

Fisheries Education in Karnataka: Trends, Current Status, Performance and Prospects

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Abstract—This paper looks at the development of Fisheries education in Karnataka and the supply of skilled human capital to the sector. The study tries to analyse their job occupancy patterns, Compound Growth Rate (CGR) and forecasts the fisheries graduates supply using the Holt method. In Karnataka, fisheries are one of the neglected allied sectors of agriculture in spite of having enormous scope and potential to contribute to the State's agriculture GDP. The State Government has been negligent in absorbing skilled human capital for the development of fisheries, as there are so many vacant positions in both education institutes, as well as the State fisheries department. CGR and forecasting of fisheries graduates shows a positive growth rate and increasing trend, from which we can understand that by proper utilization of skilled human capital can bring development in the fisheries sector of Karnataka.

Keywords—Compound growth rate, fisheries education, Holt method, skilled human capital.

I. INTRODUCTION

THE intellectual idea of fisheries education in Karnataka first evolved in 1963 with the establishment of the Marine Products Processing Training Centre (MPPTC) at Mangalore, which was an Indo-Japanese collaboration for training fish processing technologists for the newly emerging fish processing industry and was of an improvised nature to familiarize personnel with state of art of fisheries and its field manifestation. The early 60's witnessed the beginning of a new era in the field of fisheries education when the University of Agricultural Sciences, Karnataka took the courageous step of starting professional fisheries education at the university level in the country by establishing the College of Fisheries at Mangalore in 1969. This need of a college arose when the worth of this huge resources and the enormous produce of the State could no longer be under-estimated and be left tottering under the trained in-service non-fisheries personnel of the State Fisheries department. Just as the saying goes, 'Rome was not built in a day', the establishment of the building and the course work took a lot of effort, struggles, screams, strikes and protests by the visionaries who laid the foundation for their dream. The credit of introducing Purse seine fishing to India in 1976 goes to the College of Fisheries, Mangaluru by organising a diversification seminar when destructive bottom

trawling was the only fishing activity practised in the Canara Coast [1]. Qualified and trained manpower is a vital factor for Fisheries Research and Development. Though Fisheries education had a late start in India as compared to veterinary and agricultural education, it has not lagged in its growth and has received a status of significant importance.

II. CURRENT SCENARIO

The College came under the auspices of Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar since 2005. The objective of the College is to promote a greater understanding and appreciation of the biological, technical and economic importance of fisheries and related areas. Being a premier fisheries institute, the college continues to play a key role in fisheries education and research in the country [2]. The College offers B.F.Sc, M.F.Sc and Ph.D. programmes in Fisheries Sciences. The maximum seats allotted for the B.F.Sc course was 42 for Karnataka students and in addition to this 15% had been reserved for nomination from Union government, 5% for foreign nationals/NRI/NRI sponsored candidates and one seat for Kashmiri migrants [3], whereas the seats allotted for M.F.Sc and Ph.D. is 20 and 18, respectively [4]. The M.F.Sc. and Ph. D programmes are well advanced and currently have five branches namely Aquaculture, Fishery Microbiology, Fish Processing Technology, Fisheries Resources and Management and Fisheries Environment and Ecology. The College has two campuses, the main campus housing the Aquaculture, Fishery Microbiology, Fisheries Resources and Management and Aquatic Environment management departments is located at Yekkur, Kankanady, Mangalore on NH 17 and the Technology Wing is located at Hoige Bazar on the mouth of the Nethravathy River, close to the Arabian Sea and has processing and engineering divisions [2].

The infrastructure of the college is so well designed that it is able to sustain and support the smooth functioning of administration, academics and training to date. The College has advanced scientific labs: Microbial Resource Centre (recognised by the UNESCO), Disease Diagnostic Centre, Nutrition and Histopathology, Post-Harvest Fisheries, Bioinformatics, Fishery Engineering and Electronics, environmental pollution monitoring and ecosystem study, geo-spatial hydrology and remote sensing, eco-toxicology, and social sciences. The College faculty is well experienced in the above areas and is carrying out various research and consultancy projects related to their field of expertise and the College has also started the online version of the fisheries courses. Currently, the Institute has successfully secured funds

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from external funding agencies for research and development in different disciplines to the sum of around 2.44 million Euros or Rs.1,803 Lakhs [2].

III. MATERIALS AND METHODS

For studying the performance of fisheries education in Karnataka, data on various aspects like annual pass out of students, employment profile and professional fisheries education development in Karnataka over the years have been considered. Time series data on an annual pass out of students (includes UG, PG, Ph.D.) and employment profile of the students (2010-2015) was compiled from various sources, such as the alumni association database and personnel communication with students and the administration. The double Exponential smoothing (Holt) method has been employed for forecasting of annual student pass out using non-seasonal time series data with trends. The forecast for Holt's linear exponential smoothing is found by having two equations to deal with – One for level and one for trend. The forecast is found using two smoothing constants, α and β (with values between 0 and 1), and three equations:

- Level: $l_t = \alpha y_t + (1 - \alpha)(l_{t-1} + b_{t-1})$,
- Trend: $b_t = \beta(l_t - l_{t-1}) + (1 - \beta)b_{t-1}$,
- Forecast: $y_t(h) = l_t + b_th$.

Here l_t denotes the level of the series at time t and b_t denotes the trend (additive) of the series at time t . The optimal combination of smoothing parameters α and β should be chosen by minimizing the MSE over observations of the model data set.

The changes in the employment pattern for the last five years have been studied using percentage methods (weighted average).

The decadal CGR was calculated to ascertain the growth in annual pass out of students from Karnataka. The CGR has been estimated following [5].

If y_t is the study variable at time period t , then the mathematical expression employed for computation of CGR r is conventionally given by,

$$y_t = y_0 (1+r)^t$$

In general, after a multiplicative error ε is assumed in the above equation, logarithmic transformation is done throughout to make it a linear statistical model. That is,

$$\log y_t = \log y_0 + t \log(1+r) + \log \varepsilon$$

The above model can be rewritten as:

$$\log y_t = A + Bt + \varepsilon^1$$

where, $A = \log y_0$; $B = \log(1+r)$ and $\varepsilon^1 = \log \varepsilon$. Then the unknown parameter constants A and B are estimated by the method of ordinary least squares. Thus, once B is estimated, the CGR r is given by

$$r = \exp(\beta) - 1$$

IV. RESULTS AND DISCUSSION

The College of Fisheries, Mangaluru has a sanctioned strength of 81 permanent teaching staff, but at present, the number is only 31 and about 62% of faculty positions are vacant [6], [7]. The list of departments and the number of faculty attached to each is tabulated in Table I.

TABLE I
LIST OF DEPARTMENTS AND THE NUMBER OF PERMANENT AND CONTRACTUAL TEACHING STAFF DURING 2016

Departments	Permanent Teaching Staff	Contractual Teaching Staff
Aquaculture	6	3
Fishery Microbiology	3	0
Fish Processing Technology	5	3
Fisheries Resources and Management	5	0
Aquatic Environment Management	6	0
Fisheries Economics	0	1
Fisheries Engineering and Technology	4	1
Department of Basic Sciences		
English Unit	1	0
Department of Fishery Biochemistry	0	1
Fisheries Statistics and Computer science unit	0	2
Physical Education Unit	1	0
Total	31	11

TABLE II
OCCUPANCY PATTERN OF OUTPUT B. F. SC STUDENTS' FOR PAST FIVE YEARS (2010-2015)

OCCUPANCY	Cumulative % (After taking weight)
Pursuing M.F.Sc/ Ph.D in India	40.33
Working in Hatchery in India	4.74
Working in Fish/Shrimp Farm in India	0.70
Working in processing company in India	6.63
Working in Feed company in India	2.24
State Department (ADF/FI)	2.04
Scientist	0.91
KFDC	2.21
Banking Sector	2.50
Employed Abroad	5.10
PG/Ph.D Abroad	1.85
SRF/RA/JRF	6.22
Self Employed	10.00
MBA	1.37
M.Sc	0.67
Fail to complete graduation in stipulated time	5.05
Other	7.45
Total	100.00

There exists zero permanent teaching staff in the departments of Fisheries Economics, Fishery Biochemistry, Statistics and Computer science that depict an urgent need for action to be taken up by the University administration for the improvement in education quality and commitment. The quality of the Masters and Doctorate studies can be enhanced in the Department of Aquaculture if it can get bifurcated into clearly defined streams like Biotechnology, Genetics, Nutrition and Pathology due to specificity and expertise in the work carried out, and the same thing can be applied to the

Department of Fisheries Resource Management by streaming it further in Extension studies.

The occupancies of the past five years passed out batches are shown in Table II. From these statistics we can conclude that almost 40.33% of students have shown interest in pursuing a Masters and Doctorate degree in India, whereas a few of them have gone abroad for the same specialization, which is about 1.85%. About 10% of them turned out to be young and successful entrepreneurs and some are continuing their family business in fisheries. There was just a one-time recruitment for posts like Assistant Director of Fisheries and Fisheries Inspector during 2010-11 in the past five years from the State Governments of Karnataka and Lakshadweep, and only about 2.04% of students were recruited. About 14.31% of the students are working in different hatcheries, shrimp feed companies, shrimp/fish farms and processing plants in India, whereas around 5% of them are employed in the fisheries sector of foreign countries.

The College of Fisheries, Mangalore started providing degree courses for B.F.Sc, M.F.Sc and Ph.D. during the year 1969, 1974 & 1980, and gave the country's first and foremost certified UG, PG and PhD fishery professionals in 1972, 1975 and 1986. The credits of having produced a stock of 1,295, 645 and 133 graduates in UG, PG and Ph.D., respectively to date, goes to the College apart from other significant endeavours and contribution to India's entry into the arena of Fisheries education. Based on the enrolment of students for the past five years (2010-15), it was observed that only 30% of them were women, which may be due to the intensive field work involved in the sector. In spite of this low composition, an increasing trend in the enrolment of women is observed in the same duration, which is possibly due to the close proximity of the college to home and, also by their tendency to explore new fields.

The projected B.F.Sc students' output shows an increasing trend for which students output from 1972 to 2015 is considered and forecasted up to 2024, which contributes to the positive growth of the fisheries sector and is of immense importance for sustained development. By proper utilization of available human capital, the present production can be enhanced manifold by recruitment of personnel for existing lacuna (Fig. 1).

From Table III, we can decipher that the initial decade of all the three degree programmes have witnessed the maximum number of students opting and continuing in fisheries education with the highest CGR being 6.7%, 12.35% and 15.62%. During 1982-91, a negative CGR is observed as the output of number of B.F.Sc students is reduced to 20 per batch, especially during 1987-90, whereas a stable CGR is observed from 1992 to 2014 due to less fluctuation in batch strength.

TABLE III
DECADAL CGR OF B. F. SC, M. F. SC AND PH. D OUTPUT STUDENTS

Year	CGR of B.F.Sc (%)
1972-81	6.70
1982-91	-2.50
1992-01	3.25
2002-14	3.30
Year	CGR of M.F.Sc (%)
1975-84	12.35
1985-94	-6.06
1995-04	2.38
2005-15	-5.04
Year	CGR of Ph.D (%)
1986-95	15.62
1996-05	-2.69
2006-15	-4.29

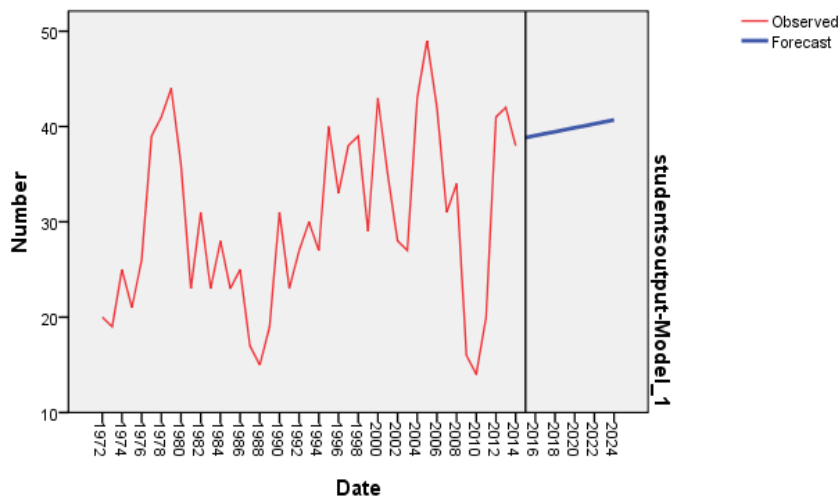


Fig. 1 Forecast of the B.F.Sc students output in Karnataka

Negative CGR is observed in the decades of 1985-94 and 2005-15 due to a sudden decrease in M.F.Sc students output, especially during 1989 and 1993. A similar situation is

observed in 2012 and 2015, the reason being the opting of Masters abroad and central institutes over the State fisheries college, which explains the negative CGR of 2005-15. An

irregular pattern is observed in Ph.D. students' output, the negative CGR is observed during 1996-2005 and 2006-15, which explains the preference of students to enter the workforce over higher education at this phase.

V. POSSIBLE PLACEMENT AREAS FOR FISHERIES GRADUATES OF KARNATAKA

The graduates who pass out from the College have ample job prospects in different sectors including the Government, the private sector, entrepreneurship and NGO's. The Government sector offers jobs at the State Fisheries Department, State Fisheries College, Different organizations under the Central Government, like Indian Council of Agricultural Research, Marine Products Export Development Agency, Fishery Survey of India, National Centre for Sustainable Coastal Zone Management, Indian National Centre for Ocean Information Service, Kisan Call Centre, Financial institutions, etc. In the private sector there are different jobs available according to the candidate's qualification in Processing plants, Fish/Shrimp Hatcheries, Fish/ Shrimp rearing units, Feed mills, Canning industries, etc. For people interested in entrepreneurship, there is sufficient technical guidance, financial assistance and subsidies provided by the National Fisheries Development Board, Agri Clinic and Agri Business Centres, etc. For people who are oriented more towards community mobilization and social upliftment of Fishers, they can join Non-Governmental Organizations.

VI. SUGGESTIONS FOR IMPROVEMENT OF FISHERIES EDUCATION AND SECTOR IN KARNATAKA

A holistic approach should be given to enhance the current status of fisheries education and the sector in Karnataka, which includes different streams of the sector like academic, research, human resource, industry, etc.,

- The fisheries education system is providing more and more graduates who are over qualified for entry level positions with strong theoretical and weak practical knowledge. Thus there arises a need to follow polytechnic attitude with more emphasis on skills and attitude and less on knowledge.
- The industry- institute consortia gaps should be identified. The mismatch occurring between the skills required by the industry and the manpower skills available has to be worked out and rectified.
- Self-employment and entrepreneurship ventures in fisheries are very rare because of its capital and labour intensive nature. This can be overcome by introducing entrepreneurial training programs, study circles, tracking programs, human resource management programs, business management programs, etc., which will certainly be beneficial to students.
- Identify disciplines which demand more competence and train faculty in that more intensively.
- Considering the current scenario, the Indian NARS (National Agricultural Research System) can be sensitized about the importance of Social Science research in

Fisheries, which will pave the way for establishment of dedicated departments leading to additional job opportunities. For example, in the case of Karnataka, the establishment of the Fisheries Social sciences division in the College of Fisheries, Mangalore will ensure quality social sciences research in relevance to the State's fisheries and also provide job opportunities for post graduates (M.F.Sc.) in Fisheries Economics and Extension.

- Experiential learning programs for culture and breeding of marine, ornamental and food fish have to be created.
- There is a need for clear coordination among industries, the State department and the College for the overall development of the fisheries sector.
- Proper hierarchical scaling of administrative posts or various posts has to be created according to the qualification of graduates in the State Fisheries Department.

VII. CONCLUSION

In India, Fisheries education first took root in the College of Fisheries, Mangalore and the College is the alma mater of many scientists who have contributed to today's well-advanced science and technology in fisheries field both at national and international levels. Until now, the College has produced 1,295, 605 and 132 students of UG, PG and Ph.D., respectively and the estimated CGR for UG shows 3.3% (2002-2014) positive growth. The forecasting of fisheries graduates shows that there will be an increasing trend in the future. Thus proper utilization of this skilled manpower can improve fisheries production both for the marine and inland sectors.

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