

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT

M.Sc. Part – I

Aquatic Biology

The Department of Aquatic Biology is started recently in the South Gujarat University. Very few universities in India have this type of department. The M.Sc course lays special emphasis on the development and management aspects of Aquaculture and related fields of Aquatic Biology. It provides for systematic acquisition of knowledge on all-important technical and scientific aspects. The course has been carefully designed to increase job opportunities.

M.Sc. degree in Aquatic Biology includes two academic year course viz., M.Sc. I and II .The curriculum includes total eight theory papers, practicals, field work, excursion and dissertation based on original piece of work carried out by the student. Exposure to fields and visits to various organisations shall help student in gaining practical knowledge. Details of theory papers, practicals, field work and dissertation of curriculum are outlined below:

M, Sc. I

Theory Papers:

Paper –I - Inland Environment

Paper- II - Physical and Chemical Oceanography

Paper-III - Planktonology and Microbiology

Paper-IV- Physiology, Biochemistry and Genetics

Practicals:

Practical - I- Hydrobiology

Practical - II- Biology of plankton

Practical –III- Histology, Biochemistry and Genetics.

Journals

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M.Sc. Part – I

Aquatic Biology

Paper – I Inland Environment

Unit-1

15 Hrs.

Origin and classification of rivers, lakes ponds, streams and estuaries including lagoons and coastal inlets.

Structure and dynamics of rivers, lakes, estuaries, lagoons and coastal inlets

Unit-2

15 Hrs.

Ecology and productivity of fresh water ponds: physical condition of water: depth, temperature, turbidity and light. Chemical condition dissolved oxygen, carbon dioxide, total hardness, dissolved solids, inorganic compounds and organic matters and biological condition; aquatic vegetation and planktons. Association of common Aquatic plants, Soil-types of soil and there role in productivity.

Unit- 3

15 Hrs

Reservoirs: Multiple uses of reservoirs, Impacts of reservoir. Classification and distribution of Indian reservoir, transitional phases of reservoirs. Development of fisheries through reservoirs. Recent advances in reservoir management.

Unit-4

15 Hrs.

Brackish water environments in temperate and tropical region of India.

Morphology of estuarine basins, estuarine shores and estuarine lakes.

Unit-5

15 Hrs.

Tides, currents and waves in estuaries. Rainfall and rivers discharge.

Transportation and deposition of silt and sand in rivers reservoirs lakes, and estuaries.

Unit-6

15 Hrs.

Physical limnology; Thermal stratification and Thermal exchange, euphotic zone.

Oxidation-reduction potentials, accessory growth factors and ecology of wetland.

REFERECES

- Bennet, G, W. (1970): Management of lakes and ponds 2nd Ed. Van Nostrand Reinhold Company.
- Edmondson, W.T/(1976): Freshwater Biology 2nd ED. John Wiley (Ed) and Sons Inc.
- Golterman, H.L., Clyno R.S. and Ohnstad, M.A.M. (1978): Methods for physical and chemical analysis of freshwater 2nd Ed. IBP Handbook no.8 Blackwell Scientific Publications.
- Grasshoff, K., Enhardt, M. and Kreenling K. (1983): Methods of seawater analysis .2nd Ed. Verlag Chemical.
- Hutchinson, G.E, (1976) : A Treatise on limnology, Vol.I & II, John Wiley & Sons.
- Jeffries, M. and Mills, D. (1990) : Freshwater Ecology .Principles and Application Behaviour Press, London.
- Jhingran, V.G. (1985): Fish and Fisheries of India. Hindustan publication Cor., New Delhi.
- Kuzin, I.(1977) : Local movement of fish in reservoirs, Oxford & IBH publication Co Pvt. Ltd.
- Lauff, G.H. (1967): Estuaries. American Assessment for the Advance Science Publication no.83
- Lecren E. D. & Lowe-Mac Connel, R.H. (1980): The functioning of freshwater ecosystem. Cambridge University Press.
- Lowe-Mac Connel R.H. (1981): Man made lakes. Academic Press London.
- Macca, T.T.: Ponds and lakes. George Allen and Unwin Ltd.
- Martin, W. (1976): Estuarine process. Vol.I & II Academic press London.
- Martyshv E. (1977): Pond Fisheries. Oxford & IBH Publication Co. Pvt, Ltd.
- Poddubny S. (1977): Ecological to pography of fish population of reservoirs. Oxford and IBH publication Co. Pvt. Ltd.,
- Parsons T.R., Takashashi M. and Hargrave B (19077): Biological Oceanographic process. Pergamon Press, N.Y.
- Perkins, E.J. (1980): The Biology of Estuaries and coastal water. Academic Press, London.
- Schwerbel, J: Methods of Hydrobiology. Pergamon Press, New York
- Welch, P.S. (1952): Limnology 2nd Ed. Mcgraw Hill Book Co.

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Aquatic Biology

Paper- II - Physical and Chemical Oceanography

Unit-1

15 Hrs.

Introduction to oceanography; History of oceanography, origin of oceans, bottom topography- Abyss, Canyons, trenches.

Unit- 2

15 Hrs

Physical properties of seawater, density, viscosity, surface tension, light in the sea; temperature distribution, temperature measuring devices, heat budget.

Currents, Waves- formation and properties tides and circulation of water in sea. Tidal effect in coastal areas. Refractive index and conductivity.

Unit-3

15 Hrs.

Sedimentation; origin and physical properties of sediments, classification of marine sediments, (lithogenous, biogeous, hydrogenous and cosmogeneous). distribution and transport of sediments, determination of age of sediments.

Unit-4

15 Hrs.

History of chemical oceanography and its importance; origin of salts, properties of water (structure of water molecule, difference with freshwater molecule). Chemical composition of seawater.

Unit – 5

!5 Hrs.

Ionic composition of seawater; major and minor constituents. Chlorinity and salinity in seawater; Methods for measurement of salinity and chlorinity.

Radio nucleides in sea, their origin and distribution.

BOD, COD, and oxygen and their importance.

Unit-6

15 Hrs.

Inorganic nutrients; Phosphates, Silicate and Nitrate, their cycle N: P ration and its signification, wealth of the sea – minerals.

Corrosion its prevention and protection, fouling and its prevention.

Instruments use in oceanography.

REFERENCES

- Barnes, A (1959) :Oceanography and Marine Biology-A book of techniques. George Allen and Unwin Ltd, London.
- David, A.R. (1977) Introduction to oceanography. Prentice Hall Inc.,
- Drake, C.L./J.Knauss, J.A. and Turekian, K.K. (1978): Oceanography, Holt Reinhart and Winston, N, York.
- Franson, M.A. (1955): Standard Methods for the examination of water, sewage and Industrial wastes. APHA AWWA – WPCF Washington D.C.
- Grant Gross M. (1977): Oceanography: A view of the earth. Pentice Hall Inc. New Jersey.
- Hill, M.N. (1963): The sea Vol.I to II. Inter sciences Publishers, New York.
- Martin D.F. (1968): Marine chemistry Vol.I (Analytical Methods). Marcel Dekkar Inc. New York
- Picard, G.L. ;(1975): Descriptive physical oceanography. Pergamon press London.
- Riley, J.P. and Skirrow, G. (1975-84): Chemical oceanography Vol.I to VIII, Academic press London.
- Ross, D.A. (1977) : Introduction to oceanography. Prentice Hall Inc. New Jersey.
- Scientific American Resource Library: Reading in the Earth Sciences Vol.I to III.
- Strick and, J.D.H.and Parscns, T.R. (1972): Practical; and Book of seawater analysis. Fisheries Research Board of Canada, Ottawa Bulletin 167.
- Sverdrup H.V., Johnson, M.W.& Fleming R.H. (1959) the ocean; their physics, chemistry and general biology. Prentice Hall Inc., New Jersey.
- Tait R.V. (1976): Elements of Marine Ecology.Butterworths Company.
- Thompson.: Biology of Benthic Marine organisms Oxford and IBH Pub.,Co.Pvt.Ltd.,
- Thompson, E.Marine Biodeteroration, Oxford and IBH Pub.Co.PvtLtd..

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Aquatic Biology

Paper – III Planktonolgy and Microbiology

Unit-1

15 Hrs.

Classifications of plankton based on size, mode of life, life cycle and feeding habits.

Luminous plankton, biology of important plankton.

Phyton and Zooplankton- Method of collection of plankton and estimation of primary, secondary and tertiary productivity, factors affecting productivity, regional differences and seasonal variations.

Unit-2

15 Hrs.

Adaptation of plankton –structural (weight increases of surface area, floatation) and physiological (specific gravity, water content, fat content, defensive vacuoles) mechanisms.

Phytoplankton and Zooplankton inter relations.

Red tide phenomenon- its causes and effects.

Unit-3

15 Hrs.

A general account of marine fungi, Seaweeds and seagrasses.

Periphyton: Importance and significance, Different types in lotic and lentic factors influencing periphyton. Role of periphyton in aquatic system.

Unit-4

15 Hrs.

Modern concept of prokaryotic and eukaryotic organisms.

Microbial biotechnology –Introduction of Halophiles, Metranogems. Thermophiles, and their significances. SCP. Microbial nutrition and growth structure of bacteria and viruses.

Unit-5

15 Hrs

Micro organisms in river, estuarine, sea and sewage water.

Decomposition of organic matter, recycling of nutrients and their significance in pond ecology.

Unit-6**15 Hrs.**

Microbial spoilage of fish

Microbial quality control aspects of processed fishery products.

Aquatic bacteriology –Pathogens, distribution prevention and control.

REFERENCES

- Alexopoulos, C.J., C.J. (1967): Algae and fungi, Mac Milan Co, London.
- Boney, A.D. (1975): Phytoplankton, Edward Arnold, and London.
- Borgis, P. (1976): Marine plankton ecology. North Holland Amer.Elsevier, N.York.
- Brock, T.D. (1966): Principles of Microbiology. Prentice Hall, Inc.New Jersey
- Burrows, W (1956): Text Book of microbiology 16th Ed.W.B.Saunders and Co. Philadelphia.
- Chapman, V.J. (1976) Mangrove vegetation.J.Gramer, Berlin.
- Davis, B.D. (1970): principles of microbiology and Immunology. (Harer International edn.) Harper and Row, N.York.
- Dawes C.J. (1981): Marine botany. John Wiley and sons.N.Y.
- Davis C.C. (1955): The Marine and freshwater plankton. Michigan state university press USA.
- Doeteseh, R.N.and Cook, T.M.(1973);Introduction to Bacteria and their ecobiology.University Park Press, Baltimore.
- Droop.M. R. and Wood E.J.F. (1986): Advances in Microbiology of the sea.Vol.I, Academic press London
- Ernst, W.G.and Morin, J.G.(1982): Environment of the deep sea Vol.II .Prentice Hall ,N.J.
- Ferguson, W.E.J.(1967): Microbiology of ocean and Estuaries.Elseveer pub.co.,Amsterdan.
- Hawker, L.E. and Linton, A.H.(1971): Micro organisms. Function s form and Environment Edward Arnold Ltd.London.
- Marris, G.P.(1986) : Phytoplankton Ecology, Chapman and Hall London.

- Newell G.E. and Newell, R.C.(1973 : Marine Plankton.Hutcinson & Co. London
- Parsons, T.R., Takahashi, M.and Bhargava, H.(1977) : Biological Oceanographic process (II ed.) Pergamon press, Oxford.
- Raymont, J.E.G.(1973): Plankton and productivity in the oceans. Pergamon press, London
- Rheinheimer,G.(1974): Aquatic Microbiology. John Wiley and Sons, London.
- Round, F.E.(1984): The Ecology of the Algae. Cambridge University Press, London.
- Skinner, F.A.and Carr.N. G. (1976): Microbiology in Agriculture, Fisheries and Food Academic press, N.Y.
- Skinner, F.A.and Shewan, J.M.(1977) : Aquatic Microbiology. Academic Press London
- Sokatch, J.R.(1969): Bacterial physiology and metabolisms A.P. London.
- Wickstead, J.H. (1965): An introduction to the study of tropical plankton. Hutchinson and Co. London.
- Wimpenny, R.S. (1966): Plankton of the sea. Faber and Faber limited London.
- Wood, E.J.F. (1965): Marine microbial Ecology. Chapman and Hall.Reinhald.
- Wood, E.J.F. (1967): Microbiology of ocean and estuaries. Elsevier Pub.,Co.N.York.
- Yale, Dawson, E. (1966): Marine Botany: An introuction. Hole Reinhart and Winston Inc., New York

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Paper – IV Physiology, Biochemistry and Genetics

Unit-1

15 Hrs.

Nutrition; Nutritional requirements of Aquatic organisms, measurement of energy, energy foods (Carbohydrates, proteins, fats), non-energy foods (Minerals Vitamins, water).

Digestion: Feeding and digestion mechanisms.

Unit-2

20 Hrs.

Respiration: Structure of gills, respirations mechanisms in aquatic organisms,

Accessory respiration organs in fishes.

Circulatory system: Anatomy of heart, electric and mechanical properties, blood volume, and blood distributions.

Properties of fish haemoglobins. Structural properties, oxygen transports.

Unit-3

10 Hrs.

Excretion; Structure and function of the kidney, nitrogenous end products and pattern of their excretion, water and electrolyte regulation in marine, freshwater and estuarine fishes.

Osmotic and ionic regulation in aquatic animals.

Unit-4

15 Hrs.

Reproduction; The gonads, types of reproduction endocrine regulation of reproduction.

Development: Eggs and larvae, fecundity and egg size, events in development (fertilization, incubation, hatching, larva, metamorphosis), metabolism and growth (rate of development, yolk utilization).

Unit-5**15 Hrs.**

Biochemical composition of fish.

Intermediary metabolism in fish; Glucose metabolism, lipid, metabolism and protein metabolism.

Importance of lipids in fish rancidity, mechanism of auto oxidation, use of anti-oxidants in controlling rancidity.

Unit-6**15 Hrs.**

Chromosomes manipulation and sex control in fish.

Historical perspectives of fish chromosomes and evolutionary significance, Fish biotechnology, fish as a cytogenetic model various methods of studying fish chromosomes.

REFERENCES

- Baldwin. (1966): Dynamic aspect of Biochemistry, Cambridge, England.
- Brown.M.E. (1957); Physiology of fishes, Vol.I & II. Academic Press, N.York.
- Cherfas, B.I.(1978) Genetics, Selection and hybridization of fish,Jersulam,Israel Prog.for scientific Translations ,JPST Cal,No.600 424.
- Conn, E.E.and Stumpf, P.K. (1976): Outlines of Biochemistry, Wiley Easter, and Delhi.
- Denton, T.E. (1973): Fish chromosome Methodology.Cahrles C.Charles Thomas publisher, spring field, IL.U.S.A.
- Folk G.E. (1974): Text book of environmental physiology. Lea and Febiger, Philadephia.
- Francisco, J.A. and Kiger J.A. Jr.: Modern Genentics, The Benjamin comings pub, Co, Inc.California.
- Fruton J.S. and Simonds, S. (1958): General Biochemistry II Edn, John Wiley and sons. New York.
- George, W.b. (1980): The scientific of Genetics; An introduction of to Heredoty.IV.Edn. acmillan pub.,co.,Inc.New York.
- Unther, A.C.G. (1980) An introduction to the study of fishes, Today and Tomorrows Book Agency, New Delhi.

- Halver, J.E. (1972): Fish nutrition, Academic Press London,
- Harper, H.A. (1983): Review of physiological chemistry. Large Medical Pub., Los Altos, U.S.A.
- Hoar, N.S. and Randall D.J. (1969-78): fish physiology vol. I to X Academic Press N.York.
- Hughes G.M.: Comparative physiology of vertebrate respiration Heinemann Education Book, London.
- Irwing, H.H. (1977): Principles of Genetics II Edn, Mac Millan Pub, Co. Inc, N.York.
- Lehninger, A.L. (1984): Bioenergetics-2nd ed., The molecular basis of biological energy transformation, W.A. Benjamin Inc.
- Lehninger, A.L. (1984): Principles of Biochemistry. Kalyani publishers Ludhiana.
- Prosser C.L. and Brown, F.A. (1962): Comparative animal physiology. W.B. Saunders Co., Philadelphia
- Shimeno, A. (1980): Studies on carbohydrates metabolism in fish. Oxford and IBH Publishing Co, Pvt, Ltd.
- Shulman, G.E. (1974): Life cycles of fish, physiology and Biochemistry, John Wiley and Sons.
- Suttle, J.W. (1977): Introduction to Biochemistry. Holt Reinhart and Winston, Tokyo.
- Vernberg, W.B. and Vernberg, F.J. (1972): Environmental physiology of Marine animals. Springer Verlag-Stuttgart.
- Vernberg, W.B. and Vernberg, F.J. (1974): Pollution and physiology of Marine organisms. Academic Press, N.York.
- Waterman, T.H. (1961): The physiology of crustaceans. Vol. I & II. Academic Press, N.York.
- William H.T. (1980): Henrey, M. Yost Jr.: The sciences of Genetics. Prentice Hall of India Pvt. Ltd, New Delhi.

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PRACTICALS –I: HYDROBIOLOGY

Water quality studies of fresh water, estuary and marine waters. Estimation of dissolved oxygen, Carbon dioxide, total hardness, alkalinity, salinity, suspended solids, calcium, Magnesium, Phosphate, Silicate, Nitrate, Nitrite, Ammonia. Measurement of turbidity of pond/ lake, Soil analysis (Phosphate, Carbonate, bicarbonate, organic matter, PH, Carbon). Study of fouling plants animals –through visit to coastal area.

PRACTICALS –II; BIOLOGY OF PLANKTON

Identification of phyto and Zooplankton, Quantitative estimation of plankton, Determination of primary and Secondary productivity, Study of freshwater/ marine algae, fungi and seagrasses, Identification, of microbes, Isolation and maintenance of pure culture staining-bacteria.

PRACTICALS – III; HISTOLOGY, BIOCHEMISTRY AND GENETICS

Study of histological structure of different organs of fish.

Biochemical estimation of protein with Biurate reagent.

Estimation of Sugar And Ascorbic acid

Activity of succinic dehydrogenase, acid and alkaline phosphatase.

Mitotic chromosome preparation from gills.

DNA & RNA staining.