biology of Penaeus monodon*,
 - 3.2 *P.indicus*
 - 3.3 *P.vannamei*.
- 3.4 Hatchery, Nursery, grow out ponds and harvesting of shrimp.

Unit – IV (Management practices)

- 4.1 Nutritional requirements of cultivable prawns.
- 4.2 Natural food and artificial feeds and their importance in shrimp culture.
- 4.3 Etiology, symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds.

Unit – V (Culture of Brackish water species)

- 5.1 Species of crabs cultured, biology and culture technique, prospects in India.
- 5.2 Species of edible oysters, culture techniques used for farming edible oysters.
- 5.3 Important species of pearl oysters and method of artificial pearl production.

References :

1. Pillay, TVR. Aquaculture principles and practices, Fishery News (Books) Ltd., London 1990.
2. Prawn and prawn fisheries by Kurain and Sebestain.
3. Shankar KM & Mohan CV 2002. Fish and Shell Fish Health Management UNESCO. Publ. Sundermann CJ 1990.
4. Johnson SK 1995. Hand book of shrimp diseases Texas A & M university, Texas.
5. Guland J.A. (ed) 1984. Penaeid Shrimps – Their Biology and Management.
6. Raymond T et al., 1990. Crustacean Sexual Biology, Columbia University Press, New York.

B.Sc. – Fisheries
Semester-V
Paper-VI – Shell Fish Culture
Theory – Model Question Paper

Time : 3 Hrs.

Max. Marks : 75

I. Answer any FIVE of the following. Draw diagrams wherever necessary. 5x5=25
M

1. Extensive culture system.
2. Biotic factors of estuary.
3. Macrobrachium rosenbergii.
4. Male morphotypes of prawn.
5. Prawn hatchery
6. Harvesting of prawn
7. Prawn feed
8. Raft culture.

II. Answer any FIVE of the following. Draw diagrams wherever necessary. 5x10=50 M

9. (a) Give an account of present history, water resources and development of Brackish water farming in India.
(or)
(b) Explain about different prawn culture systems.
10. (a) Give an account of identification and biology of two fresh water prawns.
(or)
(b) Explain in detail about fresh water prawn life cycle.
11. (a) Describe the characters and feeding habits of two cultivable brackish water prawns.
(or)
(b) Explain important aspects of shrimp hatchery.
12. (a) Discuss about any two viral and bacterial diseases of shrimps.
(or)
(b) Write an essay on types of Artificial feed, Feed preparation, Feeding strategies, Feed timing in shrimp culture pond.
13. (a) Explain about culture of crabs.
(or)
(b) Write an essay on pearl oyster culture with reference to seed technology of pearl production.

B.Sc. – Fisheries
Semester-V
Paper-VI – Shell Fish Culture
Practical – Syllabus

1. Identification of cultivable fresh water and marine water prawns (any 3 each).
2. Identification of marine crabs and oysters of commercial importance (any 2 each).
3. Identification of Phytoplankton and Zooplankton (any 5 each).
4. Identification of different live feed organisms for shrimp larvae (any 4)
5. Identification of larval stages of prawn.
6. Demonstration of eye stalk ablation in penaeus monodon.
7. Identification and mounting of appendages of prawn / shrimp.
8. Field visit to prawn / shrimp hatchery.
9. Field visit to prawn / shrimp culture ponds.

B.Sc. – Fisheries
Semester-V
Paper-VI – Shell Fish Culture
Practical – Model Question Paper

Time : 3 hrs.

Max. Marks : 50

- I. Identify the following Plankton. 5x3=15
- (A) (B) (C) (D) (E) (E)
- II. Mounting of appendages in a prawn / shrimp. 05
- III. Identify the following spotters (based upon local availability) 3x5=15
- Prawn / Shrimp
Crab
Oyster
- IV. Field visit report 05
- V. Vivavoce 05
- VI. Record 05

SYLLABUS FOR B.Sc. Fisheries

Semester-VI Paper-VII A Elective 1 – FISH HEALTH MANGEMENT

FISH HEALTH MANGEMENT

MODULE I: PATHOLOGY AND PARASITOLOGY

- 1-1 Introduction to fish diseases –Definition and categories of diseases – Disease and environment
- 1-2 Disturbance in cell structure – changes in cell metabolism, progressive and retrogressive tissue changes, types of degeneration, infiltration, necrosis, cell death and causes
- 1-3 Atrophy, hypertrophy, neoplasms, inflammation, healing and repair

MODULE II: DISEASES OF FIN FISH

- 2-1 Fungal diseases (both of shell and finfish) – Saprolegniosis, brachiomycosis, ichthyophorus diseases – Lagenidium diseases – Fusarium disease, prevention and therapy
- 2-2 Viral diseases – Emerging viral diseases in fish, haemorrhagic septicemia, spring viremia of carps, infectious hematopoietic necrosis in trout, infectious pancreatic necrosis in salmonids, swim-bladder inflammation in cyprinids, channel cat fish viral disease, prevention and therapy
- 2-3 Bacterial diseases – Emerging bacterial diseases, aeromonas, pseudomonas and vibrio infections, columnaris, furunculosis, epizootic ulcerative syndrome, infectious abdominal dropsy, bacterial gill disease, enteric red mouth, bacterial kidney disease, proliferative kidney disease, prevention and therapy

MODULE III: DISEASES OF SHELL FISH

- 3-1 Major shrimp viral diseases – Baculovirus penaeii, Monodon Baculovirus, Baculoviral midgut necrosis, Infectious hypodermal and hematopoietic necrosis virus, Hepatopancreatic parvo like virus, Yellow head baculovirus, white spot baculovirus.
- 3-2 Bacterial diseases of shell fish – aeromonas, pseudomonas and vibrio infections, luminous bacterial disease, filamentous bacterial disease. Prevention and therapy
- 3-3 Protozoan diseases- Ichthyophthiriasis, Costiasis, whirling diseases, trypanosomiasis.
Prevention and therapy

MODULE IV: NUTRITIONAL DISEASES

- 4-1 Nutritional pathology – lipid liver degeneration, Vitamin and mineral deficiency diseases. Aflatoxin and dinoflagellates.
- 4-2 Antibiotic and chemotherapeutics. Nutritional cataract. Genetically and environmentally induced diseases.

MODULE V: FISH HEALTH MANAGEMENT

- 5-1 Diagnostic tools – immune detection- DNA/RNA techniques, General preventive methods and prophylaxis. Application and development of vaccines.
- 5-2 Quarantine – Significance, methods and regulations for transplants.
- 5-3 Production of disease-free seeds. Evaluation criteria of healthy seeds.
- 5-4 Good Feed management for healthy organisms, Zero water exchange, Probiotics in health management, Issues of biosecurity.

Semester-VI
Paper-VII A – FISH HEALTH MANGEMENT

THEORY MODEL PAPER

Time : 3 hrs

Max. Marks : 75

I. Answer any FIVE of the following :

5x5=25

Draw labelled diagrams wherever necessary

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

II. Answer any FIVE of the following :

5x10=50

Draw labelled diagrams wherever necessary

9.

OR

10.

OR

11.

OR

12.

OR

13.

OR

Blue Print for the question paper

Short Answers from each section 1 each and 2 from module 2,3,4

Essay questions one each from each module with internal choice

SYLLABUS FOR B.Sc. Fisheries

Semester-VI Paper-VII A – FISH HEALTH MANGEMENT

PRACTICALS:

1. Enumeration of Bacteria by TPC Method
2. Enumeration of total Coliforms
3. Observation of gross pathology and external lesions of fish and prawn with reference to the common diseases in aquaculture
4. Examination of pathological changes in gills and gut lumen, lymphoid organ, muscles and nerves of fish
5. Examination of pathological changes in gut lumen, hepatopncreas, lymphoid organ, muscles and nerves of prawn and shrimp
6. Collection, processing and analysis of data for epedemeiological investigations of viral diseases
7. Molecular and immunological techniques; Biochemical tests; PCR; ELISA; Agglutination test; Challenge tests; Purification of virus for development of vaccines (Demonstration at institutes/labs)
8. Filed visit to farm for heath monitoring and disease diagnosis

Semester-VI Paper-VII A– FISH HEALTH MANGEMENT

Practical Model paper

- | | |
|---|-----------------|
| 1. Enumeration method | 10 Marks |
| 2. Sketching the Pathogenic characters of Fish/Prawn | 10 Marks |
| 3. Identification of Pathogens Slides/Spotters/Photographs | |
| Any four | 4x5 |
| | 20 Marks |
| 4. Record | 05 Marks |
| 5. Viva-voce/filed book | 05 Marks |

PRESCRIBED BOOK(S):

1. Shaperclaus W. 1991 Fish Diseases- Vol.I & II. Oxonian Press Pvt.ltd
2. Roberts RJ 1989. Fish pathology. Bailliere Tindall, New York
3. Lydia Brown 1993. Aquaculture for veterinarians- fish husbandry and medicine. Pergamon Press. Oxford

REFERENCES:

1. Shankar KM & Mohan CV. 2002. Fish and Shellfish Health Management. UNESCO Publ. Sindermann CJ. 1990
2. Walker P & Subasinghe RP. (Eds.). 2005 Principal Diseases of Marine Fish and Shellfish. Vols. I, II. 2nd Ed. Academic Press
3. Ellis Harward. 18 Felix S, Riji John K, Prince Jeyaseelan MJ & Sundararaj V. 2001 Bacterial Fish Pathogens (Diseases in Farm and Wild)
4. Fish Disease Diagnosis and Health Management. Fisheries College and Research Institute, T.N. Veterinary and Animal Sciences University. Thoothukkudi. Inglis V, Roberts RJ & Bromage NR. 1993.
5. DNA Based Molecular Diagnostic Techniques: Research Needs for Standardization and Validation of the Detection of Aquatic Animal Pathogens and Diseases. FAO Publ. Wedmeyer G, Meyer FP & Smith L. 1999.

SYLLABUS FOR B.Sc. Fisheries

Semester-VI

Paper VII B Elective -2 – COASTAL AQUA CULTURE

MODULE-I: INTRODUCTION

- 1-1 Types of brackish water areas in India with special reference to Andhra Pradesh
- 1-2 Status and development of brackish water aquaculture across the world with special emphasis on India and Andhra Pradesh
- 1-3 Scope and feasibility of mariculture in Andhra Pradesh
- 1-4 Need and importance of mangrove conservation

MODULE-II: CRUCIAL ASPECTS OF WATER SHELL & FIN FISH

- 2-1 Water and soil quality management in brackish water culture
- 2-2 Estimation of growth, survival and pond productivity at different stages of culture
- 2-3 Suitable strategies for harvesting

MODULE-III: TYPES OF COASTAL AQUACULTURES

- 3-1 Mono and poly culture systems, traditional, extensive and modified extensive systems, semi-intensive and intense system with special reference to mariculture
- 3-2 Site selection for enclosed culture systems, cage and pen culture
- 3-3 Molluscan species and sea weeds- sea farming practices
- 3-4 Sampling, harvesting and transport techniques and Sea-ranching

MODULE-IV: CULTURE OF MARINE FISHES

- 4-1 Important marine fish having nutritional and economic value
- 4-2 Culture of air-breathing predatory fishes - murrels, singhi, magur and koi fishes
- 4-3 Culture of Trouts

MODULE-V: CULTURE OF MOLLUSCS AND OTHER IMPORTANT MARINE ORGANISMS

- 5-1 Pearl culture – suitable species, site selection, water quality parameters, spat collection, hatchery technology, brood stock maintenance, larval rearing, surgery, graft, rearing of oysters, pearl collection, processing, natural, cultured and artificial pearls
- 5-2 Sea-weed culture- suitable species, site selection, water quality parameters, rearing and harvesting
- 5-3 Culture of lobsters – suitable species, site selection, rearing methods, feeding and harvesting
- 5-4 Culture of mussels - suitable species, site selection, rearing methods, pole, raft and long line culture

Semester-VI
Paper VII B – COASTAL AQUA CULTURE
THEORY MODEL PAPER

Time : 3 hrs

Max. Marks :

75

I. Answer any FIVE of the following :

5x5=25

Draw labelled diagrams wherever necessary

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II. Answer any FIVE of the following :

5x10=50

Draw labelled diagrams wherever necessary

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Blue Print for the question paper

Short Answers from each section 1 each and 2 from module 2,3,4

Essay questions one each from each module with internal choice

Semester-VI
Paper VII B – COASTAL AQUA CULTURE

PRACTICALS:

1. Identification of cultivable brackish water fin fishes
2. Identification of cultivable brackish water shell fishes
3. Study of seed acclimatization
4. Estimation of daily feed ratio in check tray
5. Estimation of seed survival and stress tests in brackish water culture
6. Visit to brackish water shrimp and fish ponds
7. Identification of cultivable marine fin fish
8. Identification of cultivable marine shell fish

Practical Model paper

- | | |
|---|-----------------|
| 1. SPOTTERS BRACKISH WATER FISH& PRAWN (any 4) | 20 Marks |
| 2. Seed survival experiment with changing parameters | 15 Marks |
| 3. Filed visit Log Book | 05 Marks |
| 4. Record | 05 Marks |
| 5. Viva Voce | 05Marks |

PRESCRIBED BOOK (S):

1. Bardach 1972. Aquaculture. John wiley & sons, New York
2. MC Vey JP (Ed.) 1993. CRC Hand book of mariculture & Crustacean Aquaculture. CRC Press, Boca Raton, USA
3. Santharam R, Ranganathan N and Jagathesan G. Coastal Aquaculture in India. CBS Publishers & Distributors, New Delhi

REFERENCES:

1. James PSBR 1991. Manual of pearl culture techniques. Cmfri bulletin no.39. Cochin
2. Das ML and Patnaik PN 1994. Brackish water prawn culture. Palani Paramount Publications, Palani
3. Fast AW and Lester LJ (Ed.)

CLUSTER : A FISHERIES EXTENSION
PAER VIII A 1. FISHERIES EXTENSION

MODULE – 1 INTRODUCTION

- 1-1 Meaning and scope of economics with reference to fisheries
- 1-2 Basic concepts of economics – goods, services, wants and utility, demand and supply, value price, market demand and individual demand, elasticity of demand, law of diminishing marginal utility
- 1-3 Theory of production, production function in fisheries
- 1-4 Various factors influencing the fishery product's price

MODULE – II FISHERIES MARKETING

- 2-1 Basic marketing functions, consumer behaviour and demand, fishery market survey and test marketing a product
- 2-2 Fish marketing – prices and price determination of fishes
- 2-3 Marketing institutions- primary(producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/agent/speculative middlemen)
- 2-4 Methods of economic analysis of business organizations
- 2-5 Preparation of project and project appraisal

MODULE-III FISHERIES CONOMICS

- 3-1 Aquaculture economics- application of economics principles to aquaculture operations
- 3-2 Various inputs and production function. Assumptions of production function in aquaculture analysis, least cost combination of inputs, laws of variable proportions
- 3-3 Cost and earnings of aquaculture systems – carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants
- 3-4 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matsyafed and NABARD in uplifting fishermen's conditions, fishermen cooperatives
- 3-5 Contribution of fisheries to the national economy

MODULE-IV FISHERIES EXTENSION

- 4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension education
- 4-1.1 Fisheries extension methods and rural development
- 4-3 Adoption and diffusion of innovations

MODULE-V TRANSFER OF TECHNOLOGY

- 5-1 ICAR programs – salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM
- 5-2 Training – meaning, training vs. education and teaching
- 5-3 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media

PRACTICALS:

1. Basic marketing functions
2. prices and price determination of fishes
3. Fisheries extension
4. education of Fish farmers

Field notes and necessary inputs –should be focused in the practicals

PRESCRIBED BOOK(S):

1. Adivi Reddy sv 1997. An introduction to extension education. Oxford & IBH Co.Pvt. Ltd. New Delhi
2. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
3. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

REFERENCES:

1. Dewwett KK and Varma JD 1993. Elementary economic theory. S.chand, New Delhi
2. Korakandy R 1996. Economics of Fisheries Mangement. Daya Publishing House, Delhi
3. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore.

Semester-VI
CLUSTER : A FISHERIES EXTENSION
PAER VIIIA 1. FISHERIES EXTENSION

THEORY MODEL PAPER

Time : 3 hrs

Max. Marks : 75

I. Answer any FIVE of the following :

5x5=25

Draw labelled diagrams wherever necessary

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II. Answer any FIVE of the following :

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Draw labelled diagrams wherever necessary

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Blue Print for the question paper

Short Answers from each section 1 each and 2 from module 2,3,4

Essay questions one each from each module with internal choice

CLUSTER : A FISHERIES EXTENSION
VIII A 2: FISHERY ENGINEERING

MODULE I: FISHING CRAFTS

- 1-1 Classification of fishing craft.
- 1-2 Boat building materials - wood, steel, FRP, ferro-cement, aluminum etc.,
- 1-3 Mechanization of fishing craft and its impact

MODULE II: FISHING GEAR

- 2-1 Evolution of fishing methods and gear- principles
- 2-2 Design of fishing gear and fish catching methods
- 2-3 Fishing accessories, Netting materials – natural and synthetic fishing gear materials and yarn numbering system
- 2.4 Active fishing gear - classification and description of modern fishing gears.- Design and operation of –trawls, purse seines, ring seines, beach / shore seine, boat seine, pole and line, squid jigs, trolling.

MODULE III: ANCHORS, FISH FINDING & NAVIGATIONAL EQUIPMENT

- 3-1 Types of Anchors – Chains, ropes, blocks, leads and drogues
- 3-2 Echo sounders, fish finders, sonar and net sonde
- 3-3 Sextant, chronometer, gyro compass, radar, decca, omega etc.

MODULE IV: EXPLORATION OF FISH AND CONSERVATION

- 4-1 Remote sensing applications in fish finding and catching
- 4-2 Turtle exclusion devices
- 4-3 By-catch reduction devices
- 4-4 Destructive and prohibited fishing practices
- 4-5 Fish aggregating devices and artificial reefs

MODULE V: FISH PROCESSING EQUIPMENT

- 5-1 Ice making machinery, Brine tank
- 5-2 Arrangements for leak detection
- 5-3 Operation of various freezing machinery
- 5-4 Machinery for sausage making, canning and packaging
- 5-5 Special equipment for freeze-drying, irradiation and cryogenics
- 5-6 General maintenance of freezing plant and cold storage ice plant

CLUSTER : A FISHERIES EXTENSION
VIII A 2: FISHERY ENGINEERING

THEORY MODEL PAPER

Time : 3 hrs

Max. Marks : 75

I. Answer any FIVE of the following :

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Short Answers from each section 1 each and 2 from module 2,3,4

Essay questions one each from each module with internal choice

CLUSTER : A FISHERIES EXTENSION

PAER VIIIA2. FISHERIES ENGINEERING

PRACTICALS:

1. Site survey: preparation of site map and contour map
2. Ice making and harvesting
3. Testing different netting materials- natural and synthetic
4. Estimation of buoyancy and de-buoyancy of different floating and sinking materials
5. Designing trawl net by conducting survey
6. Solving problems on finding position of gravity, flotation and buoyancy
7. Visit to fishing harbor to study deck machinery
8. Visit to fishing harbor to study hull equipment
9. Visit to boat building yard and dry docking yard
10. Visit to a fish processing unit to study the equipment used in fish processing

PRESCRIBED BOOKS:

1. Fridman Al 1992. Calculations for fishing gear designs. FAO, USA. Fishing news books Ltd, England
2. Gerhard Klust 1982. Netting material for fishing gears. FAO, USA. Fishing news books Ltd, England
3. Jan-Olf- Traung 1992. Fishing boats of the world- Volumes – 1, 2, & 3. FAO, USA. Fishing news books Ltd, England

REFERENCES:

1. Dag Pike 1992. Fishing boats and their equipment. FAO, USA. Fishing news books Ltd, England

CLUSTER VIII B: ECONOMIC FISHERIES

PAPER VIII B1: ORNAMENTAL FISHERY

MODULE I: INTRODUCTION

- 1-1 Aquarium and ornamental fishes – introduction
- 1-2 Present status of Aquarium trade in the world and India
- 1-3 Aquarium accessories – aerators, filters, lighters and heaters
- 1-4 Water quality needs and different kinds of feeds

MODULE II: FRESH WATER ORNAMENTAL FISHES

- 2-1 Live bearers, gold fish, koi, gourami, barbs and tetras, angel fish and cichlid fish
- 2-2 Brood stock development, breeding, larval rearing and grow out
- 2-3 Larval feeds and feeding

MODULE III: MARINE ORNAMENTAL FISHES

- 3-1 Varieties and habitat of marine ornamental fishes
- 3-2 major marine ornamental fish resources of India
- 3-3 Collection and transportation of live fish, use of anaesthetics
- 3-4 Breeding of marine ornamental fish
- 3-5 Other aquarium animals – sea anemones, lobsters, worms, shrimps, octopus and starfish

MODULE IV: AQUARIUM MANAGEMENT

- 4-1 Setting up fresh water, marine and reef aquariums
- 4-2 Water quality management for different types of aquariums
- 4-3 Common diseases of aquarium fish, diagnosis and treatment
- 4-4 Temperature acclimatization and oxygen packing for aquarium fish

MODULE V: COMMERCIAL PRODUCTION OF AQUARIUM FISH AND PLANTS

- 5-1 Commercial production units of ornamental fish- requirements and design
- 5-2 Commercial production of goldfish, live bearers, gouramies, barbs, angels and tetras
- 5-3 Mass production of aquarium plants
- 5-4 Retail marketing and export of ornamental fish

CLUSTER VIIIIB: ECONOMIC FISHERIES

VIIIIB-1- ORNAMENTAL FISHERY

THEORY MODEL PAPER

Time : 3 hrs

Max. Marks : 75

I. Answer any FIVE of the following :

5x5=25

Draw labelled diagrams wherever necessary

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II. Answer any FIVE of the following :

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Draw labelled diagrams wherever necessary

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Blue Print for the question paper

Short Answers from each section 1 each and 2 from module 2,3,4

Essay questions one each from each module with internal choice

CLUSTER VIII B: ECONOMIC FISHERIES
VIII B-1 ORNAMENTAL FISHERY

PRACTICALS:

1. Study of aerators – types and structures
2. Water circulation methods in aquarium and filtration
3. Collection and identification of aquarium plants
4. Identification of common marine aquarium fishes
5. Identification of common fresh water aquarium fishes
6. Breeding of egg layers
7. Breeding of live bearers
8. Evaluation of significance of aquaria for commercial and domestic use

PRESCRIBED BOOK(S):

1. Dick Mills 1998. Aquarium fishes, Dorling Kindersly Ltd, London
2. Van Ramshort JD 1978. The complete aquarium encyclopaedia, Elseveir

REFERENCES:

1. Jameson JD and Santhanan R 1996. Manual of ornamental fishes and farming technologies, Fisheries College and research institute, Tuticorn
2. Stephen Spotte 1993. Marine aquarium keeping. John wiley and sons, USA

CLUSTER VIII B: ECONOMIC FISHERIES
PAPER-VIII B-2 POST HARVEST TECHNOLOGY

MODULE I: INTRODUCTION

- 1-1 Harvest methods, Normal harvest and emergency harvest, handling, preservation for transport, sampling and harvesting of fin fishes and shellfishes, Standard procedures for stocking and harvesting.
- 1-2 Principles of preservation. Precautions in handling, landing center and processing plant.
- 1-3 Importance of hygiene and sanitation. Quality of water and ice in handling and processing.

MODULE II: PROCESSING AND STORAGE

- 2-1 Design and layout of preprocessing and processing centers.
- 2-2 Chilling and Freezing, Drying, Smoking, Canning and Freeze-Drying Principles and factors affecting drying.
- 2-3 Packing, Cold Storage. Changes during the cold storage. Packing requirements for frozen and cured products. Insulated and refrigerated vehicles.
- 2-4 Distribution of frozen products by cold chain.

MODULE III: FISHERY PRODUCTS

- 3-1 Different types of value added products from fish and shell fish
- 3-2 Fish mince and surimi
- 3-3 Coated fishery products-different types of batter and breading
- 3-4 Fishery by-products – fish meal, fish protein concentrate, shark fin rays, isinglass, fish liver oil, fish body oil, fish hydrolysates, chitin, chitosan, glucosamine hydrochloride, squalene, pearl essence, ambergris, fish silage, fish ensilage
- 3-5 Sea weed products – agar, alginic acid and carragenan

MODULE IV: TRANSPORTATION

- 4-1 Outlets for aquaculture products,
- 4-2 Transport of seed and brood stocks. Causes of mortality during transport, techniques of transport, open and closed systems, methods of transportation, use of anaesthetics.

MODULE V: QUALITY CONTROL & ASSURANCE

- 5-1 Chemical, physical and biological spoilage in fishery products
- 5-2 Waste management and sanitation in fish processing units
- 5-3 Basic concept of quality control, factors affecting quality parameters
- 5-4 Sea food quality and risk factors in sea food biotoxins
- 5-5 Introduction to IPQC, HACCP, GMP, and SSOP

CLUSTER VIII B: ECONOMIC FISHERIES
VIII B-2 POST HARVEST TECHNOLOGY

THEORY MODEL PAPER

Time : 3 hrs

Max. Marks : 75

I. Answer any FIVE of the following :

5x5=25

Draw labelled diagrams wherever necessary

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II. Answer any FIVE of the following :

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Draw labelled diagrams wherever necessary

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Short Answers from each section 1 each and 2 from module 2,3,4
Essay questions one each from each module with internal choice

CLUSTER VIII B: ECONOMIC FISHERIES
VIII B-2 POST HARVEST TECHNOLOGY

PRACTICALS:

1. Determination of moisture content in fish and fishery products
2. Chilling of fish using ice
3. Processing shrimp
4. Filleting of fish
5. Drying of fish
6. Preparation of boiled fish products
7. Preparation of shark fin rays, fish meal, chitin, and fish water
8. Fish pickling
9. Value added fishery products, fish curry, cutlets and fish fingers
10. Preparation of surimi
11. Estimation of lactic acid content in fermented fish products
12. Fabrication of solar tent drier

PRESCRIBED BOOK(S):

1. Govardhan TK, 1985. Fish processing technology. Oxford & IBH Publishing, New Delhi
2. Wheaton FW and Lawson TB 1985. Processing aquatic food products. Wiley inter-science publication, USA

REFERENCES:

1. Balachandran KK 2001. Post-harvest technology of fish and fish products. Daya publishing ouse, Delhi
2. Moorjani MN 1998. Fish processing in India, ICAR, New Delhi