ZOOLOGY SYLLABUS FOR 2018-2019

SRI Y.N. COLLEGE (A) :: NARASAPUR
DEPARTMENT OF ZOOLOGY

Zoology Syllabus for I Semester

Zoology- Paper- I

ANIMAL DIVERSITY - NONCHORDATES

Hours:60 **Max. Marks:75**

Unit - I

1.1 **Brief history, Significance of Diversity of Non Chordates**

1.2 Protozoa

1.2.1 General characters

1.2.2 Classification of Protozoa up to classes with examples

1.2.3 *Elphidium* (type study)

1.3 Porifera

1.3.1 General characters

1.3.2 Classification of Porifera up to classes with examples

1.3.3 *Sycon* – External Characters, Types of cells,

1.3.4 Skelton in Sponges

1.3.5 Canal system in sponges

Unit - II

2.1 Coelenterates

2.1.1 General characters

2.1.2 Classification of Coelenterata up to classes with examples

2.1.3 *Obelia* - External Characters, Structure of Polyp and Medusa

2.1.4 Polymorphism in coelenterates

2.1.5 Corals and coral reef formation

2.2 Platyhelminthes

2.1.1 General characters

2.1.2 Classification of Platyhelminthes up to classes with examples

2.1.3 *Fasciola hepatica* - External Characters, Excretory system, Reproductive System, Life History and pathogenicity

Unit - III

3.1 Nemathelminths

3.1.1 General characters

3.1.2 Classification of Nemathelminths up to classes with examples

3.2 Annelida

3.2.1 General characters

3.2.2 Classification of Annelida up to classes with examples

3.2.3 *Hirudinaria granulosa* - External Characters, Digestive System, Excretory System and Reproductive System

3.2.4 Coelom ducts

3.2.5 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

Unit - IV

4.1 Arthropoda

4.1.1 General characters

4.1.2 Classification of Arthropoda up to classes with examples

4.1.3 Prawn - External Characters, Appendages, Respiratory system and Circulatory System

4.1.4 *Peripatus* - Structure and affinities

4.2 Mollusca

4.2.1 General characters

4.2.2 Classification of Mollusca up to classes with examples

4.2.3 Pearl formation in Pelecypoda

4.2.4 Torsion in gastropods

Unit - V

5.1 Echinodermata

5.1.1 General characters

5.1.2 Classification of Echinodermata up to classes with examples

5.1.3 Water vascular system in star fish

5.2 Hemichordata

5.2.1 General characters

5.2.2 Classification of Hemichordata up to classes with examples

5.2.3 *Balanoglossus* - Structure and affinities

5.3 Non-Chordata larval forms

5.3.1 Amphiblastula

5.3.2 Ephyra

5.3.3 Trochophore

5.3.4 Nauplius

5.3.5 Glochidium

5.3.6 Bipinnaria

5.3.7 Tornaria

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ANIMAL DIVERSITY - CHORDATES

Hours- 60 **Max. Marks: 75**

Unit - I

1.1 General characters of Chordata

1.2 Prochordata

1.2.1 Salient features of Cephalochordata

1.2.2 Structure of *Branchiostoma*

1.2.3 Affinities of Cephalochordata

1.2.4 Salient features of Urochordata

1.2.5 Structure and life history of *Herdmania*

1.2.6 Significance of Retrogressive metamorphosis

Unit - II

2.1 Cyclostomata

2.1.1 General characters of Cyclostomata

2.1.2 Comparision of the *Petromyzon* and *Myxine*

2.2 Pisces

2.2.1 General characters of Fishes

2.2.2 Classification of fishes up to sub - class level with examples

2.2.3 *Scoliodon* - External features, Digestive system, Respiratory system, Heart, Brain

2.2.4 Migration in Fishes

2.2.5 Types of Scales

2.2.6 Dipnoi

Unit - III

3.1 Amphibia

3.1.1 General characters of Amphibian

3.1.2 Classification of Amphibia upto orders with examples.

3.1.3 *Rana hexadactyla* - External features, Digestive system, Respiratory system, Heart, Brain

3.2 Reptilia

3.2.1 General characters of Reptilia

3.2.2 Classification of Reptilia upto orders with examples

3.2.3 Calotes - External features, Digestive system, Respiratory system, Heart, Brain

3.2.4 Identification of Poisonous snakes and Skull in reptiles

Unit - IV

4.1 Aves

4.1.1 General characters of Aves

4.1.2 Classification of Aves upto subclasses with examples.

4.1.3 *Columba livia* - External features, Digestive system, Respiratory system, Heart, Brain

4.1.4 Migration in Birds

4.1.5 Flight adaptation in birds

Unit - V

5.1 Mammalia

5.1.1 General characters of Mammalia

5.1.2 Classification of Mammalia upto sub - classes with examples

5.2 Comparision of Prototherians, Metatherians and Eutherians

5.3 Dentition in mammals

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III Semester Syllabus

ZOOLOGY

CYTOLOGY, GENETICS AND EVOLUTION

Periods:60 **Max. Marks:100**

Unit - I

1. Cytology - I

1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma

1.2 Electron microscopic structure of eukaryotic cell.

1.3 Plasma membrane –Different models of plasma membrane.

Unit – II

2. Cell organelles

2.1 Structure and functions of Endoplasmic Reticulum

2.2 Structure and functions of Golgi apparatus

2.3 Structure and functions of Lysosomes

2.4 Structure and functions of Ribosomes

2.5 Structure and functions of Mitochondria

2.6 Nucleus

2.7. Chromatin - Structure and significance, Chromosomes - Structure, types, functions

Unit - III

3.1 Genetics - I

3.1.1 Mendel's work on transmission on traits

3.1.2 Principles of inheritance

3.1.3 Incomplete dominance and codominance

3.1.4 Lethal alleles, Epistasis, Pleiotropy

Unit - IV

4.1 Genetics - II

4.1.1 Sex determination

4.1.2 Sex linked inheritance

4.1.3 Linkage and crossing over

4.1.4 Extra chromosomal inheritance

4.1.5 Human karyotyping

Unit - V

5.1 Evolution

5.1.1 Origin of life

5.1.2 Lamarckism, Darwinism, Neo – Darwinism, Hardy-Weinberg Equilibrium.

5.1.3 Variations, isolating mechanisms, natural selection

5.1.4 Types of natural selection (directional, stabilizing, disruptive)

5.1.5 Artificial selection and forces of evolution

5.1.6 Speciation (Allopatric and Sympatric)

5.1.7 Macro evolutionary principles (Example: Darwin's finches)

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IV SEMESTER : B.SC ZOOLOGY

W.E.F. 2015-16 ADMITTED BATCH

ZOOLOGY - PAPER - IV

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Periods:60 **Max. Marks: 100**

Unit - I

1.1 Developmental Biology and Embryology

1.1.1 Gametogenesis

1.1.2 Fertilization

1.1.3 Types of eggs

1.1.4 Types of cleavages

1.2 Development of Frog upto formation of primary germ layers

1.3 Formation and functions of Foetal membrane in chick embryo

1.4 Development, types and functions of Placenta in mammals

Unit - II

2.1 Physiology - I

2.1.1 Elementary study of process of digestion

2.1.2 Absorption of digested food

2.1.3 Respiration - Pulmonary ventilation, transport of oxygen and carbon dioxide

2.1.4 Circulation - Structure and functioning of heart, Cardiac cycle

2.1.5 Excretion - Structure of nephron, urine formation, counter current mechanism

Unit - III

3.1 Physiology - II

3.1.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers

3.1.2 Muscle contraction - Ultra structure of muscle fibre, molecular and chemical basis of muscle contraction

3.1.3 Endocrine glands - Structure, secretions and the functions (of hormones) of pituitary, thyroid, parathyroid, adrenal glands and pancreas

3.1.4 Hormonal control of reproduction in a mammal

Unit - IV

4.1 Ecology - I

4.1.1 Meaning and scope of Ecology

4.1.2 Important abiotic factors of Ecosystem - Temperature, light, water, oxygen and CO_2

4.1.3 Nutrient cycles - Nitrogen, carbon and phosphorus

4.1.4 Components of Ecosystem (Example:lake), food chains and food web, energy flow in ecosystem

Unit - V

5.1 Ecology - II

5.1.1 Habitat and ecological niche

5.1.2 Community interactions - Mutualism, commensalism, parasitism, competition, predation

5.1.3 Ecological succession

5.1.4 Population studies

5.2 Zoogeography

5.2.1 Zoogeographical regions

5.2.2 Study of physical and faunal peculiarities of Oriental, Australian and Ethiopian regions

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ZOOLOGY SYLLABUS FOR V SEMESTER
ZOOLOGY - PAPER - V
ANIMAL BIOTECHNOLOGY

Periods:60 **Max. Marks:100**

Unit 1: Tools of Recombinant DNA technology - Enzymes and Vectors
Restriction modification systems: Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering
DNA modifying enzymes and their applications: DNA polymerases. Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases
Cloning Vectors: Plasmid vectors' and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs,

Unit 2 Techniques of Recombinant DNA technology
Cloning: Use of linkers and adaptors
Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated delivery
PCR: Basics of PCR.
DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing
Hybridization techniques: Southern, Northern and Western blotting,
Genomic and cDNA libraries: Preparation and uses

UNIT 3 Animal Cell Technology
Cell culture media: Natural and Synthetic
Cell cultures: primary culture, secondary culture, continuous cell lines; Protocols for Primary Cell Culture; Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures.
Hybridoma Technology: Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb
Stem cells: Types of stem cells, applications

Unit 4 Reproductive Technologies & Transgenic Animals
Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization , super ovulation, Embryo transfer, Embryo cloning
Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications

Unit 5 Applied Biotechnology
Industry: Fermentation: Different types of Fermentation: Short notes on - Submerged & Solid state; batch, Fed batch & Continuous; Stirred tank, Air Lift, Fixed Bed and Fluidized; Downstream processing - Filtration, centrifugation, extraction, chromatography, spray drying and lyophilization
Agriculture: fisheries – monoculture in fishes, polyploidy in fishes; DNA fingerprinting

ZOOLOGY SYLLABUS FOR V SEMESTER

ZOOLOGY - PAPER - VI

ANIMAL HUSBANDRY

Periods:60 **Max. Marks: 100**

UNIT – I :

General introduction to poultry farming. Principles of poultry housing. Poultry houses. Systems of poultry farming. Management of chicks, growers and layers. Management of Broilers.

UNIT – II:

Poultry feed management – Principles of feeding. Nutrient requirements for different stages of layers and broilers. Methods of feeding. Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms, control and management.

UNIT – III:

Selection, care and handling of hatching eggs. Egg testing. Methods of hatching. Brooding and rearing. Sexing of chicks.

UNIT- IV:

Breeds of Dairy Cattle and Buffaloes – Definition of breed; Classification of Indian Cattle breeds, exotic breeds and Indian buffalo breeds. Systems of inbreeding and crossbreeding. Housing of dairy animals – Selection of site for dairy farm; systems of housing – loose, housing system. Conventional dairy barn. Cleaning and sanitation of dairy farm. Weaning of calf. Castration and dehorning. Deworming and Vaccination programme. Records to be maintained in a dairy farm.

UNIT - V:

Care and management of dairy animals - Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks.

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ZOOLOGY –ELECTIVE PAPER:VII-(A)

IMMUNOLOGY

Periods:60 **Max. Marks:100**

Unit - I

1.1 Overview of Immune system

1.1.1 Introduction to basic concepts in Immunology

1.1.2 Innate and adaptive immunity

1.2 Cells and organs of Immune system

1.2.1 Cells of immune system

1.2.2 Organs of immune system

Unit - II

2.1 Antigens

2.1.1 Basic properties of antigens

2.1.2 B and T cell epitopes, haptens and adjuvants

2.1.3 Factors influencing immunogenicity

Unit - III

3.1 Antibodies

3.1.1 Structure of antibody

3.1.2 Classes and functions of antibodies

3.1.3Monoclonal antibodies

Unit - IV

4.1 Working of Immune system

4.1.1 Structure and functions of major histocompatibility complexes

4.1.2 Exogenes and Endogenes pathways of antigen presentation and processing

4.1.3 Basic properties and functions of cytokines

Unit - V

5.1 Immune system in health and disease

5.1.1 Classification and brief description of various types of hyper sensitivities

5.1.2 Introduction to concepts of autoimmunity and immunodeficiency

5.2 Vaccines

5.2.1 General introduction to vaccines

5.2.2 Types of vaccines

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ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE –VIII-B:
VI SEMESTER

AQUACULTURE

Cluster Elective Paper: VIII-B-1

PRINCIPLES OF AQUACULTURE

Periods:60 **Max.Marks:75**

Unit – I

1.1 Introduction / Basics of Aquaculture

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

Unit – II

2.1 Types of Aquaculture

2.1.1 Freshwater, Brackish water and Marine
2.1.2 Concept of Monoculture, Polyculture, Composite culture, Monosex culture and Integrated fish farming

2.2Culture systems

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

2.3Culture practices

2.3.1Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

Unit – III

3.1 Design and construction of aquafarms

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

3.2 Seed resources

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

3.3 Nutrition and feeds

3.3.1 Nutritional requirements of a cultivable fish and shellfish
3.3.2 Natural food and Artificial feeds and their importance in fish and shrimp culture

Unit – IV

4.1Management of carp culture ponds

4.1.1 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

4.2 Culture of giant freshwater prawn, *Macro brachium rosenbergii*

Unit – V

5.1 Culture of shrimp (*Penaeus monodon* or *Litopenaeus vannamei*)
5.2 Culture of pearl oysters
5.3 Culture of seaweeds-species cultured, culture techniques, important by-products, prospects
5.4 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*.
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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.

Cluster Elective Paper: VIII-B-2

AQUACULTURE MANAGEMENT

Hours : 60 **Max. Marks : 75**

Unit – I

1.1 Breeding and Hatchery Management

1.1.1 Bundh Breeding and Induced breeding of carp by Hypophysation; and use of synthetic hormones

1.1.2 Types of fish hatcheries; Hatchery management of Indian major carps

1.1.3 Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*

1.1.4 Breeding and Hatchery management of giant freshwater prawn.

Unit – II

2.1 Water quality Management

2.1.1 Water quality and soil characteristics suitable for fish and shrimp culture

2.1.2 Identification of oxygen depletion problems and control mechanisms in culture ponds

2.1.3 Aeration: Principles of aeration and Emergency aeration

2.1.4 Liming materials, Organic manures and Inorganic fertilizers commonly used and their implications in fish ponds

Unit – III

3.1 Feed Management

3.1.1 Live Foods and their role in shrimp larval nutrition.

3.1.2 Supplementary feeds: Principal foods in artificial diets; Types of feeds; Feed additives and Preservatives; role of probiotics.

3.1.3 Feed formulation and manufacturing; Feed storage

3.1.4 Feeding strategies: Feeding devices, feeding schedules and ration size; Feed evaluation- feed conversion efficiencies and ratios

Unit – IV

4.1 Disease Management

4.1.1 Principles of disease diagnosis and health management;

4.1.2 Prophylaxis, Hygiene and Therapy of fish diseases

4.1.3 Specific and non-specific defense systems in fish; Fish immunization and vaccination

4.1.4 Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds

4.1.5 Etiology, Symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds

Unit – V

5.1 Economics and Marketing

5.1.1 Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis

5.1.2Fish marketing methods in India; Basic concepts in demand and price analysis

5.2 Fisheries Extension

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

5.3 Fish Genetics

5.1.4 Genetic improvement of fish stocks – Hybridization of fish.

5.1.5 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
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5Halver J & Hardy RW. 2002. *Fish Nutrition.* Academic Press.

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8. Jhingran VG. 2007. *Fish and Fisheries of India.* Hindustan Publishing Corporation, India.
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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
14. Pandian TJ, Strüssmann CA & Marian MP. 2005. *Fish Genetics and Aquaculture Biotechnology*. Science Publ.

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17. Ray GL. 2006. *Extension, Communication and Management*. 6th Ed. Kalyani Publ. Delhi.

18. ReddyPVGK, AyyappanS, ThampyDM & Gopalakrishna 2005.*Text Book of Fish Genetics and Biotechnol.* ICAR

19. Reichenbach KH. 1965. *Fish Pathology*. TFH (Gt. Britain) Ltd, England.

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21. Singh B. 2006. *Marine Biotechnology and Aquculture* Development. Daya Publ. House

22.Stickney RR. 1979. *Principles of Warm waterAquaculture*. John-Willey & sons Inc.

23. Swain P, Sahoo PK & Ayyappan S. 2005. *Fish and Shellfish Immunology: An Introduction*. Narendra Publ.

24. Thomas PC, Rath SC & Mohapatra KD.2003.Breeding and Seed Production of Finfish and Shellfish. Daya Publ.

Cluster Elective Paper: VIII-B-3

POSTHARVEST TECHNOLOGY

Hours : 60 **Max. Marks : 100**

Unit – I

1.1 Handling and Principles of fish Preservation

1.1.1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.

1.1.2 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

2.1 Methods of fish Preservation

2.1.1 Traditional methods - sun drying, salt curing, pickling and smoking.

2.1.2 Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

Unit – III

3.1 Processing and preservation of fish and fish by-products

3.1.1 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.

3.1.2 Fish by-products – fish glue, icing glass, chitosan, pearl essence, shark fins, fishleather and fish maws.

3.2Seaweed Products

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

Unit – IV

4.1Sanitation and Quality control

4.2.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.

4.2.2 Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

4.2 General Regulatory affairs in industries

Unit – V

5.1 Quality Assurance, Management and Certification

5.1.1 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*.

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1. Balachandran KK. 2001. *Post-harvest Technology of Fish and Fish Products*. Daya Publ.
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14. Sen DP. 2005. *Advances in Fish Processing Technology*. Allied Publ.