

SYLLABUS FOR POST GRADUATE STUDENTS AND DEPARTMENTAL OFFICERS*

FISHERIES TRAINING INSTITUTE, KAKINADA 2,
ANDHRA PRADESH, INDIA

SYLLABUS

PAPER I. INLAND PISCICULTURE

- i. Fish culture in rural economy: Resources available - different types of waters and their utilisation - Fish culture as sole or subsidiary occupation - Fish cultural practices in India and Indo-Pacific Region.
- ii. Productivity of fish ponds: Factors of production Physical - Chemical conditions of water - nature of soil - Primary production by plants - Food chain Plankton and other food - of Fish - role of plants in Pond culture - prevention of wastage of productivity - Increasing the productivity - Food and feeding of fish.
- iii. Survey: of ponds, tanks and such other confined waters - purposes, procedure and equipment location - Physical conditions Hydrobiological assay-estimation and collection of plankton-Identification of fresh water fishes, aquatic insects and aquatic plants - maintenance of records.
- iv. Cultivable species of fishes: Qualities desirable - carps (indigeneous and exotic) - salt water fishes (Chanos Mulletts) other types of cultural value (Gourami, Murrels and Tilapia) - their bionomics and life histories (with special reference to breeding habits, feeding habits and growth) - trout culture in hill streams.

*IPFC/C66/SYM 26.

v. Fish Seed:

(a) Collection: Principles and procedure (including precautions) - Use of basket traps spawn and fry collections (including location of collection grounds, need for proper identification - Induced breeding - (Natural and artificial) - Artificial fertilisation - Cross breeding.

Collection of salt water species and their acclimatisation.

(b) Rearing (Spawn and fry): Hatching pits and Hapas - Cement cisterns - nurseries and rearing ponds - construction, preparation and maintenance manuring (organic and inorganic) Estimation of density of plankton - identification of planktonic organisms - prevention and elimination of predators trial netting - Removal of unwanted fishery - rate of Growth - sorting and thinning.

(c) Transport: From collection grounds to nurseries to rearing, stocking ponds - use of mud pots, round tin carries, oxygen packing in plastic bags - procedure and precautions - short discussion transport, long distant transport.

vi. Stocking: Seasonal and perennial waters - preparation for stocking - eradication or predators, unwanted fishes and weeds - Manuring - stocking programme - compatible species - stocking density - Actual stocking procedure.

vii. Fish pond management: Control of factors of productivity trial netting - Rate of growth - remedial measures for poor growth - removal of predators, unwanted fishes and weeds manuring artificial feeding - parasites - disease and mortality - prevention and rectification.

Culture of other species provision of special requirements - Harvesting yield - Rational exploitation - Scientific and economic principles.

viii. Design and construction of fish ponds and fish farms: Aims and purposes of fish farms - layout - soil - water supply - construction principles - operation and maintenance of fish farms - fish farmers calender - fish farming implements.

ix. Ornamental fishes - public health fishes - sport fishes forage fishes.

x. (a) Natural systems: Role of rivers in Inland Fisheries - Survey improvement to river fisheries - Rational utilisation habitate - improvement - control of undesirable species.

(b) Irrigation systems and fisheries - Anicuts - dams, reservoirs and irrigation system - change from fluviatile to Lacustrine conditions - effect on fishery - remedial - measures - Fishery below anicuts and dams - Fishery in reservoirs - fishery in canal system and connected waters - rational utilisation - pollution of waters - effects - remedies.

- xi. Estuarine Fisheries: Hydrobiological conditions - Rational exploitation - special fisheries like Hilsa, Mulletts and prawns - Estuarine fish farming - Chanos, mullet, prawn and oyster culture - reclamation of swamps and marshy lands.
- xii. Inland Fisheries Research: Main objective - making fish culture easier and more profitable - improvement in quality and quantity of seed - Introduction of new species - Research on factors of productivity and increase in productivity - rational utilisation of resources.

PAPER II. MARINE FISHERIES

- i. The Seas: Distribution of land and water - Geographical nomenclature - Physical feature of the sea - continental shelf - slope - abyss - Sea bottom - sampling the bottom.
- ii. Water movements: Currents and current systems tides and tidal streams - measurement of drifts and current - swell and waves - The Surf - vertical movement and "Upwelling".
- iii. The Chemistry of Sea Water: Salinity and Chlorinity (Constancy of composition) - Dissolved gasses - Ph. and Carbondioxide system - effect of rivers on composition of sea water - collections of samples and water analysis.
- iv. Populations of the Sea: Plant group of the sea - Thallophyta - Blue green - Yellow green - Green - Brown and Red algae.
- v. Succinct review of primary divisions (Phylum and class of animals of the sea - Their identification in the field.
- vi. Ecological groups and their relation to Physical, Chemical and Biological factors in environment:

"Plankton" (Macro-micro-Nanno) - Temporary - permanent -
"Nekton" - (Neretic - Oceanic - Pelagic - Demersal) "Benthos"
Tidal - Littoral - Archibenthic - Abyssal - Effect of light -
Temperature, Salinity, currents, oxygen, oyster - crowding and
predators - ecological groups.

- vii. Plankton and the "productivity" of the Sea: Primary productivity of the sea - Cycle of organic productivity phyto-plankton production plant nutrient consumption - as an index of organic production - Zoo plankton production - The Biomass.

Phyto-Plankton and Physico-chemical environment - floatation - factors of Phyto - plankton - production - energy factors - nutrient sales - accessory organisms (Bacteria) vertical transport - pasturage - Temperature and salinity - light - compensation depths - Nitrates and phosphates - Vertical and Horizontal circulation of water - Phosphates - Stabilisation - Distribution of Nitrates, Phosphates and silicates and factors influencing their distribution of Nitrates - Phosphates and silicates - and factors influencing their distribution - Nitrogen and Phosphorous cycles in the sea.

Plankton and Fisheries

Collection and analysis of Plankton.

- viii. Nekton and the "Fisheries": Animals constituting fisheries - Demersal and pelagic - neretic and oceanic - Fisheries of the world of India - of Andhra Pradesh - Important food fishes (including prawns and shrimps) of Andhra Pradesh - A general account of their life histories.

Turtles and marine mammals and their utilisation.

- ix. Benthic animals and commercial importance: Sponges - Corals - Pearl oyster - chanks - Edible oyster - and other edible molluscs - Windowpane oyster - molluscs for lime.

- x. Sea weeds and their utilisation: Food - Manure - Algin - Agaragar - Iodine - Potash.

- xi. Fluctuations in Marine Fisheries: Variations in catch measurement - Catch per unit - exploited and virgin stocks effect of fishing - brood strength causes of fluctuations - remedies.

- xii. Marine Fisheries Research: Principal objective - Ways of achieving it - Dynamics of fish populations spawning behaviour - manner of reproduction - fecundity - age and growth distribution and migration (Stocks and races) - Population parameters - entry into exploited phase - recruitment - fishing mortality - natural mortality - mean growth rate prediction of yield - Eumetric fishing.

Contribution of Oceanography, Fisheries Biology, Marine Biology and Marine Ecology to Fisheries.

PAPER III. FISHING GEAR

- i. Gear materials: Sources - kinds - characteristics - Yarn
twine - ropes - wire.
- ii. Synthetic material: Types - Terminology and count characteristics - Advantages and disadvantages.
- iii. Net making: Twisting of twine - preparation of webbing -
joining and tailoring of webbing - hanging of webbing -
strains and stresses.
- iv. Accessories: Floats - sinkers - Anchors - Making materials.
- v. Net preservation: Causes of deterioration - preventive
measures - Sterilization - sun-light - Copper salts - Tanning
preservation - Bicromate treatment - Coal Tar - Mobiledeck
Creosote - Cutch - Acetone.
- vi. Fishing Strategy: The Fish - Physical characteristics habitat
- Food Breeding - Movement.

Fishing area - Distance - Depth - Nature of bottom - Tides and
Currents.

Elements of catching - surprise - enticoing - impounding filtering
- entangling - enclosure - dragging - dynamic and passive.
- vii. Fishing Gear: Classification - efficiency - underwater instru-
ments to study working of net-selectivity of gear-efficiency of
gear - fishing intensity - fishing capacity.
- viii. Indigenous Fishing Methods: Cast net - dip net - drag net and
Rangoon net - Deep Water Fishing.

Shore seine - Boat seine - Drift nets - entangling nets hook
and line.

Hook and line - various kinds and sizes - bait - purpose -
movement - holding the fish - fishing depth - hand lines long
lines - trolling - Pole and line fishing - shark fishing.
- ix. Improvements to indigenous methods: Improvements to gill net
fishing - Bottom set and drift - trammel net.

- x. New Methods: Beam - pair - otter and midwater trawl factors involved in trawling - nature of bottom - type of fish - depth - length of warp - otter boards - (Difference types - Angle of attack weight, and size) - Height of the net relationship to current - Floats and sinkers - Actual Operation - speed of tow - observation and performance.
- Purse seines - Danish seine - Lampara - General principles of construction and operation.
- Fishing with lights - Electrical fishing.
- xi. Exploratory and Experimental Fishing: Modification of existing gear - experiments with new gear - fish detection and fish ranging - locating new fishing grounds.
- xii. Design and construction of fishing gear: Design of trawls - design of purse seines - design of gill nets - engine power and size of net - construction of nets - type and size of twine webbing shape - Assembly of the net - otter boards (Shape size and weight) performance of floats - all with particular reference to trawls and trawling.

PAPER IV. FISHING CRAFT

- i. Indigenous craft: Coracles and Sangadams - General description of catamarans - shoe Dhoni - Masula Boat Navas.
- ii. Motorised craft: Need for motorisation - motorisation of existing craft - New types of boats - factors involved in designing of fishing boats - Elementary knowledge of fishing boat construction - mechanisation use of gurdv, winch, line hauler and power blocks.
- iii. The Internal Combustion Engine: Various types - High, middle and low pressure - classification - petrol, diesel and semi-diesel - Two stroke and four stroke - advantages and disadvantages - various makes of engines.
- iv. Principles and definitions: Matter - Weight - volume - inertia - Elasticity - Solida - liquids gases - work energy power - friction - force - centrifugal force - Heat mechanics.
- v. Construction of Motor: Parts of a motor - frame - crank case - crank shaft - Camshaft - Main bearings - Cylinder - Piston connecting rod (top dead centre, bottom dead centre - Piston travel - combustion volume - Total volume combustion chamber valve and valve movements - fuel pump - atomiser - Governor - Fly wheel.

- vi. Lubrication system: Lubricants - types - properties use of pure prescribed type of oil - hand - drip pressure - supply to various parts.

Cooling system: Air - water - pump - connection - supply - delivery.
- vii. Maintenance and trouble shooting: Maintenance of cylinder and piston - causes of piston leakage and ~~were~~ on liners remounting bearing - valve clearance - effects of wrong clearance - fuel pump defects - Bosch pump defects - defects of fuel injectors - Defects of cooling system - fuel system - Air system - Governors - Transmission (Alignment).
- viii. Running of motors: Preparation for starting a motor - After the motor starts - during running of the motor - Defects - bad compression - overloading - smoke - knocking - increased oil consumption etc.
- ix. General maintenance of a motorised boat: Care of the hull (scraping, caulking and painting) - care of the engine overhauling as per manufacturers' instructions - preventing rust and rot - fulfil statutory and administrative requirements maintenance of log - prompt repairs and replacements.
- x. Surf landing boats: Principles - problems - limiting factors - beach landing equipment.
- xi. Service facilities: Maintenance, repairs and replacement for engines - avoidance of wastage of fishing daws - economic aspects of proper maintenance provision of proper facilities - supply of fishery requisites.
- xii. Harbour facilities: Present position - Restrictive factors of surf landing craft - fishing harbours - need for concentration of fishermen in few good "Fishing Centres".

PAPER V. NAVIGATION AND SEAMANSHIP

- i. Statutory regulations: Mercantile marine - Harbour craft survey - registration - customs - health - certificates - (Equip crew - life saving - Fire fighting).
- ii. Preparing to "Go Out": Complete equipment (including fishing requisites) - Crew - food - water - first aid precautions for emergencies - Engine failure - (Mast - sail cars) rough weather (anchor, sea anchor-oil) - Distress signals.

Weather prospect - storm signals.

- iii. Leaving the harbour: Action of propellor of rudder - principles of ship control - wind and tide other craft alongside - helm orders.
- iv. Under Way: Rules of the road - regulations for preventing collision - look out.
- v. Navigating the boat:
 - a. Direction: Compass - principles - construction types of and variation - deviation - gyrecompass - Radio Direction finding.
 - b. Depth: Hand lead - kelvin depth finder - Echo sounding.
 - c. Coastal Navigation: Running fixes - four point bearing - doubling angle on bow - Transferred position line fix to find distance a boat will pass abeam of an object - keeping to selected track - lee way - set and drift - tides and trial ranges - pilotage in channels and river mouths - International system of buoyage - Night navigation - fog signals - lighthouses.
 - d. Use of sail in an emergency (engine break down) parts of a sail - principles of sailing - rules of road for sailing vessels.
 - e. Elementary knowledge of celestial navigation.
- vi. Charting of fishing grounds:
 - a. Position fixing by cross - bearing bearings - by use of sextant and station - pointer - bearing and alignment - bearing and depth alignment and depth - "DIP" of objects of known height.
 - b. Chart: Chart projection - mercators - chart - symbols and abbreviations - charting and chart work.

Ropes and purchases: Types of ropes - characteristics - use and care of ropes - knots - bends and splices - tackles (Blocks - land - pulleys) derricks.
- vii. Signaling - Seamaphore - morse - International code.

- viii. Ship handling at Sea: Wind, Swell and waves - effect on ship movement - prevention of synchronisation - rough weather - use of sea anchor and oil.
- Going alongside another boat - going away from it.
- Anchoring and mooring.
- Handling of boats during fishing - shooting of net-towing or drifting - hauling.
- ix. Return to Harbour: Propeller and rudder action - wind and tide - principles of ship handling - while docking alongside wharf proper - lay up of boat.
- x. Surf - crossing and beach landing: Surf formation dynamics of surf - effect on boats - crossing the surf - landing on beach - hauling up.
- xi. Log and accounting: Maintenance of log - accidents and incidents - costs - expenses - receipts - economics of the Unit.

PAPER VI. FISHERIES MANAGEMENT

- i. Fisheries and National Economy: Importance of fisheries and of protein - fish as a source of protein - Liver oils and vitamins - Fisheries as Income Generator - Fisheries resources, fishing grounds of the world and of India.
- ii. Fishery Statistics: Uses - information needed, methods - Random sampling - catch per unit effort catch.
- iii. Fishery legislation: Purpose - Many general theories proved by facts - review of various types of regulation - benefit mainly to sedentary species or congregations - artificial barriers - scientific and economic investigations to precede legislation.
- iv. Fishery economics: The operative - reasons for low economics productivity - removal of restrictive factors - special problems of under developed area lack of capital - organisational weakness - possibilities and examples of improvement - Financial assistance and capital formation - Greater share in fish prices - "Take Off" stage.

- v. Fish marketing: Functions of marketing - patterns of marketing - role of cooperative storage and transport facilities - improvement to fish and markets - quality control - price stabilisation - consumers and marketing.
- A study of Hong Kong marketing organisation and sales organisations of Norway - General fish marketing in other countries.
- vi. Fish preservation: Composition of fish - changes after landing - principles of preservation - gutting and bleeding - practical aspects of use of ice; cold storage and quick freezing.
- Salting and salted products - various types - canning smoking - pickling - other preservatives a general idea.
- vii. Fishery By-products: Liver oils - extraction and utilisation.
- Fish meal: Small scale manufacture - Fish manure - use of fish waste and surplus fish - fish oil - a general idea of its extraction and use - fish scales - their use in artificial pearls. Dealing with a stranded whale.
- viii. Fishery Sciences: Role of science in fishery management data and evidence - basic and applied research - factors limiting abundance - effects of exploitation - tags and marking - Age and growth - gear selectivity - objective "Factors" of catch - pattern of occurrence - potency of unit - factors affecting populations - use resources - information required by fishermen.
- ix. Fisheries and Weather: Wind and Beaufort scale - State of the sea - terms used - Monsoon - Storms and cyclones - their formation - behaviours - storm signals use of barometer.
- x. Fisheries "Extension": Definition - need - methods - extension work in community development programme - Panchayat samithis and private pisciculturists - orientation of village level workers - publicity and information to public.
- xi. Fisheries Development: Fishing - Fishing and Fisheries characteristics of fisheries - climates for development - conditioning factors in development - development and leverage - basic leverage patterns - method and instrument of leverage.
- Present status of industry and prospective lines of the development.
- Formulation and management of products - Avenue of development "Costs and returns".
- xii. The Fisheries Department: Aims - Achievements so far - Government services to Fisheries in other countries. The "Plans" and their implementation - Scientific technological and economic - investigation social and economic uplift of Fishermen - Encouragement of private effort - role of fishery officer - fulfilment of the "Motto-Eager to learn and willing to work".