

SEMESTER II

ZY2B02U Core Course 2 BIODIVERSITY AND MODERN SYSTEMATICS

36 hrs
Credits 2

Objectives:

- } To create appreciation on diversity of life on earth
- } To understand different levels of biological diversity
- } To familiarize taxa level identification of animals
- } To learn biodiversity estimation techniques
- } To create interest for conservation of biodiversity

Pre requisite:

- Basic knowledge on the living world, plant and animal kingdom
- Knowledge on biodiversity and its conservation
- Knowledge on biological classification and representative organism of major taxa

PART I: BIODIVERSITY

(26 Hrs

)

Module I ♦ Introduction to Biodiversity

(2 hrs)

Definition

Historical perspective

Concepts ♦

Nature ♦ environment ♦ biodiversity

Scope and importance

Core Readings

Chapman J.L. & M.J. Reiss 2006 Ecology, Principles and Applications. Sec Edition
Cambridge University Press.

Supriyo Chakraborty.2004 *Biodiversity*. Pointer Publishers, Jaipur, India.

Wilson E.O., 1988 (Editor).*Biodiversity*. National Academy press, Washington DC, USA.

Module II ♦ Levels of biodiversity

(5 hrs)

Genetic, Species, Ecosystem

Domesticated, Microbial diversity

Distribution of biodiversity on earth

Tropical, temperate and polar

Landscapes and interactions

Biodiversity hotspots

Core Readings

Chapman J.L. & M.J. Reiss 2006 Ecology, Principles and Applications. Sec Edition
Cambridge University Press.

Myers, Norman.1984. *The Primary Source: Tropical Forests and Our Future*. W.W. Norton &
Company, NY.

Myers,N., Mittermiere,R.A., Mittermeier,C.G., Dea Fonseca,G.A.B and J.Kent. 2000.
Biodiversity hotspots for conservation priorities. *Nature*, 403:853-858.

Supriyo Chakraborty.2004 *Biodiversity*. Pointer Publishers, Jaipur, India.

Wilson E.O., 1988 (Editor).*Biodiversity*. National Academy press, Washington DC, USA.

Module III ♦ Values of biodiversity (4 hrs)

Direct use value

Indirect use value

Non use value

Ecosystem services

Core Readings

Myers, Norman.1984. *The Primary Source: Tropical Forests and Our Future*. W.W. Norton &
Company, NY.

Myers,N., Mittermiere,R.A., Mittermeier,C.G., Dea Fonseca,G.A.B and J.Kent. 2000.
Biodiversity hotspots for conservation priorities. *Nature*, 403:853-858.

Supriyo Chakraborty.2004 *Biodiversity*. Pointer Publishers, Jaipur, India.

Module IV ♦ Threats to biodiversity (5 hrs)

Types of threats

Habitat loss, man- wildlife conflict (with case studies)

Invasive species

Pollution

Over exploitation and human population

Climate change

Core Readings

Chapman J.L. & M.J. Reiss 2006 Ecology, Principles and Applications. Sec Edition
Cambridge University Press.

Wilson E.O., 1988 (Editor).*Biodiversity*. National Academy press, Washington DC, USA.

Module V ♦ Biodiversity conservation and management (6 hrs)

Conservation strategies

In situ, ex situ

- National parks, Sanctuaries and Biosphere reserves
- International efforts
 - Convention on Biological Diversity (CBD)
 - IUCN- WCMC, UNEP
- Legal measures
 - Wild life Protection Act, 1972
 - The Environment Protection Act, 1986
 - Forest (Conservation) Act 1980, 1988
 - Biodiversity Act 2002
 - Biodiversity rule 2004
- National biodiversity action plan
 - People's participation ♦ Peoples biodiversity register (PBR)
- Local initiatives

Core Readings

Andrew S. Pullin 2002. *Conservation Biology*. Cambridge University Press, Cambridge, UK.
 Chapman J.L. & M.J. Reiss 2006 *Ecology, Principles and Applications*. Sec Edition
 Cambridge University Press.
 Wilson E.O., 1988 (Editor). *Biodiversity*. National Academy press, Washington DC, USA

Module VI ♦ Biodiversity estimation ♦ tools and techniques (4 hrs)

- Sampling techniques -
 - Quadrat
 - Line transect
- Measurements
 - Density
 - Abundance
 - Frequency
- Biodiversity indices ♦ concepts
 - Shannon-Weiner, Simpson

Core Readings

Anne E. Magurran 2004. *Measuring Biological Diversity* .Blackwell Publishing, MA, USA.

PART II ♦ MODERN TAXONOMY (10 hrs)

Module VII ♦ Taxonomical Principles (6 hrs)

Brief history
Concepts and definition
Approaches of taxonomy
Molecular taxonomy
Importance of classification
Phylogeny and Taxonomy ♦ Tree of Life, bar coding of life
Zoological nomenclature
International Code of Zoological Nomenclature (ICZN)

Core Readings

Kapoor ,V.C.1998. Theory and Practice of Animal Taxonomy. Oxford and IBH Pub.Co, New Delhi.

Module VIII ♦ Tools and techniques

(4 hrs)

Identification Keys
Dichotomous keys (Single access key)
Polytomous key
Multi access key
Advantages and disadvantages

Core Readings

Kapoor ,V.C.1998. Theory and Practice of Animal Taxonomy. Oxford and IBH Pub.Co, New Delhi.

Selected Further Readings

Andrew S. Pullin 2002. *Conservation Biology*. Cambridge University Press, Cambridge, UK.
Anne E. Magurran 2004. *Measuring Biological Diversity* .Blackwell Publishing, MA, USA.
Chapman J.L. & M.J. Reiss 2006 *Ecology, Principles and Applications*. Sec Edition
Cambridge University Press.
Daily,G.C. (Ed.), 1997.*Nature ♦s Services : Societal Dependence on Natural Ecosystems*.
Island Press, Washington D C.
Forman, R.T and M. Gordaon. 1986. *Landscape Ecology*. John Wiley & Sons, NY, USA.
Kapoor ,V.C.1998. Theory and Practice of Animal Taxonomy. Oxford and IBH Pub.Co, New Delhi.

Kapoor ,V.C.1998. Theory and Practice of Animal Taxonomy. Oxford and IBH Pub.Co, New Delhi.

Karunakaran, C.K. 2003. Politics of vanishing forests in Kerala. Kerala Sastra Sahitya Parishat, Thiruvananthapuram.

Land resource based perspective plan for 2020 AD. Kerala State Land Use Board, Thiruvananthapuram

Myers, Norman.1984. *The Primary Source: Tropical Forests and Our Future*. W.W. Norton & Company, NY.

Myers,N., Mittermiere,R.A., Mittermeier,C.G., Dea Fonseca,G.A.B and J.Kent. 2000. Biodiversity hotspots for conservation priorities. *Nature*, 403:853-858.

Nair, K.N.S and Parameswaran,P.1976. *Keralathinte Sampath (Wealth of Kerala)*. Kerala Sastra Sahithya Parishad, Trivandrum, Kerala.

Nair, M.P., Pushpangathan, P., Rajasekharan, S.,Narayanan Nair.K. and Dan Mathew. *◆Jaivavaividhyam◆* (Biodiversity). State Institute of Languages, Thiruvananthapuram

State of the Environment Report, Kerala. (Annual Publication), Kerala State Council for Science, Technology and Environment, Thiruvananthapuram

Supriyo Chakraborty.2004 *Biodiversity*. Pointer Publishers, Jaipur, India.

Wilson E.O., 1988 (Editor).*Biodiversity*. National Academy press, Washington DC, USA.

Web Resources

<http://www.ncbi.nlm.gov>.

<http://tolweb.org>

<http://www.biosis.org>

<http://ucmp.berkeley.edu>

<http://species.enviroweb.:org>

<http://iczn.org>

<http://www.unep.org>

<http://www.iucn.org>

<http://www.cbd.org>

ZY2B02U [P] Practical 2
BIODIVERSITY AND MODERN SYSTEMATICS

36 hrs
Credit 1

1. Quadrature study
2. Transect study
3. Sampling
4. Species area curve
5. Identification using keys
 - Insect
 - Fish
 - Snake
6. Taxa, identification techniques
 - Bird body parts
 - Butterfly/ dragonfly body parts and venation
7. Simple identification of any 20 animals (local ♦ represent all taxa)
 - Common name and scientific name
8. Field study (compulsory)
 - Visit to two important areas of biodiversity
 - Report on local biodiversity conservation efforts
 - Eg. Sacred grooves, medicinal plant garden

Report should be submitted by each student

SEMESTER III

ZY3B03U CORE COURSE 3 ANIMAL DIVERSITY- NON CHORDATA

Objectives

54 hrs. Credits 3

1. To study the scientific classification of invertebrate fauna.
2. To learn the physiological and anatomical peculiarities of some invertebrate phyla through type study.
3. To learn the evolutionary significance of various invertebrate fauna
4. To stimulate the curiosity in living things around them.

MODULE I

Introduction: Briefly mention the following

(2

hrs)

Classification ♦ Keys and Principles.

Nomenclature (Uninomial, Binomial, & Trinomial), Law of Priority.

Two kingdom and Five kingdom classification.

Symmetry - Asymmetry, Spherical, Radial, Biradial and Bilateral

Coelom ♦ Acoelomates, Pseudocoelomates and Eucoelomates

Schizocoelom, Enterocoelom., Protostomia and Deuterostomia

Kingdom Protista Type: Paramecium

(10hrs)

Salient features and classification up to phyla

- | | |
|----------------------------|----------------|
| 1. Phylum Rhizopoda | : Amoeba |
| 2. Phylum Actinopoda | : Actinophrys |
| 3. Phylum Dinoflagellata | : Noctiluca |
| 4. Phylum Parabasalia | : Trychonympha |
| 5. Phylum Metamonada | : Giardia |
| 6. Phylum Kinetoplasta | : Trypanosoma |
| 7. Phylum Euglenophyta | : Euglena |
| 8. Phylum Cryptophyta | : Cryptomonas |
| 9. Phylum Opalinata | : Opalina |
| 10. Phylum Bacillariophyta | : Diatoms |
| 11. Phylum Chlorophyta | : Volvox |

12. Phylum Choanoflagellata : Proterospongia
 13. Phylum Ciliophora : Paramecium
 14. Phylum Sporozoa : Plasmodium
 15. Phylum Microsporidia : Nosema
 16. Phylum Rhodophyta : Red Alga

(Mention any five general characters for each phylum. Detailed accounts of examples are not necessary.)

General Topics : (1) Parasitic Protozoans (2). Life cycle of Plasmodium

Kingdom Animalia Outline classification of Kingdom Animalia. **(1hr)**

Three branches - Mesozoa, parazoa, Eumetazoa.

Core Readings

Dhami.P.S. and Dhami J.K. 1979 Invertebrate Zoology. R. Chand and Co. Delhi.

Ekambaranatha Ayyar M. 1990. A Manual of Zoology. Volume i. Invertebrate part I and part II. S. Viswanathan Printers & Publishers. Pvt. Ltd.

MODULE II

Mesozoa - Eg. Rhopalura.

Phylum Porifera.

(3 hrs)

Classification upto classes.

Class I- Calcarea. Eg. Sycon., Class II ♦ Hexactinellida . Eg. Euplectella.

Class III ♦ Demospongia Eg. Cliona.

General Topics

1. Reproduction in sponges 2. Canal system in sponges.

Phylum Coelenterata Type: Obelia

(6hrs)

Classification upto classes.

Class I - Hydrozoa Eg. Halistemma. Class II ♦ Scyphozoa Eg. Rhizostoma. Class

III- Anthozoa Eg. Fungia.

General Topics: Coral and coral reefs with special reference to conservation of reef fauna.

2. Polymorphism in Coelenterates

Core Readings

Zoological Society of Kerala Study material. *Animal Diversity* 2002.

Ekambaranatha Ayyar M. 1990. A Manual of Zoology. Volume i. Invertebrate part I and part II. S. Viswanathan Printers & Publishers. Pvt. Ltd.

MODULE III

Phylum Ctenophora.

(1 hr)

Eg. Pleurobrachia.

Phylum Platyhelminthes

(3hrs)

Classification upto classes.

Class I - Turbellaria. Eg. Planaria.

Class II ♦ Trematoda Eg. Fasciola

Class III- Cestoda Eg. *Taenia saginata*.

General Topics-

1. Life history of *Fasciola hepatica*.
2. Platyhelminth parasites of Man and Dog (*Schistosoma*, *Taenia solium*, *Echinococcus*).

Phylum Nematoda

(3hrs)

Class phasmidia Eg. Enterobius, Ascaris

Class Aphasmidia Eg. Trichinella

General Topic-

Pathogenic nematodes. (*Wuchereria bancrofti*, *Ancylostoma duodenale*, Trichinella).

Phylum Annelida

(2 hrs)

Classification upto classes.

Class I- Archiannelida Eg. Polygordius

Class II ♦ Polychaeta Eg. Chaetopterus

ClassIII- Oligochaeta Eg. Megascolex.

Class IV - Hirudinomorpha Eg. Ozobranchus, Hirudinaria

Core Readings

Zoological Society of Kerala Study material. *Animal Diversity* 2002.

Ekambaranatha Ayyar M. 1990. A Manual of Zoology. Volume i. Invertebrate part I and part II. S. Viswanathan Printers & Publishers. Pvt. Ltd.

MODULE IV

(12 hrs)

Phylum- Onychophora

Eg. Peripatus (Mention its affinities).

Phylum Arthropoda

Type: Panaeus

Classification upto classes.

Divided into 4 subphyla.

1. Sub Phylum - Trilobitomorpha

Class - Trilobita (mention salient features).

2. Sub Phylum- Mandibulata

- Class I ♦ Crustacea Eg. Sacculina
- Class II- Chilopoda Eg. Centipede (Scolopendra)
- Class III ♦ Symphyla Eg. Scutigera
- Class IV ♦ Diplopoda Eg. Millipede (Spirostreptus)
- Class V - Insecta Eg. Dragon fly
- Class VI ♦ Pauropoda Eg. Pauropus

3. Sub Phylum - Chelicerata

- Class - Merostomata Eg. Limulus
- Class II ♦ Arachnida Eg. Scorpion

General Topics

1. Vectorial Arthropods
2. Larval forms of Penaeus

Core Readings

Zoological Society of Kerala Study material. *Animal Diversity* 2002.

Ekambaranatha Ayyar M. 1990. A Manual of Zoology. Volume i. Invertebrate part I and part II. S. Viswanathan Printers & Publishers. Pvt. Ltd.

MODULE V

Phylum Mollusca

(4

hrs)

Classification upto classes

- Class I- Monoplacophora Eg. Neopilina
- Class II- Amphineura Eg. Chiton
- Class III- Gastropoda Eg. Aplysia
- Class IV- Scaphopoda Eg. Dentalium
- Class V- Pelecypoda Eg. Pinctada
- Class VI- Cephalopoda Eg. Sepia

General Topic-

Pearl formation and culture

Phylum Echinodermata

(4 hrs)

Classification upto classes

- Class I- Asteroidea Eg. Astropecten

Class II- Ophiuroidea	Eg. Ophiothrix
Class III- Echinoidea	Eg. Echinus
Class IV- Holothuroidea	Eg. Holothuria
Class V ♦ Crinoidea	Eg. Antedon

General Topics

1. Water vascular system.
2. Larval forms of Echinoderms

Minor Phyla

(2 hrs)

1. Chaetognatha Eg. Sagitta
2. Sipunculida Eg. Sipunculus
3. Rotifera Eg. Brachionus

Phylum Hemichordata

(1 hr)

Eg. Balanoglossus

Core Readings

Zoological Society of Kerala Study material. *Animal Diversity* 2002.

Ekambaranatha Ayyar M. 1990. A Manual of Zoology. Volume i. Invertebrate part I and part II. S. Viswanathan Printers & Publishers. Pvt. Ltd.

Selected Further Readings

Anderson D.T. 2001 Invertebrate Zoology Sec Edition Oxford University Press

Barnes R.D. 1987. Invertebrate Zoology. W. B. Saunders. New York.

Dhami.P.S. and Dhami J.K. 1979 Invertebrate Zoology. R. Chand and Co. New Delhi.

Ekambaranatha Ayyar M. 1990. A Manual of Zoology. Volume i. Invertebrate part I and part II. S. Viswanathan Printers & Publishers. Pvt. Ltd.

Hyman L. H. The Invertebrate Volumes. Mc Graw Hill.

Jordan. E. L., and Verma P.S. 2000. Invertebrate zoology. S. Chand and Co. Ltd., New Delhi.

Kotpal R. L, Agarval S. K. and R. P. Khetharpal 2002. Modern Textbook of Zoology.

Kotpal.R. L., 1988-92 (All series). Rastogi Publishers, Meerut.

Parker & Haswell. Textbook of Zoology. Invertebrate . Vol. I 7th Edition.