Proposed draft Syllabus for B.Sc. II Fisheries

Submitted to

Yashavantrao Chavan Institute of Science, Satara

(Autonomous)

Under

Choice Based Credit System (CBCS)

(June 2019-2020)

B.Sc. Part II Fisheries

Semester III

Paper I : Fishery Biology - I

Paper II : Inland Fisheries

Semester IV

Paper III: Fish Physiology - I

Paper IV: Aquaculture

Yashavantrao Chavan Institute of Science, Satara

(Autonomous)

Syllabus for Bachelor of Science Part II

I) Title: Fisheries

II) Year of implementation: 2019-2020

III) Preamble:

1. To impart the knowledge of animal science to the pupils.
2. To make the pupil to use the knowledge in their daily life
3. To make the pupil aware of natural resources and environment
4. Application of knowledge in Fisheries for nutrition Aquaculture practice.
5. To provide practical experiences which form the part of their learning processes.
6. To develop aptitude for scientific work and ability to pursue studies far beyond graduation
7. To encourage the pupil to take life science as a carrier which is the need now a day
8. To make the pupil fit for the society

IV) General Objectives of the course:

1. To impart the knowledge is the basic aim of education. The students are expected to acquire the knowledge of animal science, natural phenomenon, manipulation of nature and environment by man.
2. Understanding the scientific terms, concepts, facts, phenomenon and their interrelationships.
3. Applications of the knowledge
4. To develop skills in practical work, experiments and laboratory materials, instruments
5. To develop interest in the subject and scientific hobbies
6. To develop scientific attitude which is the major objective, this makes the students open minded, critical observations, curiosity, thinking etc.
7. Abilities to apply scientific methods, collection of scientific data, problem solving, organize science exhibitions, clubs etc.
8. Appreciation of the subject, contribution of the scientists, scientific methods, scientific programmes etc.

V) Duration:

1. The course shall be full time course
2. The duration of course shall be one year.

VI) Pattern:

Pattern of examination will be semester for theory and practical with internal assessment scheme. (Seminar / Industrial Visit/ Educational Tour/ Project/ Field Visit)

VII) Medium of instruction:

The medium of instruction shall be in English

VIII) Structure of Course:

B.Sc. II Fisheries

IIIrd Semester – Number of papers 2

Paper I:

Fishery Biology I

Paper II:

Inaland Fisheries

IVth Semester – Number of papers 2

Paper III:

Fish Physiology I

Paper IV:

Aquaculture

Rayat Shikshan Sanstha's

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA

(AUTONOMOUS INSTITUTE)

Syllabus for B.Sc. Part – II introduced from June, 2019.

1.Structure of Syllabus:

B.Sc. – II **Semester –III**

Sr. No.	Course Title	Theory			Practical		
		Paper No.& Paper Code	No. of lectures Perweek	Credits	Course Title	No. of lectures per week	Credits
1	Fisheries	Paper-I: BZFT301	3	2	Practical Paper – I : BZFP303	8	4
		Paper-II: BZFT302	3	2			

B.Sc. – II **Semester –VI**

Sr. No.	Course Title	Theory			Practical		
		Paper No.& Paper Code	No. of lectures Per week	Credits	Course Title	No. of lectures Per week	Credits
1	Fisheries	Paper-III: BZFT401	3	2	Practical Paper – II: BZFP403	8	4
		Paper-IV: BZFT402	3	2			

Note: B: B. Sc. T=Theory and P= Practical

Evaluation Structure: B.Sc. II Sem-III & IV (Fisheries)

Semester	Paper No.& Code	ESE	InternalExam		Paper No. & Code	Practical		Submission		**Total**
			ISE I	ISE II		Exam	Journal	Seminar	Day to Day Performance	
III	Paper I :BZFT301	30	5	5	Pr. Paper I: BZFP 303(A)	25	5	5	5	**150**
	Paper II :BZFT302	30	5	5	Pr. Paper I: BZFP 303(B)	25	5			
	Total	60	10	10	Total	50	10	5	5	**150**
IV	Paper III BZFT 401	30	5	5	Pr. Paper II: BZFP 403(A)	25	5	5	5	**150**
	PaperIV :BZFT 402	30	5	5	Pr. Paper II: BZFP 403(B)	25	5			
	Total	60	10	10	Total	50	10	5	5	**150**
Total of Sem. III &IV		120	20	20	Total	100	20	10	10	**300**

B. Sc. Part II Semester- III

FISHERIES

PAPER-I

BZFT- 301 (FISHERY BIOLOGY I)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Learning Objectives:

1. Students are introduced to brief history of Fisheries regarding capture and culture fisheries in Inland and Marine waters, various activities like: i. Fishing. ii. Processing iii. Marketing& taxonomy of Shell and Fin Fishes.
2. Studentsshould able to learn morphology of mollusc, cartilagenous fish, bony fish, typical lung fish and internal anatomy of typical cartilagenous fish.
3. Students should able to learn internal anatomy of typical bony fish and economic importance of some important fin and shell fish.
4. Students should be aware of important general topics that is study of fins, swim bladder, migration and locomotion in fishes, lung fishes etc

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UNIT-I

1. An introduction to Fisheries: (04)

1.1 History in brief.

1.2 Inland, marine, capture and culture fisheries.

1.3 A broad outline of fishery activity: i. Fishing. ii. Processing iii. Marketing

1.4 Importance of fisheries.

2. Taxonomy of Shell-fish: (03)

2.1Classification and General Characters of Crustacea and Mollusca

3. Taxonomy of Fin-fish:(05)

3.1 General outline of the classification.

3.2 Chondrichthyes, Osteichthyes and Dipnoi.

UNIT-II

4. External Morphology of : (04)

4.1 Bivalve- Unio.

4.2 Typical cartilaginous fishes - Scoliodon

4.3 Typical bony fish- Labeo

5. Internal Anatomy of Fin fish : Scoliodon (07)

With reference to –

5.1 Digestive system

5.2 Circulatory system

5.3 Excretory and reproductive system

5.4 Brain

UNIT – III

6. Internal Anatomy of Fin fish: Labeo With reference to – **(07)**

6.1 Digestive system

6.2 Circulatory system

6.3 Excretory and reproductive system

6.4 Brain

6.5 Life Cycle of Labeo

7. Economic importance of the following: (04)

Prawn, Unio, Oyster, *Scoliodon*, *Harpodon*, Pomphret, Sardine, *Labeo* and *Catla*

UNIT – IV

8. Study of the following general topics : (11)

8.1 Study of fins: Evolution of paired and unpaired fins in fishes

8.2 Swim bladder.

8.3 Migration in fishes.

8.4 Locomotion in fishes :Carangiform, Anguilliform and Ostraciform

8.5 Lung Fishes.

8.6 Hill stream adaptation in fishes.

8.7 Parental care in fishes

_____**Total Periods= 45**

Learning Outcomes:

1. Students learn the history and importance of fisheries and also acquire the knowledge regarding the fisheries activities such as fishing, processing, marketing in Inland and Marine waters.
2. Students are made aware of taxonomy, general characters and outline of classification of shell and fin fishes using standard key.
3. Students are able to recognize molluscs, cartilagenous and bony fish by observing external morphological peculiarities.
4. Students learn internal anatomy of typical cartilage and bony fish.
5. Students acquire the knowledge of economic importance of fin and shell fish.
6. Students get knowledge regarding different types of fins, swimm bladders, types of migrations, locomotion and adaptation in fish.
7. Students learns the parental care in fishes.

References:

1. Fish and Fisheries of India : V. G. Jhingran. Hindustan Publication Corp. (India), Delhi**(Unit I)**

2. Tropical Fish Farming : D. K. Belsare. Environmental Publi. Karad, Maharashtra **(Unit I)**

3. Aquaculture : J. E. Bardach. J. H. Ryther and W. O. McLarney**(Unit I)**

4. Encyclopaedia of Fishes and Fisheries of India. A. K. Pandey. G. S. Sandhu Vol. IV. Anmol Publi. New Delhi. **(Unit I)**

5. An Introduction to Fishes : S. S. Khanna. Central Book Depot. Allahabad**(Unit I, II, III, IV)**

6. Vertebrate Z oology -Kotpal R.L.**(Unit II, III)**

7. Vertebrate Zoology- J.Z.Young**(Unit II, III)**

8. Chordate Zoology- Dhami and Dhami.**(Unit II, III)**

9. A Textbook of Fishery Science and Indian Fisheries : C. B. Shrivastav. KitabMahal, New Delhi.**(Unit III)**

B. Sc. Part II Semester- III

FISHERIES

Paper-II

BZFT- 302 (Inland Fisheries)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Learning Objectives

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1. Students should be introduced to different types of fresh water habitats with reference to food chain, food web and primary productivity.
2. Students should learn about activities in Inland riverine, reservoir, lacustrine capture fisheries.
3. Students should study different types fishing crafts, gears & their maintenance.
4. Students should learn different fish preservation and processing techniques**.**

UNIT- I

1. Freshwater Habitat:(05)

1.1 Introduction.

1.2 Characters and classification of : Ponds, Lakes, Streams, Rivers and Reservoirs.

2. Freshwater Ecosystems in Ponds, Rivers and Reservoirswith respect to: (08)

2.1 Food chain.

2.2 Food web.

2.3 Primary productivity.

UNIT- II

3. Inland Capture Fisheries: **(10)**

3.1 Riverine captures fisheries.

3.2 Reservoir capture fisheries.

3.3 Lacustrine capture fisheries.

UNIT- III

4. Fishing Crafts and Gears: **(12)**

4.1 Fishing Crafts: Rafts, Catamaran, Canoes, Machwa, Trawler.

4.2 Fishing Gears: Hooks and Lines, Cast net, Gill net, Trap net, Rampani net and Trawl net.

4.3 Maintenance of Fishing Crafts and Gears. **(03)**

UNIT- IV

5. Fish preservation and processing techniques **(07)**

Principle and methods with reference to

5.1 Refrigeration and freezing

5.2 Drying

5.3 Salting

5.4 Smoking

5.5 Canning

_____**Total periods = 45**

Learning Outcomes:

1. Student gets knowledge of different types of fresh water habitats with reference to food chain, food web and primary productivity.
2. Students are made aware of activities in Inland riverine, reservoir, lacustrine capture fisheries.
3. Students learn about different types fishing crafts, gears & their maintenance.
4. Student perceives different fish preservation and processing techniques.

Refernces:

1. Fish and Fisheries of India : V. G. Jhingran. Hindustan Publication Corp. (India), Delhi**(Unit I)**
2. Ecology - P.D. Sharma**(Unit I)**
3. A Textbook of Fishery Science and Indian Fisheries : C. B. Shrivastav. KitabMahal, New Delhi**(Unit I)**
4. A Manual of Freshwater Acquaculture : R. Santhanam. N. Sukumaran and P. Natrajan. **(Unit II)**
5. An Introduction to Fishes : S. S. Khanna. Central Book Depot. Allahabad. **(Unit II,III)**
6. Manual of Methods in Fish Biology : S. P. Biswas.**(Unit II,IV)**
7. Manual in Fishery Science : K. R. Reddy and M. G. Babare. **(Unit II)**
8. Fishery technology – Balachandran**(Unit IV)**

B. Sc. Part II

BZFP 303

FISHERY PRACTICAL-I

Marks-50 (Credits: 02)

PRACTICAL-I (Based on Biology and inland fisheries).

Learning Objectives

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1. Students should learn taxonomy oF the different shell fishes,
2. Students should learn about the morphology and the classification of some cartilagenous and bony fishes.
3. Students should study different types fishing crafts, gears & their maintenance.
4. Students should learn different economic importance of some valued fishes.

Group A:

I. Taxonomy of fin fishes;

Classification of the following fishes up to families:

1. Scoliodon, Pristis, Torpedo, Chimaera, Polypterus,
2. Acipenser, Amia, Lepidosteus,Harpodon, Eel,
3. Labeo, Clarias, Exocoetus, Hippocampus,Ophiocephalus,
4. Anabas,Pleuronectus, Echeneis,Tetradon and Antennarius.

II. Taxonomy of shell fishes:

5. Crustacea: Prawn, lobster and crab.
6. Mollusca: Unio, Pearl oyster and Sepia.

III. Morphology

7. Morphology of Scoliodon
8. Morphology of Labeo.

IV.Study of Fin:

9. Paired fins: Pectoral and pelvic fins
10. Unpaired fins: Dorsal, ventral and different types of caudal fins

Group B:

V. Mounting of the following scales:

11. Placoid

12. Cycloid and Ctenoid scales

VI. Study of different types of swim bladders:

13. Physostomous&Physoclistous

VII. Dissection of Catla, Mrigal or Cyprinus (Demonstration):

14. Digestive system

15.Heart and major blood vessels. (Demonstration)

16.Brain

VIII. Study of Crafts and Gears:

17. Crafts – i. Raft. ii. Catamaran. iii. Dugout canoe. iv.Trawler

18. Gears – i. Cast net. ii. Gill net. iii.Rampani net iv. Trawl net.

IX. Economic importance of the following:

19. Prawn,Oyster, Bivalve, Scoliodon,

20.Pomphret, Harpadon, Sardine, Labeo.

X. Visit to fish market

XI. Project related to economics of local fish market / survey of fish market / fish by-products

[Note: Sketches, Specimen/photographs may be used]

Learning Outcomes:

1. Students classify the Fin fish & shell fish by studying morphological peculiarities
2. Students learn the morphological peculiarities of typical cartilaginous and bony fish.
3. Students gain the knowledge of different types of paired and unpaired fins and their functions.
4. Student learns about different types of scales, their microscopic structure, function & importance in taxonomy.
5. Student learns about different types of swim bladder and function.
6. Student learns about Digestive system, Heart and major blood vessels, Brain by demonstration method.
7. Student learn to recognized different type of fishing crafts and gears.
8. Student acquires knowledge of economically important shell and fin fish.
9. Students learn about economics of different fishes in fish market.

References:

1. Vertebrate Zoology- R.L. Kotpal
2. Vertebrate Zoology – P.S.Dhami&J.K.Dhami
3. Vertebrate Zoology – S.S. Lal
4. Practical Zoology Invertebrates – S.S. Lal

5. Practical zoology B.Sc. I – Mutkekar, Shinde
6. Handbook of Practical Zoology B.Sc.I - Jadhav
7. Practical Zoology Chordates- Verma & Agarwal
8. Practical methods in ecology and environmental science- R K Trivedy, P K Goel C.L.Trisal
9. Techniques in Life sciences –D.B.Tembhare
10. Anatomy and Physiology of Fishes- Szantosh Kumar, ManjuTembhre
11. Chordates- H.V. Bhaskar
12. Chordate Zoology- E.L. Jordan & P.S. Verma

B. Sc. Part II Semester- IV

FISHERIES

Paper-III

BZFT- 401 (FISH PHYSIOLOGY I)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Learning Objectives

1. Students should learn about physiology of nutrition (food feeding and digestion) and respiration (types of gills, mechanism of respiration and accessory respiratory organs) in fishes.
2. Students should learn about physiology of circulation (composition of blood, structure of heart, mechanism of circulation) & excretion (structure and function of kidney and gills) in freshwater and marine water fishes.
3. Students should get knowledge of modes of reproduction and maturity stages in gonads of fishes.
4. Students should learn about importance of different sense organs and amazing organ in fishes.

UNIT – I

1. Nutrition: **(06)**

1.1 Food and Feeding.

1.2 Physiology of digestion.

1.3 Assimilation.

2. Respiration: (07)

2.1 Types of gills.

2.2 Mechanism of respiration.

2.3 Accessory respiratory organs- Anabas, Clarias and Saccobranchus.

UNIT- II

3. Circulation: (06)

3.1 Composition and functions of blood

3.2 Structure of heart in Scoliodon and Labeo

3.3 Mechanism of circulation in Scoliodon and Labeo

4. Excretion: (06)

4.1 Osmoregulation in freshwater, marine and diadromous fishes.

4.2 Structure and function of kidney.

4.3 Excretory function of gills.

UNIT- III

5. Reproduction :(07)

5.1 Modes of Reproduction: Oviparity,Viviparity, Ovo- viviparity and Hermaphroditism.

5.2 Maturity stages in gonads:

i) Resting phase (immature)

ii) Early maturing phase.

iii) Advanced maturing phase.

iv) Matured phase.

v) Spawning phase

vi) Spent phase.

UNIT- IV

6. Sense organs :(08)

6.1 Olfactory Organs:

6.2 Taste buds.

6.3 Eye.

6.4 Membranous labyrinth.

6.5 Lateral line system.

6.6 Ampullae of Lorenzini.

6.7 Weberian ossicles.

7. **Amazing organs in fishes :** **(05)**
7.1 Electric organs in fishes
8. Bioluminescence in fishes
9 .Venomous and Von-venomous fishes

Total periods = 45

Learning Outcomes :

1. Students understand physiology of nutrition and respiration.
2. Students understand physiology of circulation and excretion.
3. Students acquired the knowledge of different modes of reproduction and maturity stages in gonads of fishes.
4. Student understands the importance of different sense organs and gets information of different amazing organs in fishes.

References :

1. Textbook of Fish Culture : Breeding and Cultivation of Fish. Mare. Huet. **(Unit III)**

2. An Introduction to Fishes : S. S. Khanna. Central Book Depot. Allahabad. **(Unit I,II,III, IV)**

3. Textbook of Fish Culture : Breeding and Cultivation of Fish. Mare. Huet. **(Unit III)**

4. Fish and Fisheries- Pandy& Shukla **(Unit I,II,III,IV)**

5. Manual in Fishery Science : K. R. Reddy and M. G. Babare**(Unit IV)**

6. Manual of Methods in Fish Biology : S. P. Biswas.**(Unit I,II,III)**

B. Sc. Part II Semester- IV

FISHERIES

Paper-IV

BZFT- 402 (AQUACULTURE)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Learning Objectives

1. Students should learn definition, scope, history of aquaculture and should be able to compare aquaculture with agriculture at national and global level.
2. Students should gain the knowledge regarding pre-requisite of site selection and layout of fish farm.
3. Students learn about physico-chemical parameters of water bodies and criteria for selection of major species of fish for aquaculture.
4. Students should study different type of plankton and its importance &should also learn construction and setting of an aquarium.

UNIT- I

1. Introduction to Aquaculture: **(05)**

1.1 Basic Aquaculture- Definition and scope.

1.2 History of Aquaculture- Origin and growth.

1.3 Present national and global scenario.

1.4 Comparison of aquaculture and agriculture.

2. Types of aquaculture: **(07)**

2.1 Semi Intensive, Intensive and Extensive aquaculture.

2.2 Pond culture.

2.3 Pen and cage culture.

2.4 Running water culture.

UNIT- II

3 Prerequisites of site selection (04)

3.1 Topography

3.2 Soil type.

3.3 Water supply.

4. Layout of Fish farm: (04)

4.1 Types of ponds.

4.2 Construction of pond.

UNIT- III

5. Physico- chemical conditions of fish pond: (07)

5.1 Physical conditions: Depth, Temperature, Turbidity, Light.

5.2 Chemical conditions: Oxygen, Carbon dioxide, PH , Organic and inorganic contents.

6. Criteria for selection of aquaculture species. (03)

7. Major species of fishes for freshwater aquaculture. (03)

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UNIT– IV

8. Freshwater Plankton: (06)

8.1 Definition and classification

8.2 Morphological study of :

a) Phyto- plankton b) Zoo-plankton

8.3 Importance of plankton

9. Aquarium Fishery: (06)

9.1 Setting of an aquarium.

9.2 Common aquarium fishes:

a) Angel fish. b) Gold fish. c) Guppy fish. d) Gourami. e) Swordtail Fish. f) Molly g) Koi etc.

9.3 Breeding of aquarium fish

9.4 Maintenance

_____**Total periods = 45**

Learning Outcomes:

1. Students learns definition, scope, history of aquaculture and should be able to compare aquaculture with agriculture at national and global level.
2. Students gains the knowledge regarding pre-requisite of site selection(Topography, soil type and water supply) and layout(Construction and type of ponds) of fish farm.
3. Students learns about physico-chemical parameters of water bodies and criteria for selection of major species of fish for aquaculture.
4. Students are able to identify different type of plankton
5. Student learn to construct and setting of aquarium and rearing different type of an aquarium fish

References :

1. Fish and Fisheries of India : V. G. Jhingran. Hindustan Publication Corp. (India), Delhi **.(Unit I,II,III)**

2. Tropical Fish Farming : D. K. Belsare. Environmental Publi. Karad, Maharashtra.**(Unit I)**

3. Text Book of Aquaculture. M. S. Reddy**(Unit I)**

4. Freshwater Fish Pond Culture and Management. M. Chakrof.9 **(Unit II, III)**

5. A Handbook of Fish Farming : S. C. Agarwal, Narendra Publication House, Delhi**(Unit II,III)**

6. Encyclopaedia of Fishes and Fisheries of India. A. K. Pandey. G. S. Sandhu Vol. IV. Anmol Publi. New Delhi**(Unit II, III)**

7. Methods of Physical and Chemical Analysis of Water :Gotterman et.al. **(Unit III)**

8. An Introduction to Fishes : S. S. Khanna. Central Book Depot. Allahabad. **(Unit IV)**

9. Planktonology by kuby**(Unit IV)**

10. Aquarium System : 1981 : A. D. Hawkins. Academic Press.**(Unit IV)**

11. Aquarium Fishes and Plants : K. Bajaj and R. Zukal Himalayan Publication. **(Unit IV)**

12. Freshwater Aquarium : J. A. Dawas. Robert Royce. Ltd.**(Unit IV)**

B. Sc. Part II

BZFP 403

FISHERY PRACTICAL-II

Marks-50 (Credits: 02)

PRACTICAL-II (Based on Fish Physiology and Aquaculture)

Learning Objectives

1. Students learn about physico-chemical parameters of water bodies and criteria for selection of major species of fish for aquaculture.
2. Students should study different type of plankton and its importance &should also learn construction and setting of an aquarium.
3. Students should study different type of accessory respiratory organs in fishes.

Group A:

I. **Estimation of the following chemical factors from water sample.**

1. Dissolved oxygen.
2. Free carbon dioxide.
3. Alkalinity
4. Hardness

II. Determination:

5. Determination of primary productivity

IV. Estimation of:

6.Total glycogen in fish organ

7. Protein in fish organ

8.Lipid in fish organ

V. Demonstration of accessory respiratory organs in:

9. Anabas
10. Clarias.
11. Saccobranchus

Group B:

VI. Demonstration of:

12. Weberian ossicles

VII. Study of planktons:

13. Quantitative estimation of plankton

14. Qualitative estimation of zooplankton

VIII. Study of life cycle in Labeo-

15. Egg and sperms, fertilized egg, hatchling, fry, fingerling and adults

IX. Aquarium fishery:

16. Demonstration of tank fabrication

17. Setting of an aquarium

18. Aquarium fishes: i) Angel. ii) Gold fish iii) Guppy iv) Gouramy.

19. v) Molly vi) Swordtail fish vii) Koi

X. Visit to fish seed production center/Visit to aquarium shop

Learning Outcomes:

1. Students learn to estimate Dissolved oxygen, Free carbon dioxide, Alkalinity, Hardness of water samples.
2. Student learns to determine primary productivity of the water body.
3. Student learns to estimate total glycogen in fish organ, protein in fish organ, lipid in fish organ
4. Student understands the importance of accessory respiratory organ in different fishes.
5. Student gets knowledge about importance of Weberian ossicles.
6. Student learns Quantitative & Qualitative estimation of zoo-plankton.
7. Student understands different stages of life cycle in Labeo.
8. Student learns to construct the aquarium, setting of aquarium and rearing of different types of aquarium fishes.
9. Student learns different type of activities carried out at fish seed production center during their educational tour.

References:

1. Vertebrate Zoology- R.L. Kotpal
2. Vertebrate Zoology – P.S.Dhami&J.K.Dhami
3. Vertebrate Zoology – S.S. Lal
4. Practical Zoology Invertebrates – S.S. Lal
5. Practical zoology B.Sc. I – Mutkekar, Shinde
6. Handbook of Practical Zoology B.Sc.I - Jadhav

7. Practical Zoology Chordates- Verma & Agarwal
8. Practical methods in ecology and environmental science- R K Trivedy, P K Goel C.L.Trisal
9. Techniques in Life sciences –D.B.Tembhare
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11. Chordates- H.V. Bhaskar
12. Chordate Zoology- E.L. Jordan & P.S. Verma