

NATIONAL UNIVERSITY



Syllabus Department of Zoology

One Year Master's Course
Effective from the Session: 2013-2014

National University

Subject: Zoology

Syllabus for One-Year Master's Course

Effective from the Session: 2013-2014

Wildlife Biology Branch

Paper Code	Paper Title	Credits
313101	Advance Biology	4
313103	Wildlife Ecology	4
313105	Herpetology (Amphibia and Reptile)	4
313107	Ornithology	4
313109	Mammalogy	4
313111	Wildlife Management	4
313113	Wildlife Economy and Conservation Biology	4
313114 }	Thesis/Theory	6
313116 }	Viva-Voce	2
Or		
313118 }	Practical	6
313120 }	Viva-Voce (Field record and practical Note Book) Practical Group = A, Thesis Group = B	2
	Total =	36

Detailed Syllabus

Paper Code	313101	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Advanced Biology			

[Common compulsory paper for Wildlife Biology, Fisheries & Entomology group]

A. Biodiversity and Resource Conservation:

Concepts of Biodiversity
Concept and classification of resources
Renewable and non-renewable resources and their management
Consequences of the loss of Natural Resources
Protection of Local, National and Global Environment
Conservation of Ecosystems
Conservation and Management Strategies including ex situ and in situ
Legislation: National & International Convention Case study of
Biodiversity and Resource Management, Coral Reefs, Tropical Rain
Forest, Mangrove Forest.

B. Human Ecology, Population Ecology & Genetic Ecology

Human Ecology:

History of Human race and its distribution
Human types and their physical features, distribution and mode of living in relation to
social, cultural, religious and other activities Ecological impacts on Man's physical
features, social and cultural life. Impacts of Human population on environment
Development activities and their impacts on environment.
History of Agriculture revolution, industrial revolution and green revolution.
Impacts of scientific and technological development on Human ethics.

Population Ecology:

Definition
Population and population Change
Group properties of population: Density, natality, mortality, biotic potential, age
distribution, dispersion.
Concept of Carrying Capacity
Population Growth Forms: J and S-shaped growth forms
Population Interactions: Coexistence, competition, Predation and plant-herbivore
interaction.
Life Table: Definition, types, construction and analysis.

Genetic Ecology:

Importance of Genetic Ecology
Patterns of Genetic Variation
-External Influence
-Isolation of populations
-Ecotype and Clines.

Books Recommended:

1. E. J. Milner – Gulland and R. Mace. 1998. The Conservation and Use of Biological Resources. Blackwell Science.
2. A Dobson. 1996. Conservation and Biodiversity. Scientific American.
3. J. Turk, J. Witters, R. Witters and Turk. Ecosystems, Energy. Population. W.B. Saunders Company. Philadelphia, London.
4. B. Groombridge and M. D. Jenkins. 1996. Assessing Biodiversity Status and Sustainability. WCWC.
5. K. J. Gaston and J. I. Spicer. 1998. Biodiversity: An Introduction Blackwell Science.
6. M. Jeffries. 1997. Biodiversity and Conservation. Routledge
7. J. Treweek. 1999. Ecological Impact Assessment. Blackwell Science
8. M. Liddle. 1997. Recreation Ecology: The Ecological Impact of Outdoor Recreation and ecotourism. Chapman & Hall.
9. G.W. Suter. 1993. Ecological Risk Assessment Lewis, USA
10. Instant Basics, Dr. M.A. Basher, 2004, Positron publication, Bangla Bazar, Dhaka.
১১. ইকোলজি ও পরিবেশ, দূষণ, শাহআলমনবী এবং এ. কে. এম. ফজলুলকরিম চৌধুরী ২০০৩, তাজলাইব্রেরী, চট্টগ্রাম।

Paper Code	313103	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Wildlife Ecology			

Ecology:

Ecosystem – Ecological Networks, Energy flow through the ecological system, Ecological succession and Ecotone.
Population ecology and management, population estimation, Community Ecology, Estuarine: Habitat type (Aquatic, Terrestrial, Arboreal, Aerial etc.
Habitat defragmentation: causes and Effects.
Degradation of Biodiversity (Biodiversity Act 2013- Basic knowledge of offences, trial and penalties)
Predator prey interactions.
Biogeochemical cycles, Limiting factors.

Environmental Issues:

Environmental Safeguards policies and Regulations.
Environmental policy (1992) and Environmental Action plan (1992)
National Environmental Management plan (1995)
Environmental Acts and their applications, Bangladesh Environmental Conservation Act (1995) and Rules (1197)
Environmental Codes and Best Management practices
Impacts of Local and Regional economic activities on wildlife environment.
Global Environmental Issues: Global warming Climate change, Green House Effects, Acid Rain, Ozone layer depletion, CFC, etc.
Local Issues: Natural calamities, Embankments, Hydroelectric projects, Flood control (FAP) and their impacts on wildlife and their environment.
Environmental Screening: Initial Environmental Examination (IEE), Environmental Impact Assessment (EIA), Environmental Management plan (EMP)

Paper Code	313105	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Herpetology (Amphibia and Reptile)			

Amphibia and Reptilia

Classification of Amphibians and Reptiles of Bangladesh.

Faunal diversity and Taxonomic issues at generic and species level of Amphibian and Reptilian species of Bangladesh.

Status and Distributions of the Amphibians and Reptilians of the Oriental Region with special reference to Bangladesh.

Adaption in reference to morphological and physiological features: Adaptive radiation of Amphibians and Reptiles in aquatic, terrestrial, arboreal and aerial habitats.

Ecology, Habitat use Hibernation and Aestivation, adaptive radiation.

Food and Feeding Habits, territoriality, flights, dispersion and orientation of amphibians and reptiles.

Poisonous and Non – poisonous snakes , Epidemiology of snake bite, Fangs and snake bite signs symptoms and treatment , biting mechanism , snake venom , snake charmers and superstitions and physio-chemical properties of snake venom.

Economic important of amphibians and reptiles in relation to agriculture, forestry and fisheries.

Pest control, aesthetic, education and economic values.

Role of amphibians Calls, courtship behaviour, nesting egg laying, and parental care of Amphibians and Reptiles.

Intra species and Inter–species interaction.

Extinct, Endangered and Threatened Amphibians and Reptiles in Bangladesh and their causes of Decline (Red Data Book, CITES schedules, etc.).

Techniques Amphibians and Reptiles study and data analysis.

Intra and Inter- species interaction.

Social behaviour: Environmental influences upon behaviour.

Competition for resources and Communications.

Paper Code	313107	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Ornithology			

Classification, Faunal diversity and Taxonomic issues at generic and species, sub species level of the Birds.

Past and reference status and distributions of Birds species of the Oriental Region with special reference to Bangladesh.

(a) Avian adaptation to habitat diversity at micro and macro habitat levels.

Macro- habitat (Biome)

(b) Micro – habitat of water fowls, wader / shore birds, other wetlands birds, forest birds of prey, game birds and cultivated land birds.

Adaption in relation to morphological and physiological features: Adaptation of birds in relation to mode of life, Flying and flying capacity.

Food and Feeding habits of beneficial and harmful birds: Insectivores, grainivores, frugivores, piscivores, nectar feeders and omnivorous birds.

Structural modification in relation to the food and feeding behaviour.

Habitats types, predation, feathers and flight, adaptations, flightless birds.

Breeding: Breeding seasons, courtship behaviour, nesting, egg laying, incubation hatching etc.

Intra and Inter-species interaction.

Social behaviour: Environmental influences upon behaviour.

Competition for resources and Communications.

Paper Code	313109	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Mammalology			

Classification and Faunal diversity and Taxonomic issues at generic and species level of the mammals.

Status and Distribution of Mammals of Bangladesh up to species level.

Adaption on relation to morphological and physiological features, Adaptive modification (Aquatic, terrestrial, arboreal and aerial habitats).

Food and Feeding Habits of mammals: Herbivores, carnivores, omnivores, predator and prey relationship.

Breeding behaviour and Biology: Breeding season's territory and home range, mating and gestation period and litter, lactation and parental care of major Taxonomic group of mammals.

Egg laying mammals and marsupial, arboreal and aquatic mammals.

Extinct, Endangered and Threatened mammals of Bangladesh and their cause of Decline.

Territoriality, flights, migration, dispersion and behaviour.

Habitat analysis and habitat restoration.

Intra and Inter- species interaction.

Social behaviour: Environmental influences upon behaviour.

Competition for resources and Communications.

Paper Code	313111	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Wildlife Management			

Management- principles and practices.

Planning and Monitoring process of wildlife management.

Salient features of wildlife preservation order, 1973, wildlife Management Laws and practices in Bangladesh.

Laws and conventions related to wildlife. Bangladesh wildlife Act, Forest Act 1927,

Convention on Biological diversity (1992) Ramsar convention (1971).

Wildlife Trade: Convention on international Trade in Endangered Species of wild Fauna and Flora (CITES) (Traded animals, parts, products and derivatives), World trade market and CITES schedules.

Protected Areas of Bangladesh: History, Status, categories and Management, Co-management of protected areas IUCN threatened Categories, National Parks, Sanctuaries, Game reserves, Recreational parks, Wetlands, Forest.

Protected areas of Bangladesh, India and Pakistan.

Economic aspects of Wildlife Management: Tourism, Zoos and Safari parks, Museum, animal Farming and Captive Breeding, re-introduction of wildlife, wildlife, Cage/ Fencing, habitat, preparation and maintenance of wildlife for captive breeding.

Wildlife farming: Prospect and scope of wildlife farming in Bangladesh, general outline of wildlife farming, economic importance of wildlife farming, Frog farming, Turtle farming, crocodile farming in Bangladesh.

Human- Wildlife Conflict in Bangladesh and its mitigation: Cause, Impacts and potential solutions to human wildlife conflict (snake bite, crop damage by elephants and macaques, poultry damage by wild cats and jackals, human and cattle deaths by tiger etc.)

Role of wildlife in maintaining ecological balance.

Vertebrate pests and their management strategies.

Development activities and its impacts on Wildlife.

Introduction of exotic species and Impacts on indigenous species.

Deforestation monoculture forest and plantation and Animal Association.

Management of wildness areas Management of World Heritage Sites, Ramsar sites,

UNESCO Biosphere Reserves, Trans-boundary Arrangements.

Introduction of field equipment for wildlife study (Map, Compass, Binoculars, Rangefinder, Refractometer, Camera, GPS, Soil pH meter etc.).

Wildlife survey (planning, Sampling, direct and indirect methods).

Paper Code	313113	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Wildlife Economy and Conservation Biology			

Preliminary knowledge about wildlife of Bangladesh.

Scopes of conservation biology, valuing the wildlife biodiversity, threats to wildlife.

Conservation priorities, conservation strategies, establishing, designing and managing protected areas.

Ethics of conservation, priorities in conservation effort, conservation and rural development, role of culture and religion in conservation, National Conservation Strategy plan of Bangladesh.

Culture aspects of conservation, conservation of forest, wetlands and insular ecosystems.

Wildlife conservation and sustainable development, social forestry, fragmentation of population, plantation of indigenous species.

Invasive alien and exotic species.

Participatory approaches to wildlife conservation and conservation education.

Wildlife capture, transportation, care, wildlife handling.

Conservation of the threatened animals in –situ and Ex-situ conservation.

Epidemiology and Wildlife Zoonotic diseases in Bangladesh, parasites (Ecto and Endo), handling/ controlling and medication for wild animals.

Epidemiology of following Zoonotic diseases: Anthrax, Rabies, Nipah, Avian Influenza (H5N1, H7N9), parasitic infestation, Effects of overuse of antibiotics.

Integrated conservation and development approaches and techniques (Co-management counsel formation).

Wildlife education and awareness building strategies (Eco-tourism, Management of Zoo and Museum).

National and international organizations involved in wildlife conservation: WWF, IUCN, CITES, IPPL, SSC, CNPPA, WSB, etc.

Paper Code	313114	-----	Credits: 6	
Paper Title:	Thesis/Theory			

Paper Code	313116	-----	Credits: 2	
Paper Title:	Viva-Voce			

Paper Code	313118	-----	Credits: 6	
Paper Title:	Practical			

Taxonomy: Classification and identification of Amphibia to Mammalia up to species level in museum and in the field.

Museum study: Morphological structures like toes, claws, webs, scales, fangs, feathers, scores counting, measurements, key characters etc.

Taxonomy of Museum Specimens: Amphibia, Reptiles, Birds and Mammals.

Food analysis of toads and frogs and available wild animals.

* Qualitative

* Quantitative and

* Volumetric.

Wildlife study techniques: Population census, transects and plot counting, age determination , collection, netting and trapping , killing , preservation and identification , tagging, marking, ringing, radio telemetry, time laps camera, hiding observatory.

Population study techniques:

a. Trapping and Marking of captured animals.

b. Census:

(i) Transect lines (ii) Plot counting or sampling (iii) Dropping

(iv) Pug marks (v) capture and Recapture (vi) Direct observation.

1. Collections, Killing and preservation.

2. Application of biostatistician methods i.e. Standards.

Morphological Study: Dissection and incubation period, stages of embryological development, hatching and rearing.

Bio-statistical study: Date collection and recording Standard Deviation, Mean, Average, carrying capacity.

Viva voce including all class records.

Book review, Library survey of Dhaka city, Newspaper cutting.

Preparation of reports.

M. Sc. Final Practical Examination, 2014 (Group –A)
Wildlife Biology Branch

Day	Question no.	Experiments and reports	Marks
1 st	01	Identify the Specimens : (a-j)	10×3=30
	02	Comments on the Specimens : (a-e)	5×3=10
	03	Find out the percentage of the specimens supplied	10
	04	Write a report on the systematic of the specimens supplied (Books will be supplied)	10
2 nd	05	Identify the hair supplied.	10
	06	Study the specimens supplied and point out their taxonomic characters at the generic and species level.	20
	07	Field study. Visit the area specified and a report on the birds/ other wildlife giving – (a) Date (b) Weather (c) Topography (d) Ecological Conditions (e) Identifications Spp. And (f) Population status.	15
3 rd	08	Write an ecological account of the area specified	15
	09	Analysis the stomach / pallet contents supplied and prepare a report.	15
	10	Dissect and display the alimentary canal/ Reproductive system of the specimen supplied.	10+5=15
4 th	Viva voce	Class records (Collection), Practical Note Book	10
		Special Report (to be submitted as directed)	10
		Viva voce	30

Books Recommended

- G. Cubitt and G. Mountfort, 1985. Wildlife – The Wildlife and Sanctuary of India and Nepal. William Collins Sons. Co. Ltd London.
- S.H. prater. 1971. The Book of India animals (2) BNHS Oxford Univ. Chicago press.
- J. C. Daniel. 1983. The Book of Indian Reptiles, Bombay Nat.Hist. Soc. Bombay
- R. Whitaker. 1978. Common Snakes of India , Macmillan Co. India
- R.H. Giles 1971. Wildlife management Techniques. The Wildlife Society, Washington, D.C.
- M.A.R. khan 2010. Wildlife of Bangladesh – A Checklist. Sahitya Prakash, Dhaka
- M.M.H. Khan 2008, protected Areas of Bangladesh – A guide to wildlife. Bangladesh Forest Dept. Dhaka
- M. Bolton (Editor), 1997. Conservation and the Use of Wildlife Resources. Chapman & Hall.
- R.M. DeGraff and R.I. Miller (Editors). 1996. Conservation of Faunal Diversity in Forested Landscapes. Chapman 7 Hall.

Paper Code	313120	-----	Credits: 2	
Paper Title:	Viva-Voce			

Fisheries Branch

Paper Code	Paper Title	Credits
313101	Advance Biology	4
313115	Fish Taxonomy, Fish Physiology and Ichthyology	4
313117	Fish Biology, Aquaculture nutrition and Population dynamics	4
313119	Fish Ecology, Fish limnology and Oceanography	4
313121	Aquaculture and Fisheries Technology & Harvesting	4
313123	Fish Processing & Handling, Fisheries resources & Management and Extension, Economics, Rural sociology, Marketing & Cooperation	4
313125	Fish Genetics and Fish Pathology & Parasitology	4
313122	Thesis/Theory	6
313124	Viva-Voce	2
Or		
313126	Practical	6
313128	Viva-Voce (Field record and practical Note Book) Practical Group = A, Thesis Group = B	2
	Total =	36

Detailed Syllabus

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[Common compulsory paper for Wildlife Biology, Fisheries & Entomology group]

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Development activities and their impacts on environment.

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Definition

Population and population Change

Group properties of population: Density, natality, mortality, biotic potential, age distribution, dispersion.

Concept of Carrying Capacity

Population Growth Forms: J and S-shaped growth forms

Population Interactions: Coexistence, competition, Predation and plant- herbivore interaction.

Life Table: Definition, types, construction and analysis.

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Importance of Genetic Ecology

Patterns of Genetic Variation

-External Influence

-Isolation of populations

-Ecotype and Clines.

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4. B. Groombridge and M. D. Jenkins. 1996. Assessing Biodiversity Status and Sustainability. WCWC.
5. K. J. Gaston and J. I. Spicer. 1998. Biodiversity: An Introduction Blackwell Science.
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9. G.W. Suter. 1993. Ecological Risk Assessment Lewis, USA
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Paper Code	313115	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Fish Taxonomy, Fish Physiology and Ichthyology			

Fish Taxonomy:

Principles & techniques of systematic study.

Collection, preservation, taxonomic procedures, **meristic of now meristic studies.**

Classification of Crustaceans & mollusks up to order

Classification of fishes upto family.

Fish Physiology:

Osmoregulation

Reproduction

Endocrine organs, their secretions & functions

Physiology of digestion, circulations & respiration (including accessory respiration)

Sensory organs.

Ichthyology:

Structural modification of fish for aquatic adaptation

Migration of fishes including shoal & school)

Seasonal Changes in fishes

Developmental adaptations, physiological & energetic adaptations.

Paper Code	313117	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Fish Biology, Aquaculture nutrition and Population dynamics			

Fish Biology:

Principles & techniques in biological studies of fish.

Biological study of food & feeding habit

Growth condition, factors & meristic relationship

Maturation & spawning habit

Fecundity

Life of *Labeo rohita*, *tenuilosa ilisha*, *Clarias batrachus*

Anabastestudineus & *Macrobrachium rosenbergii*

Aquaculture nutrition:

Qualitative & quantitative requirements of proteins, fat & energy of fish.

Feed preparation - formulation, handling & storage

Feed strategies for carps & shrimp, environmental issues on fish feed used for aquatic systems.

Factors influencing feeding behaviour, feed types, feeding method

Net protein utilization

Growth rate & histological parameters of a healthy herbivore (*Labeo rohita*) & Carnivore (*Chana punctatus*)

Population dynamics:

Estimation of population size & measurement of abundance

Age & growth estimation of growth parameters

Estimation of survival & mortality rates

Stock assessment (with tools & analysis), Stock recruitment

Theory of fishing
 Tagging & Marking-types & techniques
 Production & analysis of exploited population
 Problems of over and under fishing

Paper Code	313119	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Fish Ecology, Fish limnology and Oceanography			

Fish Ecology:

Aquatic ecosystem
 Ecological classification marine, estuarine & fresh water
 Ecological (special reference to Bangladesh)
 Interrelationship between fish & their biotic – abiotic environment
 Impacts of man's activities on ecosystem.

Fish limnology:

Introduction of physicochemical & biological limnology.
 Hydrological cycles
 Limnological problems in fish culture in lentic & lotic water
 Eutrophication
 Sediments & its physio-chemical characteristics.
 Plankton -spatial and seasonal distribution
 Benthos
 Productivity of water bodies & food chains

Oceanography:

Introduction to oceanography
 Origin & history of ocean basins, continental shelves & slopes,
 Zonation of sea
 Topography, sediment formation of ocean bottom
 Mixing process of oceans
 Water actions inter water tides, currents, eddy diffusion
 Upwelling & tsunami
 The role of ocean in global warming.
 Effect of climate change in world oceans.

Paper Code	313121	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Aquaculture and Fisheries Technology & Harvesting			

Aquaculture:

History & scope
 Aquaculture techniques for finfish & shell fish
 Hatcheries –type, essential components, fry production methods. Water quality monitoring, water supply & treatment.
 Site selection & construction of inland and coastal fisheries habitat
 Species selection, stocking densities & ratio used in Carp culture.
 Induced spawning – Egg handling & incubation, fry rearing.
 Transportation of live fry, fingerlings & brood fishes.

Composite culture
 Mariculture
 Coastal and open sea fish & shell fish farming.
 Ornamental fish culture techniques
 Genetics & hybridization.

Fisheries technology & harvesting:

Principles of fishing
 Fishing gears – trawls, nets & longlines & their operations.
 Fish crafts – types and operations
 Methods of harvesting of bottom, mid water & surface fisheries
 Plankton monitoring, echo-sounding.

Paper Code	313123	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Fish Processing & Handling, Fisheries Resources & Management and Extension, Economics, Rural sociology, Marketing & Cooperation			

Processing & Handling:

Principles and methods of fish preservation and processing
 Refrigeration, canning, curing, drying, salting, smoking & pickle
 Post mortem changes, Spoilage & contamination.
 Handling & transportation.
 Fisheries byproduct
 Quality control and methods of examining fish products – HACCI
 Design of a cold storage & fish processing plant.

Fisheries resources & management:

Fisheries resources of Bangladesh and its role in economy.
 Issues & threats to fisheries resources, causes for decline in it.
 Concepts & principles of fisheries management open, estuarine & marine
 Role of government, autonomous & voluntary organization
 Fish conservation Act & New fisheries management policy
 Community based fisheries management.

Extension, Economics, Rural sociology, Marketing & Cooperation:

Principles, objectives & methods of extension
 Basic element, panning and evolution of extension works in Bangladesh
 Fisheries economy contribution to national economy, nutrition, & employment
 Socio economics & livelihood standard of fishermen
 Marketing within and abroad Concept, present status
 Fish production Statistics of Bangladesh
 Co-operative – present status & future prospect of it in Bangladesh

Paper Code	313125	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Fish Genetics and Fish Pathology & Parasitology			

A. Fish Genetics:

Phenotypes: Chromosomes and fertilization; colour, scale patterns, body and fin shape, variance and selection.

Sex determination: inheritance associated with sex, sex determination, sex-linked and sex-limited inheritance in fishes.

Chromosomal manipulation: sex reversal, mono sex population, polyploidy, gynogenesis, hybrids, inbreeding, dominant genetic hybridization, cross-breeding, heterosis, genetic drifts, hybridization and its advantages & disadvantages, gene and transgenic fishes.

Concepts of cryopreservation: protocol, preparation of extender and diluent, equilibration, ampouling, freezing, sorting, thawing. Insemination and post insemination management.

B. Fish pathology & parasitology:

Concept of fish pathology & parasitology

Diseases of fish – cause, mode of infection, pathogenicity,

Symptoms & control measures of – bacterial, viral, fungal,

Noninfectious, nutritional environmental.

Cause, mode of infection, life cycle, etiology symptoms & control measures of parasites of fishes.

Quarantine & certifications

Paper Code	313122	-----	Credits: 6	
Paper Title:	Thesis/Theory			

Paper Code	313124	-----	Credits: 2	
Paper Title:	Viva-Voce			

Paper Code	313126	----	Credits: 6	
Paper Title:	Practical			

Taxonomic identification of 15 freshwater and 15 marine fishes (06 Chondrichthyes and 09 Osteichthyes) of Bangladesh

Taxonomic identification of freshwater and marine crustaceans and molluscs of Bangladesh

Study of planktonic and benthic fauna of water body and making a report on its productivity

Study of fish pathogens from diseased fish

Study of mouth structure of fish in relation to food and feeding habits

Study of fishing gears & crafts

Study of fish bones

Determination of age of fish and making comment on growth of fish in relation to length and weight

Dissection of digestive, circulatory, respiratory, nervous, reproductive and muscular system of fishes, crustaceans and molluscs

Preparation and submission of class records

Field report on Marine habitat, and Estuarine and freshwater fish cultures

M. Sc. Final Practical Examination, 2014 (Group –A)

Fisheries Branch

Day	Question no.	Experiments and reports	Marks
1 st	01	One crustacean, mollusk and one fish dissection (Dissection 8 + Display 2 + Drawing and labeling 4 =14)	14×3=42
	02	Identification of pathogen from diseased fish	3×2=06
	03	Identification of Crustacean 2, Mollusc 2, Parasite w2, Gear / Crafts 2, Chondrichthyes 2, Osteichthyes 2, Fish bone 2	14×2=28
2 nd	04	Taxonomic study of fish (Chondrichthyes 1, Osteichthyes 1	10×2=20
	05	Study of freshwater (micro 5, Benthos 2) and report on productivity	7×2=14
3 rd	06	Taxonomic study of crustacean and Mollusc	10+10=20
	07	Study of food and feeding habit of fish (1 specimen)	05
	08	Determination of age by studying scale and making comment on growth in relation to length and weight (Figure 2, discussion and comment 8)	10
	09	Submission of a skeleton of fish	05
4 th	Viva-Voce	Taxonomy and practical note book	10
		Excursion and field report	10
		Viva voce	30

Paper Code	313128	-----	Credits: 2	
Paper Title:	Viva-Voce			

Entomology Branch

Paper Code	Paper Title	Credits
313101	Advance Biology	4
313127	Insect Morphology and Insect Taxonomy	4
313129	Insect Physiology and Insect Embryology	4
313131	Insect Ecology and Insect Behavior	4
313133	Medical Entomology and Veterinary Entomology	4
313135	Toxicology, Agricultural and Forest Entomology and Pest Management	4
313137	Insect Genetics and Molecular Biology	4
313130 }	Thesis/Theory	6
313132 }	Viva-Voce	2
Or		
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Conservation of Ecosystems
Conservation and Management Strategies including ex situ and in situ
Legislation: National & International Convention Case study of
Biodiversity and Resource Management, Coral Reefs, Tropical Rain
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D. Human Ecology, Population Ecology & Genetic Ecology

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History of Human race and its distribution
Human types and their physical features, distribution and mode of living in relation to
social, cultural, religious and other activities Ecological impacts on Man's physical
features, social and cultural life. Impacts of Human population on environment
Development activities and their impacts on environment.
History of Agriculture revolution, industrial revolution and green revolution.
Impacts of scientific and technological development on Human ethics.

Population Ecology:

Definition
Population and population Change
Group properties of population: Density, natality, mortality, biotic potential, age
distribution, dispersion.
Concept of Carrying Capacity
Population Growth Forms: J and S-shaped growth forms
Population Interactions: Coexistence, competition, Predation and plant-herbivore
interaction.
Life Table: Definition, types, construction and analysis.

Genetic Ecology:

Importance of Genetic Ecology
Patterns of Genetic Variation
-External Influence
-Isolation of populations
-Ecotype and Clines.

Books Recommended:

1. E. J. Milner – Gulland and R. Mace. 1998. The Conservation and Use of Biological Resources. Blackwell Science.
2. A Dobson. 1996. Conservation and Biodiversity. Scientific American.
3. J. Turk, J. Witters, R. Witters and Turk. Ecosystems, Energy. Population. W.B. Saunders Company. Philadelphia, London.
4. B. Groombridge and M. D. Jenkins. 1996. Assessing Biodiversity Status and Sustainability. WCWC.
5. K. J. Gaston and J. I. Spicer. 1998. Biodiversity: An Introduction Blackwell Science.
6. M. Jeffries. 1997. Biodiversity and Conservation. Routledge
7. J. Treweek. 1999. Ecological Impact Assessment. Blackwell Science
8. M. Liddle. 1997. Recreation Ecology: The Ecological Impact of Outdoor Recreation and ecotourism. Chapman & Hall.
9. G.W. Suter. 1993. Ecological Risk Assessment Lewis, USA
10. Instant Basics, Dr. M.A. Basher, 2004, Positron publication, Bangla Bazar, Dhaka.
১১. ইকোলজি ও পরিবেশ, দূষণ, শাহআলমনবীএবং এ. কে. এম. ফজলুলকরিম চৌধুরী ২০০৩, তাজলাইব্রেরী, চট্টগ্রাম।

Paper Code	313127	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Insect Morphology and Insect Taxonomy			

A. Insect morphology:

Body wall: Structure and derivatives
Head: Types, segmentation, sutures and areas
Mouth parts: Types, modifications, and feeding adaptations
Wing: Structure, venation and modifications
Muscles: structure and types
Morphology of alimentary canal; filter chamber
Circulatory system: haemocytes and types
Respiratory systems: Terrestrial, aquatic and end parasitic insects: Structure and types of spiracles
Excretory system: Types of Malpighian tubules; cryptonephridia
Nervous system and various sense organs sound and light producing organs
Reproductive system

B. Insect Taxonomy

Principles of insect classification: detailed classification of insect orders and suborders
Description of orders and principal families including their morphology, diagnosis habit, habitats and reproduction
Biological notes of principal insect orders
Economic importance of major insect order and families
Collection and preservation of insects

Paper Code	313129	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Insect Physiology and Insect Embryology			

A. Insect Physiology:

Physiology of digestion; dietary requirements of insects; the role of micro-organisms in insect nutrition and digestion

Circulatory system: Structure and physiology of circulation, haemocytes and plasma

Hormones and physiology of moulting

Exocrine glands, pheromones and defensive secretions

Tracheal system and respiration in terrestrial insects; respiration in aquatic and endoparasitic insects

Excretion: salt and water regulation: physiology of excretion

Physiology and integration of nervous system

Eye and vision; light production

B. Insect Embryology:

General concepts of embryology

Branches of embryology

Insect eggs

Egg maturation

Vitellogenesis

Metamorphosis: Incomplete and complete metamorphosis

Role of hormones in insect development and metamorphosis

Unusual types of development-viviparity, parthenogenesis, and paedogenesis

Paper Code	313131	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Insect Ecology and Insect Behavior			

A. Insect ecology:

Introduction; ecological factors affecting insect life, abundance and development; impact of weather and climate on the life of insects

Insect dispersal and migration

Photoperiodism

Diapause & cold-hardiness

Trophic relationship

System analysis

Population dynamics

B. Insect behaviour:

Basic responses and patterns of behaviour: Innate behaviour, reflexes, kineses and taxes; learned behaviour; habituation, associative learning, latent learning, insight learning

Behavioural periodicity and clocks

Functional aspect of behaviour

Displacement

Orientation, navigation and homing

Communication: chemical communication, audio-communication, visual communication, tactile communication, interspecific communication

Reproduction: mate location, rivalry and territoriality; courtship
 Host selection and feeding: host selection by phytophagous insects, host selection by blood feeding insects, host selection by entomophagous insects
 Defense: Behavioural defense, structural defense, chemical defense, colourational defense (e. g. cryptic colouration, flash patterns, warning colouration, mimicry and group defense
 Social behaviour (honey bee, termites, ants and wasps)

Paper Code	313133	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Medical Entomology and Veterinary Entomology			

A. Medical Entomology:

Concept, history and objectives of medical entomology
 Medical importance of Arthropods and Arthropod borne diseases
 Concept of vectors, Mode of transmission of pathogen by insect vectors
 Life cycle of pathogen, symptoms, prevention and control measure of following diseases: a) malaria, b) filariasis, c) leishmaniasis and d) dengue fever
 Medical importance of the following:
 a) Ticks b) mites, c) mosquitoes d) cockroaches e) scorpions and f) spiders
 Morphological characteristics, life history, host-parasite relationship and control measure of the following insects:
 a) Housefly b) sand fly c) tsetse fly d) bedbug and e) lice
 Brief outline of forensic entomology and maggot therapy

B. Veterinary Entomology:

Concept, history and importance of veterinary entomology. Relationship and veterinary entomology with other branches of entomology.
 Identifying characteristics, life history, host- parasite relationship and control measure of following:
 a) Stable fly b) horse fly c) blow fly d) deer fly and e) beetles.
 Pathogenesis, clinical signs and symptoms, diagnosis, treatment, prevention and control of following diseases:
 b) Foot and mouth disease b) rotavirus infection c) brucellosis d) babesiosis e) rabies and f) theileriosis.
 Concept of zoonosis. Brief outline of following zoonotic diseases:
 c) Anthrax b) avian influenza c) plague d) cow pox and e) nipah fever.

Recommended Readings

Lane, R. P. and R.W. Crosskey. 1993. Medical Insects and Arachnids. Chapman & Hill, London.
 Mullen, G. and L. Durden, 2002. Medical and veterinary Entomology. Academic press, London.
 Service, M.W. 1995. Medical Entomology for students. Chapman and Hall, London.
 Soulsby, E. J.L. 1986. Helminthes, Arthropods and protozoa of Domesticated Animals. English Language Book Society, William Clowes Ltd, London.
 Urquhart, K.M, J. Armour, J. L. Duncan, A. M. Dunn, and, F. W. Jennings. 1996. Veterinary parasitology. Blackwell Science Ltd. USA.
 Kamaruddin, K.M. 2007. Handbook on Livestock and poultry Diseases in SAARC Countries. Prakash Printing and packaging, Panthapath, Dhaka- 1205, Bangladesh.

Paper Code	313135	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Toxicology, Agriculture and Forest Entomology and Insect Pest Management			

A. Toxicology:

Classification of toxic compounds.

Inorganic insecticides: arsenic, fluorine, lead and sulfur compounds: method of use and mode of action of these compounds.

Synthetic organic insecticides; chlorinated hydrocarbons, organophosphates, carbamates; systematic insecticides for plants and animals.

Organic insecticides of plant origin; pyrethrines, nicotine, rotenone source, use and mode of action of these compounds.

Fumigants: methyl bromine, HC, chloropicrin, carbon tetrachloride, ethyl dibromide –use, mode of action and general precautions to be followed in fumigation.

Miscellaneous chemicals: attractants, repellants, antifeedants, chemosterilants, insect growth regulators and synergistic compounds.

Insecticides resistance including detoxification mechanisms.

Formulation of insecticides.

B. Agriculture and Forest Entomology:

General information on insects related to agricultural crops, stored grains, grain products, vegetables, fruits and forest trees

Status of insect pest in relation to agro-ecological changes

Biology, life history, nature of damage and control measures of the following:

Rice pests: brown plant hopper, yellow stem borer, rice hispa, ear-cutting caterpillar

Jute pests: jute hairy caterpillar, jute stem weevil

Tea pest; tea mosquito bug, yellow tea mite

Potato pest; potato tuber moth

Brinjal pest; brinjal fruit and shoot borer

Sugarcane pest; sugarcane top shoot borer

Fruit pest: melon fruit fly

Stored product pests; red flower beetle, rice weevil, pulse beetle

Dry fish pest: hide beetle

Forest tree pests: termite, wood borer, defoliators

C. Insect Pest Management:

Introduction; concept of pest and pest management, types of pest, causes of pest problem, strategies and tactics of pest management

Pest control measures:

Chemical control: various methods, merits and demerits

Biological control: various agents, merits and demerits

Hormonal control; historical background, various hormones used in insect control

Genetic control; sterile insect technique and autocidal control techniques

Forecasting pest outbreak; concept, causes, directions for predictions of forecasting outbreak

Integrated Pest Management (IPM): integrated tactics, steps, advantages, disadvantages and status in Bangladesh

Sampling techniques: types, common sampling techniques, assessment of pest infestation in field

Insect pest-plant interaction; types, insects and host plant resistance, insect weeds and crop interactions, insect pollinator-plant interactions

Paper Code	313137	-----	Credits: 4	Class Hours: 120 hrs.
Paper Title:	Insect Genetics and Molecular Biology			

A. Insect Genetics:

Introduction; concept, scope and applications

Sex-linked inheritance: definition, kinds of sex linked genes, sex linked inheritance in *Drosophila*

Sex determination in insects:

- a. *Drosophila* and *Lucilia*
- b. Hymenoptera: Honey bee
- c. Orthoptera: grasshopper

B. Molecular Biology:

Molecular basis of development: oocyte formation, embryogenesis and postembryonic development in *D. melanogaster*.

Molecular basis of behaviour: biological / photoperiodic clock, learning and memory, odour behavior, courtship behaviour

Genetics of insect resistance: types and mechanisms (biochemical, genetic and detoxification)

Transgenic insects: transformation methods, application and controversies.

Insect transposable elements: types transposition methods, application

Recommended Readings

Denholm, I. 1999. Insecticide Resistance from Mechanism to Management. Prentice and Hall. London.

Elsevier. 2003. Insect Molecular Genetics, An Introduction to principles and Applications.

Elsevier. 2005. Comprehensive Molecular Insect Science. Oxford

Glick, B. R & Pasternak, J. 1998. Molecular Biotechnology: principles and Applications of Recombinant DNA. ASM Press Washington DC

Hoy, M.A. ---- Insect Molecular Genetics. Elsevier Science, Santiago, California.

Tlo, D. & Webber, B. 1992. Insecticides Mechanism of Action of Resistance. Intercept Ltd. UK.

Paper Code	313130	----	Credits: 6	
Paper Title:	Thesis/Theory			

Paper Code	313132	-----	Credits: 2	
Paper Title:	Viva-Voce			

Paper Code	313134	-----	Credits: 6	
Paper Title:	Practical			

Taxonomy:

Collection, identification and preservation of insects. Students will have to submit their insect collections at the time of the practical examination. For common and economically important insects, identification up to species level is essential.

Techniques for insect collection and preservation

Aquatic insects of all stages; study and preparations of report.

Morphology:

Dissection of common insects for the study of their major systems, preparation of whole mounts of minute insects and insect parts.

Physiological experiments:

Coagulation of blood haemocytes, blood circulation

M. Sc. Final Practical Examination, 2014 (Group –A)

Entomology Branch

Day	Question no.	Experiments and reports	Marks
1 st	01	Dissection- (dissection 9 and display 3 +drawing and labeling 4)	16×1=16
	02	Temporary mount-(dissection and mounting 6+ staining 2 + drawing and labeling 4)	10×1=10
	03	Collection and identification of terrestrial insects and report writing	10+6=16
2 nd	04	Spotting (10 specimens ×2)	10×2=20
	05	Identification of economically important insects	10×2=20
	06	Taxonomy up to family, 2 specimens	2×6=12
3 rd	07	Taxonomy up to genus, 2 specimens	2×8=16
	08	Taxonomy up to species, 1 specimen	1×10=10
	09	Collection and identification of different stages of aquatic insects, and preparation of a report	10+4=14
	10	Collection box submission	14
4 th	Viva voce	Taxonomy and practical note book	10
		Excursion and field report	10
		Viva voce	30

Paper Code	313136	Marks: 50	Credits: 2	
Paper Title:	Viva-Voce			