

**FURTHER DETAILS REGARDING MAIN TOPICS OF  
PROGRAMME NO. 10/2015 (Item No. 33)**

**ASSISTANT DIRECTOR OF FISHERIES  
(ZONAL)**

**FISHERIES**

**(CATEGORY Nos. 624/2014)**

**Part I: Oceanography**

General introduction –world ocean – origin - dimension of oceans –development of ocean knowledge from early voyages - geographical features - physical and chemical properties of sea water (temperature, salinity, density, light and sound - distribution of temperature, salinity, density and oxygen in space and time. Ocean mixed layer and thermocline - dissolved and particulate organic matter in the sea -Water masses: formation and classification - T-S diagram - water masses of the world ocean -Estuaries and their classifications - Heat budget of ocean - insolation – long wave radiation - Bowen’s ratio. General circulation of the atmosphere – trade winds – wind-driven and thermohaline circulation - major currents of the world oceans – seasonal currents in the Indian ocean - upwelling and sinking. Ekman transport– El-Nino and La-Nina. The sea as a biological environment – Classification of marine environment - Introduction to marine life - primary and secondary producers, Evolution and food webs - Marine resources– Marine Hazards – Sea level rise and shoreline variability- Human impacts on the oceans -Coastal Zones and Coastal Zone management.

**Part II: Aquaculture**

Aquaculture – definition. Objectives, history and scope. Present global and national scenario. Aquaculture for rural development. Classification of aquaculture system – extensive, semi intensive, super intensive, monoculture, poly culture, composite fish culture, mixed farming,

mono sex culture. Aquaculture in ponds, pens enclosures, cages, running water, recirculatory system. Selection of sites for aquaculture practices – general considerations – Design and construction of aqua farms – components of fresh water, brackish water fin fish and shell fish farms. Selection of sites, selection of materials for open sea farming. Different designs of open sea farming. Bio engineering problems and solutions. Location, design and construction of carp hatchery, trout hatchery, freshwater prawn hatchery, brackish water and marine finfish and shell fish hatchery. Pumps and aerators – classification of pumps – types of aerators, compressors and blowers. Commercially important fresh water, brackish water and marine finfish and shell fish species and their aquaculture practices in India. Pre stocking and post stocking managements. Integrated aquaculture farming practices in India – history and scope. Organic aquaculture. Culture of cat fish, air breathing fish, cold water species and larvivorous species. Sewage fed fish culture. Seaweed culture. Fresh water pearl culture. Traditional fish and shrimp farming practices in India. Ornamental fish culture – Major groups of freshwater and marine fishes and other groups of organisms and their propagation. Aquarium plants and their propagation. Brood stock development and hatchery seed production of commercially important freshwater, brackish water and marine fin fish and shellfish species. Nutritional requirement of commercially important fin fish and shell fish - major and minor nutrients. Nutritional bioenergetics. Feed ingredients. Feed formulation and evaluation – feeding techniques and devices. Live feed culture. Genome manipulation in aquaculture. Selective breeding programme – Hybridisation. Production of mono sex population, sex reversal. Cryopreservation. Recombinant DNA technology. Transgenic fish. Introduction to fin fish and shellfish diseases, pathology and parasitology. Bacterial, fungal, viral, protozoan and nutritional diseases. Diagnosis of bacterial, fungal, viral and parasitic diseases. Prophylactic and control measures. Bioremediation in aquaculture systems.

### **Part III: Ecology and Pollution, Biostatistics, Instrumentation & Biological Techniques**

#### **Ecology and Pollution**

Environmental pollution – types, causes and consequences, concept of waste – types and sources of solid waste, e-waste, liquid waste and sewages, bioremediation, bioremediation for cleaning environment, phytoremediation, bio-filters, bio-films, Natural and man-made sources of radioactive pollution, radioisotopes of ecological importance, toxicity of heavy metals, Bioaccumulation and biomagnification, bio indicators, LC 50, Xenobiotics, teratology, Wetlands and its importance, Ramsar sites, industrial pollution of water bodies, coastal pollution, overexploitation of coastal zone, sand mining and its impacts, surface run-

off, wetland reclamation causes and consequences, remote sensing, GPS and its application, EIA and its tools and technology, Climate change and its impacts, mitigation and adaptation, role of UNFCCC and IPCC, restoration ecology – need and policies, ecological foot print, carbon foot – print, carbon credit, eco-taxes, Ecotone and edge effect, habitat fragmentation and destruction, depletion of biodiversity in aquatic systems, alpha, beta, and gamma diversity, Species Diversity indices, guild, niche, food web and food chain, energy flow, intellectual property rights, copy rights, designs, patents, trade marks, geographical indications, bio-piracy, carrying capacity assessment, water budgeting, biosphere reserves, mangroves, derelict water bodies – problems and management.

### **Biostatistics**

Types of sampling, Data collection – analysis and data representation, Measures of central tendency – measures of dispersion, Standard deviation, Correlation, Regression, Graphic methods, Probit analysis, tests of significance, Analysis of variance, Probability – statistical softwares

### **Instrumentation and Biological techniques**

Microscopy, Chromatography, Electrophoresis, Colorimetry and spectroscopy, Centrifugation, Biological and histological techniques – microtome techniques, fixation and staining, Histochemistry of macromolecules – detection of carbohydrate, proteins and lipids, Micrometry.

### **Part IV: Fishery Biology**

Principles of taxonomy- Type concept- Binomial nomenclature- Classical taxonomy – morphometrics – meristics- Identification and classification of fin fish, crustaceans, molluscs, aquatic algae and sea weeds of commercial and aquacultural importance- - dichotomous keys. Modern taxonomical tools – Electrophoretic methods-. Karyotyping. Molecular markers - Mitochondrial DNA and nuclear genes- DNA Barcoding- Bioinformatic tools- softwares. Census of marine life- Online repository- web based databases - Fish base- sealifebase- worms- Itis

Life history traits - Food and feeding habits – Feeding types- trophic levels- feeding adaptations- methods of study – gut content analyses- food indices. Nutritional and digestive physiology- Endocrine control of growth. Respiratory pigments, gas exchange concept, osmoregulation.

Age and growth – methods-.Dimensions of growth. Length-weight relationships. Concepts of fish stock, population - Macro and micro analytical models -Von Bertalanffy's growth equation- Growth and mortality parameters- estimation Stock- cohort- recruitment. Surplus

model- MSY- Swept area method- Box model – Stochastic model. Gear selectivity. Yield per recruit on analysis –Thompson and Bell analysis. Overfishing- fisheries management strategies- Multispecies fisheries management- Ecosystem based fisheries management- Ecopath- Ecosim.

Reproduction and development in fishes, crustaceans and molluscs of commercially important species-Sex differentiation in fishes - Reproductive strategies in fishes Maturation and spawning, spermatogenesis, oogenesis, yolk formation, Embryo genesis -life history stages- relative condition factor, size at first maturity- fecundity – ova diameter studies. role of endocrine system in reproduction- basis of heredity-

Migration reasons and methods. Physiology of migration and behaviour,.Type of schools and their characteristics- fish behavior.

### **Part V: Fishing Method**

Major inland capture fishery resources of India. Capture fishery -riverine, lacustrine-estuarine fisheries in India. Inland capture fisheries in Kerala - major inland water bodies – fin fishes and shell fishes of commercial importance- inland craft and gear- fishing methods- fish production statistics. Problems and prospects in inland capture fisheries of Kerala.

Marine fishery resources of India. Fisheries potential of EEZ and present level of exploitation. Marine fisheries of Kerala - major fishing grounds- pelagic –midwater-demersal fishery- fishery resources- craft and gear- fishing methods- fish production statistics- contribution by traditional, motorized and mechanized sectors -mud bank fisheries – upwelling- monsoon fishery. Tuna resources of the EEZ of India- fishing methods- status of exploitation.

Deep sea fishery resources- deep sea fishing- Exploratory fishery surveys. Chartered and joint ventures. Policies.

Fishing boats- types of boats used in India. Construction of fishing boats- principal measurements and coefficients of form – Line plan -offset table - mould lofting. Marine Engines – 2 stroke and 4 stroke engine – petrol and diesel engine – various parts of engine and their functioning. Different propulsion system – outboard motors –inboard/outboard engines. Maintenance of engines and boats. Electronic equipment used in fishing- echosounder- sonar- net sonde- trawl eye- Navigation – charts- GPS- radio equipment- Deck equipment.

Fishing gears - natural and synthetic materials -numbering systems- Classification of gears- types of gears in India- Trawl- Seines- Ring seines- Purse seines- Gill nets. Floats and sinkers-Hooks- baits. Principles of fishing gear designs. Gear operations.

## **Part VI: Fish Processing technology, Quality Control and Fish Marketing**

Proteins – Structure – Types – Amino acids. Lipids and Fatty acids, Carbohydrates Vitamins and Minerals. Rigor mortis, Glycolysis, Lactic acid formation, ATP, Hypoxanthine, Come-up-time, Thermal death time, K-value, Z-value, F-value, Cold point, Autolysis, Belly burst, Rancidification, Aldehydes, Ketones, Hydroperoxides, Total volatile base nitrogen (TVBN), Non protein nitrogen (NPN), Alpha amino nitrogen (AAN), Free fatty acids (FFA), Thiobarbituric acid value (TBA), Peroxide value (PV), Microbial spoilage, Enzymatic and Organoleptic spoilages in fishes. Hedonic scale, Scoring method., Curing, Freezing, Canning, Irradiation, Fish by-products and Value added products, Food additives and Sea food toxins. Domestic and Export market, Sea food trade, Green certification, MPEDA, HACCP, EIA Regulations, EU Regulations, USFDA, EEC, GMP, ISO, BIS, Codex Alimentarius commission, TQM Concept.

## **Part VII: Fisheries Management**

Marine fisheries - challenges of multi-gear fisheries- open access, regulated fisheries. Monitoring, Control and Surveillance system.

Marine Protected Areas, Sanctuaries – Bio-reserves. Establishment of National marine parks, *in situ* and *ex situ* conservation. FADs- Coral reef conservation.

Protection and restoration of fish stock- ranching – exotic introduction – endangered species- IUCN red list-

Fisheries policies- instrument and mechanisms for inland, coastal and open ocean fisheries management- input control measures - access control- duration of fishing- fishing effort control- Trawl ban- ban on destructive fishing methods. Output control measures- total allowable catch- catch quotas- licensing. Closed fishing areas- closed seasons- mesh size regulation-- minimum legal size- TED- BRD- limited entry.

UNCLOS, FAO Code Of Conduct For Responsible Fisheries- EBFM. - Community participation in fishery resource management- Co-management in fisheries- IUU fishing- Certification of fisheries

Fisheries Acts and Legislations in India- Indian Fisheries Act, 1897- Merchant shipping Act,1958-Maritime Zones Act 1976; 1981- KMFR Act 1980-Biological Diversity Act, 2002 – Registration of fishing vessels- Deep sea fishing policy- guidelines- Chartering- Joint ventures

Demand analysis – production theory- analysis of costs- Market structure – market channels- market mix - price determination- fish pricing- competitions.

Management process (planning, organising, staffing, leading and controlling. Human Resource Management- staff, training and development, motivation, maintenance-recruitment, selection, socialization, performance appraisal, promotion, transfer, demotion, separation, compensation.

Status of fisheries exploitation- catch trends- marine and inland fish production trends in Kerala- development of aquaculture fish production in Kerala

Development of fisheries sector- five year plans- role of department of fisheries-agencies – various developmental schemes- achievements.

Principles, concepts, and practices of fisheries extension systems and approaches - extension approaches practiced by Department of Fisheries, KVKs, Agricultural Technology Management Agency (ATMA), NGOs, FAO, Bay of Bengal Programme (BOBP-IGO), FFDA, BFFDA, ADAK- Information and Communication Technology (ICT) in fisheries extension. Advantages and limitations of present welfare and subsidy oriented extension systems- communication -skills – process- recent communication technologies.

## **Part VIII: General Knowledge, Current Affairs & Renaissance in Kerala**

### **Salient Features of Indian Constitution**

Salient features of the Constitution - Preamble- Its significance and its place in the interpretation of the Constitution.

Fundamental Rights - Directive Principles of State Policy - Relation between Fundamental Rights and Directive Principles - Fundamental Duties.

Executive - Legislature - Judiciary - Both at Union and State Level. - Other Constitutional Authorities.

Centre-State Relations - Legislative - Administrative and Financial.

Services under the Union and the States.

Emergency Provisions.

Amendment Provisions of the Constitution.

### **Social Welfare Legislations and Programmes**

Social Service Legislations like Right to Information Act, Prevention of atrocities against Women & Children, Food Security Act, Environmental Acts etc. and Social Welfare Programmes like Employment Guarantee Programme, Organ and Blood Donation etc.

## **RENAISSANCE IN KERALA**

### **Towards A New Society**

Introduction to English education - various missionary organisations and their functioning- founding of educational institutions, factories, printing press etc.

### **Efforts To Reform The Society**

#### **(A) Socio-Religious reform Movements**

SNDP Yogam, Nair Service Society, Yogakshema Sabha, Sadhu Jana Paripalana Sangham, Vaala Samudaya Parishkarani Sabha, Samathwa Samajam, Islam Dharma Paripalana Sangham, Prathyaksha Raksha Daiva Sabha, Sahodara Prasthanam etc.

#### **(B) Struggles and Social Revolts**

Upper cloth revolts, Channar agitation, Vaikom Sathyagraha, Guruvayoor Sathyagraha, Paliyam Sathyagraha, Kuttamkulam Sathyagraha, Temple Entry Proclamation, Temple Entry Act, Malyalee Memorial, Ezhava Memorial etc.

Malabar riots, Civil Disobedience Movement, Abstention movement etc.

#### **Role Of Press In Renaissance**

Malayalee, Swadeshabhimani, Vivekodayam, Mithavadi, Swaraj, Malayala Manorama, Bhashaposhini, Mathnubhoomi, Kerala Kaumudi, Samadarsi, Kesari, AI-Ameen, Prabhatham, Yukthivadi, etc

#### **Awakening Through Literature**

Novel, Drama, Poetry, Purogamana Sahithya Prasthanam, Nataka Prashtanam, Library movement etc

#### **Women And Social Change**

Parvathi Nenmenimangalam, Arya Pallam, A V Kuttimalu Amma, Lalitha Prabhu, Akkamma Cheriyan, Anna Chandi, Lalithambika Antharjanam and others

#### **Leaders Of Renaissance**

Thycaud Ayya Vaikundar, Sree Narayana Guru, Ayyan Kali, Chattampi Swamikal, Brahmananda Sivayogi, Vagbhadananda, Poikayil Yohannan (Kumara Guru), Dr Palpu, Palakkunnath Abraham Malpan, Mampuram Thangal, Sahodaran Ayyappan, Pandit K P Karuppan, Pampadi John Joseph, Mannathu Padmanabhan, V T Bhattathirippad, Vakkom Abdul Khadar Maulavi, Makthi Thangal, Blessed Elias Kuriakose Chavara, Barrister G P Pillai, TK Madhavan, Moorkoth Kumaran, C. Krishnan, K P Kesava Menon, Dr. Ayyathan Gopalan, C V Kunjuraman, Kuroor Neelakantan Namboothiripad, Velukkutty Arayan, K P

Vellon, P K Chathan Master, K Kelappan, P. Krishna Pillai, A K Gopalan, T R Krishnaswami Iyer, C Kesavan. Swami Ananda Theerthan , M C Joseph, Kuttippuzha Krishnapillai and others

**Literary Figures**

Kodungallur Kunhikkuttan Thampuran, KeralaVarma Valiyakoyi Thampuran, Kandathil Varghese Mappila. Kumaran Asan, Vallathol Narayana Menon, Ulloor S Parameswara Iyer, G Sankara Kurup, Changampuzha Krishna Pillai, Chandu Menon, Vaikom Muhammad Basheer. Kesav Dev, Thakazhi Sivasankara Pillai, Ponkunnam Varky, S K Pottakkad and others

**GENERAL KNOWLEDGE AND CURRENT AFFAIRS**

General Knowledge and Current Affairs

***NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.***