

Govt. Degree College Baramulla, (Autonomous)

Semester 2nd

Course - Major/Minor

Subject: Industrial Fish and Fisheries

Title: Fish Behaviour

Code: IFF22M201

Credit: (4+2) Theory: 04; Practical: 02

Contact Hours: 64 (T) + 64 (L)

Part 1: Theory (4 Credits)

Course Objectives:

- *To introduce students to the basic concepts of different types of fish behaviour.*
- *To provide knowledge about growth pattern in fishes.*
- *To understand the basic concepts of reproduction among fishes.*

Learning outcomes:

On completion of the course, the student should be able to:

- *Understand the different patterns of fish behaviour.*
- *Understand the breeding behaviour of fishes.*

UNIT I: Social behaviour among fishes

(16 Contact hours)

- 1.1 Social behaviour – Aggregation, Shoaling and Schooling
- 1.2 Adaptation of Hill stream fishes
- 1.3. Adaptations of deep sea fishes
- 1.4 Fish Migration and its types
- 1.5 Patterns and diversity of parental care in fishes

Unit II: Feeding Behaviour in fishes

(16 Contact hours)

- 2.1 Natural food of fishes - Basic food, Occasional food, Incidental food, Emergency food
- 2.2 Fish food organisms (Artemia, Daphnia, Infusoria, Copepods)
- 2.3. Feeding habits of fishes - Plankton feeders, Herbivorous fishes, Carnivorous fishes, Omnivorous fishes, Monophagic fishes, Stenophagic fishes, Euryphagic fishes, Surface feeders, Column or mid feeders, Bottom feeders, Grazers or Browsers, Strainers, Parasites, Suckers
- 2.4 Gastroscopic index

Unit III: Breeding Behaviour

(16 Contact Hours)

- 3.1 Types of reproduction in fishes
 - 3.1.1 *Hermaphroditism*
 - 3.1.2 *Parthenogenesis*
 - 3.1.3 *Bisexuality (Oviparity, viviparity and Ovoviviparity)*

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3.2. Sexual dimorphism in fishes

3.3. Spawning habits of fishes. Factors effecting spawning

3.4. Fecundity and estimation of fecundity.

UNIT IV: Age and Growth of fishes

4.1. Growth of fish: Isometric and Allometric growth.

4.2. Methods of determining age and growth in fishes - Rearing of fish in a controlled environment, Tagging and recapture method, Length frequency distribution method, Counting of rings or annuli on hard parts

4.3. Length- Weight relationship

4.4. Gonadosomatic index

Books Recommended:

1. Ichthyology by Lagler
2. Fish and Fish biology by HR Singh and S S Khanna
3. Fishes – An introduction to Ichthyology by P.S. Moyle.
4. Fish and Fisheries by Panday and Shukla
5. Fish Biology and Ecology by Dr. Ravi Shankar Piska and Dr. S. Jithender Kumar Naik
6. The Biology of Fishes by Kyle H.
7. The life of fishes by Marshal. N.B.

Part 2: Laboratory Course (2 Credits)

Course Objectives:

- *To demonstrate the external morphology of migratory fish species*
- *To study the procedure of analysis of gut contents*
- *To study the methods of collection of fish food organisms*

Learning outcomes:

On completion of the course, the student should be able to:

- *Identify different fish species*
- *Analyse the gut contents*
- *Identify and classify fish food organisms*

1. Museum survey (Morphological study) of Migratory fishes
 - (a) Salmon
 - (b) Eel
 - (c) Hilsa

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2. Study of structural modifications of body parts according to feeding habits from charts/specimen
 - (a) Mouth
 - (b) Stomach
3. Collection of fish food organisms
4. Analysis of gut contents of fishes
5. Estimation of fecundity of fish
6. Determination of age of fish from hard parts

Books Recommended:

1. A practical manual of fish biology and ecology (fisheries) by Piska and Naik
2. Fish fauna of India and Adjacent countries by Raj Tilak, Fisheries Survey of India (FSI)
3. Fishes of India by Qureshi and Qureshi

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Semester 2nd

Course – Skill Enhancement Course

Subject: Industrial Fish and Fisheries

Title: COMMERCIAL FISH FARMING -II
CREDIT: (2+2) THEORY: 02; PRACTICAL: 02

Code: BFF22S202
CONTACT HOURS: 30 (T) + 30 (L)

Part 1: Theory (2 Credits)

Course Objectives:

- *To provide Basic knowledge about feeding and breeding of culturable fish species.*
- *To provide knowledge about formulation of fish feed and breeding of fish to produce quality seed.*

Learning outcomes:

This course will be helpful in generation of self-employment by rearing of fishes in backyard ponds on small as well as large scale. Also the stakeholders can prepare their own fish feed and can breed their stock to produce quality fish seed.

UNIT I: Fish Nutrition

(15 Contact hours)

- 1.1 Nutritional requirement of aquaculture species – Carps and Trouts
- 1.2 Live fish feed and its importance in aquaculture
- 1.3 Supplementary feeding and its importance in aquaculture
- 1.4 Different types of feed – Wet feed, Semi – moist feed and Dry feed.
- 1.5 Different types of manufactured feed - Extruded (floating or buoyant), Pressure-pelleted (sinking) feeds.
- 1.6 Formulation and Manufacture of fish feed
 - 1.6.1 Fish feed ingredients (Basal feed and protein supplement)
 - 1.6.2 Feed formula - Pearson square method
 - 1.6.3 Feed Processing – grinding, screening, mixing, steaming, palleting, drying and packaging
- 1.7 Feed additives: binders, pigments, growth promoters and feed stimulants.

Unit II: Fish Breeding

(15 Contact hours)

- 2.1 Breeding season of various cultivable species (carps and trouts)
- 2.2 Spawning and factors effecting spawning
- 2.3. Induced breeding
- 2.4 Simulated and Sympathetic breeding
- 2.5 Design and working of different types of hatcheries
 - 2.4.1 Hatching pits and Hatching Happa

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2.4.2 D-85

2.4.3 Circular Chinese Hatchery

2.4.4 Trout hatchery

2.5 Maintenance of brood stock

2.4 Transportation of Brood stock

Part 2: Laboratory Course (2 Credits)

1. Preparation of artificial feeds using locally available feed ingredients.).
2. Culture of live fish food (Infusoria, tubifex, earthworm).
3. Study of eggs of different species – common carp, trout.
4. Water quality management in aqua-hatcheries (Carp & trout).
5. Visit to Manasbal & Kokernag feed manufacturing units of J& K Govt.
6. Field visit to various fish farms and hatcheries to observe cultural and breeding practices

Books Recommended:

1. Lovell, R.T. 1998. Nutrition and feeding of fishes, Chapman & Hall, New York.
2. New, M.B. 1987. Feed and feeding of fish and shrimp. A manual on the preparation and preservation of compound feeds for shrimp and fish in aquaculture. F.A.O. Rome.
3. Sena S. De Silva, Trevor A. Anderson. 1995. Fish nutrition in aquaculture, Chapman & Hall Aquaculture Series, London.
4. Lakra, W.S. 2000. Fish Genetics and Biotechnology. CIFE. ICAR. Mumbai.
5. Purdom, Colise 1993. Genetics and Fish Breeding. Chapman and hall, London.

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COURSE – MULTIDISPLINARY COURSE

Subject: Industrial Fish and Fisheries

Title: APPLIED FISHERIES

CREDIT: 03

Code: BIF22M103

CONTACT HOURS: 48

Course Objectives:

- *To provide Basic knowledge about the basic and applied fisheries*
- *To provide knowledge about aquaculture, ornamental fisheries and fish products*

Learning outcomes:

This course will be helpful in generation of self-employment by encouraging entrepreneurship in fish farming, aquarium construction and management and diversification of fish products

Unit 1 - Fish Biology and Aquaculture

(15 Contact hours)

- 1.1 – General characters of fishes
- 1.2 – Nutritional value of fish
- 1.3 – Definition and scope of fisheries
- 1.4 - Definition and History of Aquaculture
- 1.5 - Prestocking management - Removal of weeds, removal of insects, liming
- 1.6 - Procurement and stocking of seed
- 1.7 - Post stocking management - Supplementary feeding, harvesting

Unit 2 – Ornamental Fisheries

(15 Contact hours)

- 2.1 – Aquarium and its types – All glass aquarium, Framed aquarium, Public aquarium
- 2.2 – Construction of Home aquarium
- 2.3 – Accessories used in aquarium – Aerator, Filter, Thermostat
- 2.4 – Setting of aquarium tank
- 2.5 – Common Aquarium fishes – Gold fish, Koi carp, Guppy, Sword tail, Gourami
- 2.6 – Maintenance of Aquarium – feeding, cleaning of aquarium tank and accessories

Unit 3 – Fish Products

(15 Contact hours)

- 3.1 – Preparation of fish products
 - 3.1.1 Fish cutlets,
 - 3.1.2 Fish balls,
 - 3.1.3 Fish wafers
 - 3.1.4 Fish fingers
 - 3.1.5 Fish wada
 - 3.1.6 Fish papad
 - 3.1.7 Fish pickle
- 3.2 – Extraction of fish oil
- 3.4 – Preparation and uses of fish meal

Books Recommended:

1. A Handbook Of Fish Biology & Indian Fisheries by R.K parihar
2. General and Applies Ichthyology by Gupta and Gupta
3. Fish and Fisheries by Panday and Shukla
4. A Manual of Fisheries Sciences by Tun tun Singh
5. Post-harvest Technology of Fish and Fish Products by Balachandran