Int.J.Curr.Microbiol.App.Sci (2018) *7*(6): 3395-3409

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 06 (2018)**
Journal homepage: http://www.ijcmas.com

Review Article https://doi.org/10.20546/ijcmas.2018.706.399

Professional Fisheries Education in India: History, Current Status and Future - A Review

Manmohan Kumar[1*], Udai Ram Gurjar[1], Naresh Raj Keer[1], Sanjay Kumar Chandravanshi[2], Archit Shukla[1], Shyam Kumar[1], Shubham Gupta[2] and Prasenjit Pal[2]

[1]ICAR-Central Institute of Fisheries Education, Panch Marg, Off Yari Road, Versova, Andheri (W), Mumbai-400061, India
[2]College of Fisheries, Central Agricultural University (I), Lembucherra, Tripura-799210, India

**Corresponding author*

Keywords

Deans' Committee, Fisheries Education, Mangalore, Professional

Article Info

Accepted:
22 May 2018
Available Online:
10 June 2018

A B S T R A C T

Professional fisheries education is a new branch of science, which is having tremendous potential sooner rather than later. A new era in the professional fisheries education in India started at the State Agricultural/Veterinary Universities with the establishment of first Fisheries College at Mangalore in 1969. Presently, there are thirty professional fisheries colleges in India. Professional fisheries graduates have employment opportunities in fisheries departments of Central and State Governments, fisheries research institutes, academic/ universities and so on. Legitimate assessments of workforce necessities of the fisheries sector are yet to be made. There is scope for producing more professional fisheries graduates. The graduates seem to require a superior establishing in administration procedures and more practical experience in commercial operations. The capability of fisheries sector could be used and created through quality advanced education in fisheries. With appropriate planning for developing fisheries, higher education following the above-mentioned strategies the development of fisheries sector could be accomplished to a more prominent degree. The Fifth Deans' Committee supporting the harmoniousness of perfection and significance has reasonably refreshed the agricultural and allied educational systems in India. The Report also prescribes minimum standards for setting up a new college and mostly professional fisheries colleges have implemented the ICAR Fifth Deans' Committee recommendations. The projections indicate that by 2022 the annual outturn required from professional fisheries colleges/institutions ought to be around 2,820 B.F.Sc., 450 M.F.Sc. and 220 Ph.D. The present yearly intake capacity of B.F.Sc., M.F.Sc. furthermore, Ph.D. programmes are 1,079; 417 and 181 respectively, while the annual outturn might be around 85-95% of intake.

Introduction

The population of India is expected to be 1.6 billion by 2050; the need for increased food production is a significant challenge. According to Annual Report 2016-17 (DOAHDF), fisheries is a sunrise sector with differed resources and potential, engaging more than 14.50 million people at the primary level and numerous more along the value

chain. Change of the fisheries sector from traditional to business scale has prompted an expansion in fish production from 7.5 lakh tonne in 1950-51 to 11.41 lakh tonne during 2016-17.The export earnings from the sector registered at Rs. 37,870.90 crores in 2016-17 (US $ 5.78 billion) (MPEDA, 2016-17). The industry contributed around 0.9% to the National Gross Value Added (GVA) and 5.43% to the agricultural GVP (2015-16) (DOAHDF, 2016-17).

Remarkably, aquaculture likewise makes significant commitments in the socioeconomics of various countries incorporating India regarding expanding rural income, improving food and nutritional security, and creating greater employment opportunities (Kannadhason *et al.,* 2011). For that matter, India is ranked second in the world in aquaculture production (excluding aquatic plants) and an annual growth rate of 8% has been set for aquaculture under "Blue Revolution Scheme" of the Govt. of India so as to increase the fish production from current 11.41 million tonnes (2016-17) to 15 million tonnes by 2020 (DOAHDF, 2016-17). In this regard, it is striking to note that we can achieve the above-mentioned target by increasing quality of skilled human in fisheries through professional education because this sector is facing the severe shortage of trained quality human resources.

The Blue Revolution notwithstanding, India is as yet home to one-fourth of the world's undernourished and destitute individuals. Further, the food demand is probably going to twofold by 2050, higher yield and total factor productivity gaps exist in our food and agriculture system. Studies uncover that, with the same old thing, in the face of the declining land, water and biodiversity assets and the increasing volatilities of environmental change and markets, by the year 2030, only 59% of India's total demand for food and agricultural products will be met (Fifth Deans' Committee Report, ICAR, 2017).

Professional fisheries graduates have employment opportunities in fisheries departments of Central and State Governments, fisheries research institutes, academic/ universities, private fisheries corporations and federations, banking sector, private industries, fish and shrimp farming, technical consultant/ executive, self-employment and so on. Legitimate assessments of manpower necessities of the fisheries sector are yet to be made. There is scope for producing more professional fisheries graduates if Central and every State department endorse fisheries degrees for fisheries positions. The graduates seem to require a superior establishing in administration procedures and more practical experience in commercial operations (Shetty, 1988).Various analysts revealed manpower necessities in the fisheries sector, their appraisals generally differing from a couple of thousand to anenormous number of people of fluctuating training, education and expertise levels (Chidambaram, 1985; James, 1987; Thakur *et al.*, 1997; Kohli, 1998; Ayyappan and Biradar, 2000).

Professional Fisheries Education in India

Professional fisheries education in India was started a bit late in India when compared to veterinary and agricultural education. A new era in the professional fisheries education in India began at the State Agricultural/Veterinary Universities with the establishment of first Fisheries College at Mangalore in 1969 under the auspices of the University of Agricultural Sciences, Bengaluru. Presently, there are thirty professional fisheries colleges in India which constitute of State Agricultural Universities and two Central Universities *viz.* Central Agricultural University (CAU), Imphal,

Manipurand Dr. Rajendra Prasad Central Agricultural University (Dr. RPCAU), Samastipur, Biharas well as one deemed-to-be university ICAR- Central Institute of Fisheries Education, Mumbai in India (Table 1).

Eleven out of the thirty fisheries colleges offer only four years UG course leading to B.F.Sc. and sixteen colleges offer both UG (B.F.Sc.) of four years and PG courses (M.F.Sc.) of two years duration while ICAR-Central Institute of Fisheries Education(CIFE), Mumbai and IFPGS, Vaniyanchavadi, Chennaioffers M.F.Sc. and Ph.D. but PGIFER, Gandhinagar offers only M.F.Sc. Seventeen colleges take Ph.D. programmes of three years duration with one year coursework in addition to ICAR-CIFE (Deemed University), Mumbai. Semester system of education is followed in all these colleges. The College of Fisheries, Kochi, formerly under the Kerala Agricultural University has been now affiliated to the full-fledged Fisheries University of India, established in 2011 Kerala University of Fisheries and Ocean Studies (KUFOS) with its headquarters at Kochi and second fisheries university established in 19thJune 2012with headquarters at Nagapattinam known as Tamil Nadu Dr. J. Jayalalithaa Fisheries University (TNJFU). College of Fisheries Engineering is a constituent college of TNJFU at Nagapattinam along the Bay of Bengal. The College is first of its kind in India set up with a sole aim of creating engineering personnel for the fisheries enterprises.

Scope for Professional Fisheries Education in India

Professional fisheries education in India has been encircled to produce job creators than to job seekers. Professional Fisheries colleges and institutes are urging to sustain brilliant thoughts/advancements among the students and in this manner; stages should be made to develop innovative ideas into commercially feasible ventures. In 2020, the demand for graduate will be more in aquaculture and marine than in fisheries sub-sectors. The fisheries sector requires strategy systems to drive nutrition-sensitive aquaculture and this ought to be educated by qualified fisheries professionals. To get this going, the country ought to put enough in fisheries research and education (Felix, 2018). Dedication, commitment and thorough study of subjects are essential to end up capable, proficient professional fisheries researcher or academician (Mukherjee, 2018).

A report by ICAR-CIFE tries to extend necessity of fisheries graduates by 2020 and gauges requirement for 10,457 against a supply of 4,570 (Munil, 2010). Agrawal *et al.*, (2016) reported that the estimated number of 5,140 fisheries science graduates in 2010, at current levels of yield, would achieve 6,700 by 2020 while according to Biradar, 2018; projections indicate that by 2022 the annual outturn required from professional fisheries colleges/institutions ought to be around 2,820 B.F.Sc., 450 M.F.Sc. and 220 Ph.D.

The estimated demand per annum of fisheries professionals by 2022 is shown in Table 2. The present yearly intake capacity of B.F.Sc., M.F.Sc. furthermore, Ph.D. programmes are 1,079; 417 and 181 respectively, while the yearly outturn might be around 85-95% of intake.

Fifth Deans' Committee Report

National Agricultural Education System (NAES) in India is so immense and assorted that keeping up consistency and assuring quality is an enormous undertaking. The Indian Council of Agricultural Research (ICAR) being the pinnacle body dealing with agricultural education research in India has been in the forefront in refreshing the curricula of the different program in

agricultural universities in the nation (Mukherjee, 2018). In this resolve, the Council has been intermittently appointing Deans' Committees, which, in consultations and considerations with all partners, have been making proposals on refreshing scholarly standards and norms towards addressing the difficulties and openings (Mukherjee, 2018).

The Fifth Deans' Committee (Prof. R. B. Singh, Chairman), supporting the harmoniousness of perfection and significance, has reasonably refreshed the educational program, course substance, degree terminology, prescribed changes in confirmation and examination, teaching method, staff necessity, administration and so on.

The report also prescribes minimum standards for setting up a new college. Mostly professional fisheries colleges have implemented the ICAR Fifth Deans' Committee recommendations from the academic year 2016-17 exception of a couple of private fisheries colleges. In four years of B.F.Sc. course, three years (I-VI semester) is coursework and one year (VII and VIII Semester) is Student READY Program. The department-wise distribution of proposed courses in B.F.Sc. is shown in Table 3.

Minimum Standards for Establishing College of Fisheries

Degree Nomenclature: B.F.Sc (Bachelor of Fisheries Science)

Eligibility Criteria: 10+2/Intermediate with PCMB/PCB/Agriculture (P - Physics, C - Chemistry, M - Mathematics B - Biology) from a recognised Board/University

The Medium of Instruction: English

Minimum Intake: 40 students per year

Departments

Department of Aquaculture (AQ)

Fisheries Resource Management (FRM)

Department of Aquatic Animal Health Environment (AAHM)

Department of Aquatic Environment Management (AEM)

Department of Fish Processing Technology (FPT)

Department of Fish Engineering (FE)

Department of Fisheries Extension Economics & Statistics (FEES)

Faculty Requirements for Departments

There are following numbers of faculties required for different departments for establishing the college of fisheries are shown in Table 4.

Land Requirements

Main building and hostels: 04 ha
Instructional Farm Area: 20 ha
Playgrounds & other amenities: 02ha
Total: 26 ha

Geographical location

For the Maritime States, the ideal location is near the coastline having access to open sea, estuaries, fishing harbours and fish processing plants with a good water source.

For the Inland States, the location needs to be close to water bodies / Farm facilities.

For Hilly Regions, the land requirement may be less as per availability.

Table.1 Yearly Intake Capacity of UG, PG and PhD. Programmes in Professional Fisheries Colleges and Institutions in India

Sl. No.	Name of the College	Annual Intake Capacity		
		Bachelors	Masters	Doctoral
1.	**College of Fisheries, Mangalore (Karnataka)** Established: **1969** **University:** Karnataka Veterinary, Animal & Fisheries Sciences University, Bidar	**46**	**25**	**15**
2.	**Fisheries College and Research Institute, Thoothukudi (Tamil Nadu)** Established: **1977** **University:** Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam	**60**	**37**	**24**
3.	**College of Fisheries, Panangad (Kerala)** Established: **1979** **University:** Kerala University of Fisheries & Ocean Studies, Kochi	**80**	**50**	**25**
4.	**College of Fisheries, Ratnagiri (Maharashtra)** Established:**1981** **University:** Dr. BalasahebSawantKonkanKrishiVidyapeeth, Dapoli	**45**	**31**	**11**
5.	**College of Fisheries, Berhampur (Odisha)** Established:**1981** **University:** Orissa University of Agriculture & Technology, Bhubneshwar	**48**	**12**	**03**
6.	**College of Fisheries, Pantnagar (Uttrakhand)** Established: **1985** **University:** GovindBallabh Pant University of Agriculture & Technology	**25**	**12**	**08**
7.	**College of Fisheries, Dholi (Bihar)** Established: **1986** **University:** Dr.Rajendra Prasad Central Agriculture University, Pusa, Bihar	**40**	**----**	**----**
8.	**College of Fisheries, Raha (Assam)** Established: **1988** **University:** Assam Agricultural University, Jorhat	**25**	**13**	**03**
9.	**College of Fisheries, Veraval (Gujarat)** Established: **1991** **University:** Junagadh Agricultural University	**64**	**21**	**03**
10.	**College of Fisheries, Nellore (Andhra Pradesh)** Established:**1991** **University:** Sri Venkateswara Veterinary University (SVVU), Tirupati	**40**	**08**	**01**
11.	**Faculty of Fisheries Science, Kolkata (West Bengal)**			

	Established: **1995** **University:** West Bengal University of Animal & Fishery Sciences, Kolkata	**32**	**32**	**16**
12.	**College of Fisheries, Lembucherra (Tripura)** Established: **1998** **University:** Central Agricultural University, Imphal, Manipur	**35**	**30**	**03**
13.	**College of Fisheries, Udaipur (Rajasthan)** Established: **2003** **University:** MaharanaPratap University of Agriculture & Technology, Udaipur	**30**	**06**	**03**
14.	**Faculty of Fisheries, Srinagar (Jammu and Kashmir)** Established: **2005** **University:** Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir	**45**	**20**	**05**
15.	**College of Fisheries, Faizabad (Uttar Pradesh)** Established:**2006** **University:** NarendraDev University of Agriculture & Technology, Kumarganj, Faizabad, U.P.	**40**	**----**	**----**
16.	**College of Fishery Science, Telankhedi, Nagpur (Maharashtra)** Established: **2006** **University:** Maharashtra Animal & Fishery Sciences University, Nagpur	**32**	**----**	**----**
17.	**College of Fishery Science, Udgir (Maharashtra)** Established: **2006** **University:** Maharashtra Animal & Fishery Sciences University, Nagpur	**32**	**----**	**----**
18.	**College of Fisheries, Ludhiana (Punjab)** Established: **2008** **University:** Guru AngadDev Veterinary & Animal Sciences University	**50**	**14**	**06**
19.	**College of Fisheries, Kawardha (Chhattisgarh)** Established: **2010** **University:** Chhattisgarh KamdhenuVishwavidalaya, Durg	**60**	**02**	**----**
20.	**College of Fisheries Science, Jabalpur (Madhya Pradesh)** Established: **2012** **University:** NanajiDeshmukh Veterinary Science University, Jabalpur	**30**	**----**	**----**
21.	**Tamil Nadu Dr. M.G.R. Fisheries College and Research Institute, Ponneri (Tamil Nadu)** Established: **2014** **University:** Tamil Nadu Dr. J. Jayalalithaa Fisheries	**60**	**12**	**09**

	University, Nagapattinam			
22.	**College of Fisheries, Navsari (Gujarat)** Established: **2014** **University:** Navsari Agricultural University, Navsari	**25**	**----**	**----**
23.	**College of Fisheries Science and Research Campus, Etawah (Uttar Pradesh)** Established: **2015** **University:** Chandra Azad University of Agriculture and Technology, Kanpur	**40**	**----**	**----**
24.	**College of Fisheries Engineering, Nagapattinam (Tamil Nadu)** Established: **2015** **University:** Tamil Nadu Dr. J. Jayalalithaa Fisheries University,Nagapattinam	**20**	**----**	**----**
25.	**College of Fisheries Science, Gumla (Jharkhand)** Established: **2017** **University:** Birsa Agriculture University, Ranchi	**30**	**----**	**----**
26.	**College of Fishery Science, Pebbair (Telangana)** Established: **2017** **University:** P.V. NarasimhaRaoTelangana Veterinary University, Pebbair	**25**	**----**	**----**
27.	**Dr. M.G.R. Fisheries College and Research Institute, Thalainayeru (Tamil Nadu)** Established: **2017** **University:** Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam	**20**	**----**	**----**
28.	**Postgraduate Institute of Fisheries Education and Research, Gandhinagar(Gujarat)** Established: **2015** **University:**Kamdhenu University, Gandhinagar	**----**	**03**	**----**
29.	**Institute of Fisheries Postgraduate Studies, Vaniyanchavadi, Chennai (Tamil Nadu)** Established: **2017** **University:** Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Nagapattinam	**----**	**12**	**02**
30.	**Central Institute of Fisheries Education, Mumbai (Maharashtra)** Established: **1961** **Deemed-to-be-University**	**----**	**77**	**44**
Total Seats		**1079**	**417**	**181**

(Source: Handbook of Fisheries and Aquaculture, 2011 and update based on personal communication)

Table.2 Estimated Demand per Annum of Fisheries Professionals by 2022

Sl. No.	Sub- sector	Estimated Demand per Annum			
		Diploma	Bachelors	Masters	Doctoral
1.	Fish and Shrimp Seed Hatcheries and Disease Diagnostic Labs	4,460	725	220	15
2.	Aqua Feed Industry	25	30	05	05
3.	Aquaculture	18,100	1,150	40	10
4.	Fish Processing	00	100	30	50
5.	Development and Extension	00	195	45	05
6.	Research and Academic	00	10	30	175
7.	Culture-based Fisheries	190	350	00	00
8.	Mariculture	640	160	80	00
9.	Coldwater Fisheries and Aquaculture	10	30	00	00
10.	Retail Fish Outlets	00	50	00	00
11.	Financial Institutions	00	20	05	00
Total		**23,425**	**2,820**	**455**	**215**

(Source: Biradar, 2018)

Table.3 Department-wise Distribution of Proposed B.F.Sc. Courses

Sl. No.	Department	No. of Courses	Credit Load
1.	Aquaculture	12	29 (17+12)
2.	Fisheries Resource Management	09	23 (14+09)
3.	Aquatic Animal Health Management	07	18 (11+07)
4.	Aquatic Environment Management	08	20 (12+08)
5.	Fish Processing Technology	09	21 (13+08)
6.	Fisheries Engineering	06	14 (8+06)
7.	Fisheries Extension, Economics and Statistics	08	15 (09+06)
8.	Comp. Non-credit courses (Swimming & Phy. Edu.)	02	----
	Sub total	**61**	**140 (84+56)**
	Student READY In-Plant Attachment Programme	01	10 (0+10)
	Student READY Rural Fisheries Work Experience Programme	01	8 (0+8)
	Study Tour (in and outside State)	01	02 (0+2)
	Student READY Experiential Module	01	17 (0+17)
	Project Work	01	02 (0+2)
	Seminar	01	01 (0+1)
	Total	**06**	**40 (0+40)**
	Grand Total	**67**	**180 (84+96)**

(Source: Fifth Deans' Committee Report, ICAR, 2017)

Table.4 Requirements of Faculty for Departments for B.F.Sc.

Sl. No.	Department	Faculty			Total
		Professor	Associate Professor	Assistant Professor	
1.	Aquaculture	01	02	03	06
2.	Fisheries Resource Management	01	02	03	06
3.	Aquatic Animal Health Management	01	01	02	04
4.	Aquatic Environment Management	01	01	03	05
5.	Fish Processing Technology	01	03	05	09
6.	Fisheries Engineering	01	01	02	04
7.	Fisheries Extension, Economics and Statistics	01	01	02	04
Total		**07**	**11**	**20**	**38**

(Source: Fifth Deans' Committee Report, ICAR, 2017)

Table.5 Courses Offered in M.F.Sc. and Ph.D.

Sl. No.	Specialization in M.F.Sc./ Ph.D.
1.	Aquaculture
2.	Fish Nutrition and Feed Technology
3.	Fish Physiology and Biochemistry
4.	Fish Genetics and Breeding
5.	Fish Biotechnology
6.	Fisheries Resource Management
7.	Aquatic Animal Health Management
8.	Aquatic Environment Management
9.	Post-Harvest Technology/ Fish Processing Technology
10.	Fisheries Extension
11.	Fisheries Economics

(Source: Fifth Deans' Committee Report, ICAR, 2017)

Table.6 Proposed Professional Fisheries Colleges in India

Sl. No.	Area/State
1.	Kishanganj, Bihar
2.	Amravati, Maharashtra
3.	Meerut, Uttar Pradesh
4.	Mathura, Uttar Pradesh
5.	Banda, Uttar Pradesh
6.	Kozhikode, Kerala
7.	Thrissur, Kerala
8.	Kollam, Kerala
9.	Kanyakumari, Tamil Nadu

(Source: Based on personal communication)

Table.7 Fisheries Related Courses Offered by Other College/University/Institute

Sl. No.	Name of the College/ University	Courses Offered
1.	The Indian Institute of Technology, Kharagpur, West Bengal	4 year B. Tech. Degree programme in Naval Architecture & Marine Engineering. M.Tech. & Ph.D. programme in Aquaculture Engineering.
2.	The College of Engineering, Waltair	B.E. degree with Fishery Engineering & Naval Architecture as special subject.
3.	Cochin University of Science & Technology under its Faculty of Marine Sciences	M.F.Sc. & Ph.D. programmes in Marine Biology, Industrial Fisheries, Oceanography & Marine Geology.
4.	The Karnataka Regional Engineering College, Suratkal	2 years industrial programme in Fish Harbour Engineering.
5.	Indian Institute Of Technology, Chennai	M.Tech in Coastal Engineering.
6.	The Central Institute of Fisheries Nautical & Engineering Training (CIFNET), Cochin	4 year graduate course in Fisheries Nautical Sciences under the Cochin University of Science & Technology.
7.	The Barkatullah University, Bhopal	M.F.Sc. Courses in Applied Limnology & Fishery Technology, Aquatic Environment Sciences & Applied Aquaculture for the regular and self-financing stream of students.
8.	The Andhra University, Waltair	M.F.Sc. Course in Marine Geology & Marine Biology
9.	The Annamalai University, Porto Novo	M.F.Sc. Course in Marine Biology
10.	Kerala University, Thiruvananthapuram	M.F.Sc. Course in Fisheries & Aquatic Biology
11.	Tata Institute of Fundamental Research, Mumbai	M.F.Sc. Course in Marine Geo-chemistry
12.	The Universities of Agra (Uttar Pradesh), Annamalai (Tamil Nadu), Mumbai (Maharastra), Burdwan (West Bengal), Kolkata (West Bengal), Kalyani (West Bengal), Kochi (Kerala), Madras (Tamil Nadu), Meerut (Uttar Pradesh), Viswa Bharati (West Bengal), & Waltair (Andhra Pradesh)	Ph. D. courses in selected Fisheries related & Aquatic Biological subject in pure & applied zoological sciences.
13.	The University of Madras	PG diploma course in Coastal Aquaculture
14.	IIT, Mumbai	PG diploma course in Dock and Harbour Engineering
15.	The Indian Institute of Foreign Trade (IIFT), Ministry of Commerce, Govt. of India	1 year diploma course in International Trade in Seafood Industry
16.	College of Fisheries, Chidambaram, Tamil Nadu University:Annamalai University, Annamalainagar	4 years graduate course in Fisheries Science (B.F.Sc.)
17.	Doon PG College of Agricultural and Allied Sciences, Dehradun, Uttrakhand	4 years graduate course (B.F.Sc.) and 2 years Masters' course (M.F.Sc.) in Fisheries Science
18.	Dolphin (PG) College of Science & Agriculture, Fatehgarh Sahib, Punjab	4 years graduate course in Fisheries Science (B.F.Sc.)
19.	Pandit Deen Dayal Upadhyay Institute of Agricultural Sciences, Utlou, Manipur	4 years graduate course in Fisheries Science (B.F.Sc.)
20.	M.S. Swaminathan School of Agriculture, Centurion University of Technology and Management, Bhubneshwar, Odisha	4 years graduate course in Fisheries Science (B.F.Sc.)
21.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra	3 years diploma in Fisheries

(Source: Handbook of Fisheries and Aquaculture, 2011 and update based on personal communication)

Courses Offered in M.F.Sc. and Ph.D.

The colleges offer courses in various specializations, viz. Aquaculture, Fishery Microbiology, Fisheries Resources Management, Aquatic Environment and Ecology, Fish Processing Technology, Fisheries Engineering, Fisheries Economics, Fisheries Biotechnology, Fisheries Biology, Fisheries Extension, Fisheries Hydrology and Fish Pathology are shown in Table 5 (Fifth Deans' Committee Report, ICAR, 2017). The number of courses offered by a college varies, maximum are offered by TNJFU followed by CIFE; COF, Ratnagiri; COF, Mangalore; KUFOS and CAU (I).

Deemed University

The ICAR-Central Institute of Fisheries Education, Mumbai is a Deemed to be University which is a leading Fisheries University having a recognized legacy and has supported numerous illustrious scholars and pioneers throughout the years. It was set up in 1961 as an in-service training Institute to bestow two year PG Diploma in Fisheries Science, however now it occupies a unique place in fisheries education as the only deemed university in India. It offers M.F.Sc. in 11 specializations, viz. Aquaculture, Aquatic Animal Health Management, Aquatic Environment Management, Fisheries Resources Management, Fisheries Biotechnology, Fisheries Economics, Fisheries Extension, Fish Genetics and Breeding, Fish Nutrition and Feed Technology, Fish Physiology and Biochemistry, and Post-Harvest Technology. Ph.D. programme is also conducted in 11 specializations, viz. Aquaculture, Fish Nutrition and Feed Technology, Fish Physiology and Biochemistry, Fish Genetics and Breeding, Fisheries Biotechnology, Fisheries Resources Management, Post-Harvest Technology, Aquatic Animal Health Management, Aquatic Environment Management, Fisheries Economics and Fisheries Extension. Admission to M.F.Sc. and Ph.D. programmes is through all India test conducted by ICAR and CIFE respectively. The 2-year D.F.Sc. course which was responsible for the improvement of skilled and trained manpower in India since 1961, was stopped by the CIFE with impact from the scholastic year, 1998-99, consequent to start of master`s degree programme in several disciplines (Kumar and Biradar, 2011). The Institute follows the credit system pattern of assessment for the course and research work. The coursework is of one-year duration (two semesters of six months) and it is a compulsory part of the Ph.D. programme.

In spite of the fact that a noteworthy part of the course and dissertation research work in the above courses is completed in IACR-CIFE but facilities for field-oriented research can be profited at its sister institutions *i.e.* students also have the option to carry out research work after completion of coursework at the CIFE in sister ICAR Fisheries Research Institutions;

ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata-700120, West Bengal

ICAR-Central Marine Fisheries Research Institute, Tatapuram, Kochi - 682 014, Kerala

ICAR-Central Institute of Freshwater Aquaculture, Kausalyaganga, Bhubaneswar-751 002, Orissa.

ICAR-Central Institute of Brackishwater Aquaculture, Santhome High Road, Chennai - 600 028, Tamil Nadu

ICAR-Central Institute of Fisheries Technology, Willington Island, Matsyapuri, Kochi - 682 029, Kerala

ICAR-National Bureau of Fish Genetic Resources, Lucknow- 211 006, Uttar-Pradesh

ICAR-Directorate of Coldwater Fisheries, Post Box. No.28, Roop Nagar, Near Shivala Nursery, Bhimtal - 263 136, Dist. Nainital, Uttar-Pradesh

Proposed Professional Fisheries Colleges in India

There are following new professional fisheries colleges for B.F.Sc. under SAUs in different states of India will be opening soon shown in Table 6. The new professional fisheries colleges would address the shortfall of fisheries professionals, transform fisheries education and lead to employment generation.

Fisheries Related Other Courses

Besides the Professional Fisheries Colleges, some of the following colleges/universities/institutions also offering fisheries related courses in India which are shown in Table 7:

Fisheries sector has become the most promising sector that plays a pivotal role in global food producing sector. It is the quickest developing component of the agriculture sector. Professional fisheries education is a new branch of science, which is having tremendous potential sooner rather than later.

Fisheries sector assumes a critical part in enhancing the socioeconomic status of India in view of its potential commitment to food security, national income, social destinations and sustainable healthy export earnings. The capability of fisheries sector could be used and created through quality advanced education in fisheries. With appropriate planning for developing fisheries, higher education following the above-mentioned strategies the development of fisheries sector could be accomplished to a more prominent degree.

Acknowledgements

The authors are extremely thankful to ICAR-Central Institute of Fisheries Education, Mumbai; Indian Council of Agricultural Research, New Delhi; Central and State Agricultural Universities of India for providing information of different professional fisheries colleges/institutes.

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How to cite this article:

Manmohan Kumar, Udai Ram Gurjar, Naresh Raj Keer, Sanjay Kumar Chandravanshi, Archit Shukla, Shyam Kumar, Shubham Gupta and Prasenjit Pal. 2018. Professional Fisheries Education in India: History, Current Status and Future - A Review. *Int.J.Curr.Microbiol.App.Sci.* 7(06): 3395-3409. doi: https://doi.org/10.20546/ijcmas.2018.706.399