ES 64 FISH PHYSIOLOGY AND BREEDING Cr. 3(2+1)

Course Objectives

The objectives of the course are:-

1. To provide sufficient knowledge about all physiological phenomena in fishes.
2. To provides practical information to obtain better growth by following physiological aspects during extensive or semi-intensive culture.
3. To emphasize thoroughly in breeding of most cultivable freshwater fishes by manipulating reproductive and endocrinological aspects during natural season as well as off seasons.

Learning Outcomes

Upon successful completion of the course, the student will be able to:

1. Relatethe keyconcepts of fish physiology and breeding techniques.
2. Describe the different systems and their coordination.
3. Assess problems associated with natural and artificial breeding.
4. Determine the fish production with relation to induced breeding.
5. Judge the fish behavior and migration patterns.
6. DEMONSTRATE the various organs by dissecting the fish and also collection of ill fishes for better understanding of various diseases.

Course Contents:

1. **Fish nutrition**
   - Digestive system;
   - Stomach less fishes;
   - Stomach fishes;
   - Digestion and absorption;
   - Food; Plant origin; Animal origin;
   - Feeding; Fresh food; Dry concentrates; Pelleted food.
2. **Transportation:**
   - Blood; Blood cells (Erythrocytes, leukocytes, Platelets and plasma);
   - Circulation; Arterial system; Venous system; Capillaries;
   - Transport of food material.
3. **Respiration:**
   - Gills;
   - Lungs;
   - Skin;
   - Swimbladder;
   - Homeostasis.
4. **Excretion:**
   - Kidneys;
   - Hypo-osmotic urine;
   - Hyper-osmotic urine;
   - Osmoregulation.
5. **Reproduction:**

- Gonads; Testes and ovaries;
- Maturation;
- Reproductive cells (egg and sperm);
- Artificial fertilization of sex cells.

6. **Breeding:**
   - Natural (seasonal); Artificial;
   - Hormonal induced breeding;
   - Temperature & photoperiod;
   - control induced breeding.
7. **Growth:**
   - Extensive culture (due to the consumption of natural food);
   - Semi-intensive culture (due to natural & artificial food);
   - Intensive culture (due to only dry concentrates).
8. **Fish health:**
   - Water quality;
   - Hygiene of fish culture facilities;
   - Hygiene of equipments used in fish culture.
9. **Diseases and their control:**
   - Viral;
   - Bacterial;
   - Fungal;
   - Parasitic;
   - Protozoan;
   - Helminths (trematodes, cestodes, nematodes, acanthocephalons); Crustaceans (cladocera);
   - Annelids (leeches); Arthropods (water ticks, water flea, water mites).
10. **Fish migration:**
    - To nursery ground;
    - To maturation grounds;
    - Freshwater to marine water;
    - Marine water to freshwater.
11. **Fish behaviour:**
    - Learning and memory;
    - Light response for maturation;
    - Courtship behaviour;
    - Aquarium fish behavior

Practicals:

1. Study of gut contents,
2. Study of feeding modification and adaptation in fish,
3. Study of respiratory adaptation in fish, Study of blood cells and their counts in normal and diseased fish,
4. Study of water quality parameters (DO, NH_3, hardness, alkalinity, turbidity, transparency, temperature, salinity),
5. Study of various forms of swimbladder as hydrostatic organ,
6. Study fecundity of various fish species,
7. Study the effects of reproductive hormone (GnRH) on fish maturation,
8. Diagnosis of bacterial infection in infected fish,
9. Study of fish parasites,
10. Visit to various fish seed hatcheries during breeding seasons

Books Recommended

1. Kestin, S. C. and Warris, P.D. (Editors). KESTIN FARMED FISH QUALITY, 2002, Blackwell Science, Oxford, UK.
2. Saksena, D.N. ICHTHYOLOGY: RECENT RESEARCH ADVANCES. 1999. Oscar

Publications. India.
3. Woo, P.T.K FISH DISEASES AND DISORDER. Vol 1. PROTOZOAN AND METAZOAN INFECTIONS. 1995. CABI Publisher.
4. Brenabe, G. AQUACULTURE, Vol. I. 1992. Blackwell Publishing, Oxford. UK.
5. Maseke C. FISH AQUACULTURE. 1987. Pergamon Press, Oxford. UK.
6. Huet M. TEXT BOOK OF FISH CULTURE: BREEDING AND CULTIVATION. 1973. Blackwell Publishing Company
7. Hoars, W.S. FISH PHYSIOLOGY. 1971. Academic Press. UK.
8. Hoars, W.S. FISH REPRODUCTION. 1969. Academic Press. UK.
9. Matty, A.J. FISH ENDOCRINOLOGY. 1985. Timber Press, UK.
10. Gorbman, A. COMPARATIVE ENDOCRINOLOGY. 1st Edition. 1983. John Wiley & Sons. UK

ES 65 FISHERIES MANAGEMENT Cr. 3(2+1)

Road to management, natural populations, protection against hazards, improvement of habitat, age and growth, managing natural populations, the significance of fishes in the life of mankind and biological basis of natural fishery.

Books Recommended

1. Templeton, R. G. 1995. Freshwater Fisheries Management (2nd Ed.) Fishing News Books, Blackwell Science, USA.
2. Jacques, A. 1999. Management of Freshwater Fisheries. Technique et Documentation, Lavoisier, Paris.
3. Rounsefell, G.A. and Everhart, W.H. 1963.Fishery Science its Methods and Application. John Wiley & Sons, Inc., New York.
4. Arrignon, J. 1999. Management of Freshwater Fisheries. Oxford & IBH Publishing Co. N. Delhi.