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Change in Fishing Patterns in Jammu & Kashmir Provinces of J&K – A Comparative Study

IMTIYAZ QAYOOM*, MASOOD UL HASSAN BALKHI and BILAL AHAMAD BHAT

Faculty of Fisheries, Sher-E-Kashmir University of Agricultural Sciences & Technology of Kashmir, Rangil, Ganderbal – 190000, J&K, India.

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ABSTRACT

Jammu and Kashmir serves a congenial habitat for variety of fish species due to large number of cold water resources which has paved way for the development of fisheries sector in the state. The state has crossed 20.0 thousand tonnes of fish production because of modern aquacultural practices implied at both governmental and private levels. Kashmir province is a leading producer of fishes contributing more than 80% of the total production of the state while as Jammu on the other hand has also emerged as a major producer of animal protein through fisheries sector. The fish production data of four decades reflects increasing trend of production in all commercially important species of both the provinces. However the statistical models forecasting the future production provide an idea about the growth patterns in fishes. In this paper, growth pattern of three different fish species (Trout, Mirror carp and Country fish) from Kashmir province and various fishes from Jammu province (collectively named as Jammu fish) of the state was assessed using fish production data from 1956-57 to 2011-12. Forecasting of fish production was made on the basis of the best fitted statistical models. Results showed that Kashmir province shows overall compound growth of 4.2% against 7.9% of increased compound growth rate of fish production of Jammu province since 1956-57. Cubic model was found to be the best fitted model for all the species in both the regions. However, when future fish production of the state is taken into consideration, the statistical models indicated a decreasing trend in the overall fish production of both the provinces**.** Besides, the matter of concern is that the demand of 70,000 thousand tonne consumption of fish protein in the state which is a milestone yet to be achieved.

Key words: Fishing patterns, Water use, Fish production, Statistical models, R square, Compound Growth Rate.

INTRODUCTION

Jammu and Kashmir is known as a tourist destination due to its munificence of blossoms and magnanimity of resorts, the state is holding huge water spread area of 57000 hectares approximately out of which about 24000 hectares are in the shape of lakes, marshy areas and reservoirs and 23000 hectares in the shape of river systems (Anayat and Arjamand 2013). These waterbodies are home to various freshwater organisms of plant and animal origin serving congenial habitats for their wellbeing. Temperate and tropical zones of the state offer a potential resource for the development of cold & warm water fisheries including Trouts, Schizothoracines, Indian major carps and Chinese carps.

The Fisheries Development Programme was launched with the object of increasing the fish production by establishment and up gradation of fish farms, hatcheries, popularisation of fish farming in private sector, imparting training to fish farmers and creating infrastructure for marketing of fish (Wagay,

2012) Moreover, under the Centrally Sponsored Scheme, National Mission for Protein Supplement (NMPS), a new activity has been sanctioned in which cage/pen culture units are to be established in water bodies like reservoirs and lakes with the financial assistance from Government of India. It is due to these efforts that fish production which was 18.46 thousand tonnes in 2000-01, has now reached 20.0 thousand tonnes in 2013-14 (J&K Fisheries Department). While as that of famous trout has touched 262.00 tonnes during 2013-14.

Among the ten districts of Kashmir valley, Baramulla leads in the fish production (42770.40 quintals) followed by district Bandipora which contributes about 34970.60 quintals of total fish production of the valley (Report by department of Fisheries J&K). From Jammu province, district Jammu leads in fish production (6657.90 quintals) followed by Kathua and Udhampur districts that contribute 4481.70 and 4195.00 quintals respectively.

Therefore the study was undertaken to forecast the fish production on the basis of data collected from 1956 – 57 and best fitted statistical models applied on it to assess whether the modern technologies implied the field will continue to enhance the production of fishes in these regions in future.

MATERIAL AND METHODS

The work has been carried out on secondary data. Main sources of data collection include Year books; Statistical Digest, audit reports, research papers and data available on the website of Department of State Fisheries Jammu and Kashmir. The data consisted of the annual production of three different fish species viz. Trout (*Oncorhynchus mykiss*), Mirror carp (*Cyprinus carpio specularis*) and Country fish (*Schizothoracine* species) from Kashmir province and various fishes from Jammu region collectively named as Jammu fish. Various statistical models were applied in order to predict the future production of fishes in the state. The Compound Growth Rates were estimated using the following equation:

$$\text{Log } Y = \log a + t \log b \quad \ldots(1)$$

Where

Y = Fish Production

t = time trend, denoting years

Compound growth rate in percent = {antilog of (log b) – 1}*100

Equation (1) was fitted to the given data using “Least Square Method” and “Goodness of Fit” is assessed by the coefficient of determination R square. Besides assessing a comparative growth performance of different species of Kashmir, a

Table. 1: Annual percentage increase in growth rate of Fish production

		Kashmir Province				Jammu province	
S. No	Year	Trout	Mirror Carp	Country Fish	Total	Jammu Fish	Total State
1	1957	12	2207	4138	6357	839	7196
2	1967	44	33741	11403	45188	2366	47554
		(266.67)	(1428.88)	(175.57)	(610.84)	(182.00)	(560.84)
3	1977	81	46112	21904	68097	2210	70307
		(84.09)	(36.66)	(92.09)	(50.69)	(- 6.59)	(47.85)
4	1987	154	71060	32560	103774	5340	109114
		(0.009)	(0.005)	(0.004)	(0.005)	(0.014)	(0.005)
5	1997	248	112021	40588	152857	22944	175801
		(61.039)	(57.64)	(24.66)	(47.298)	(329.663)	(61.117)
6	2007	1520	116835	43028	161383	30617	192000
		(512.90)	(4.297)	(6.012)	(5.578)	(33.44)	(9.21)
7	2013	2600	78508	38150	118668	28332	199500
		(71.053)	(-32.804)	(-11.34)	(-26.47)	(-7.46)	(3.91)

prediction of the future production was also made on the basis of prediction models and related to the demand of protein in the province.

RESULTS

Results obtained from the present study showed an increase in the trend of fish production of both the regions with compound growth rate of 7.2% in Jammu while as in Kashmir province was found 4.2 % only. The annual percentage increase in growth of fish production in Jammu and Kashmir is given in the Table 1.

Forecasts showed cubic model to be the best fitted model for all fish species in both the provinces. The R^2 calculated by least square method was found 0.946 for overall fish production of Kashmir valley (Table 2).

DISCUSSION

Total fish production of the state does not show an appreciable increase in the coming decade, despite the annual fish production data depicts increase in quantum fish production every

Table 2: Model Summary and Parameter Estimates of Total fish production of Kashmir

	Model Summary					Parameter Estimates			
Equation	**R^2**	**F**	**df_1**	**df_2**	**Sig.**	**Constant**	**b_1**	**b_2**	**b_3**
Linear	.851	256.137	1	45	.000	3.314E4	3.142E3		
Logarithmic	.861	279.547	1	45	.000	-3.405E4	4.899E4		
Inverse	.449	36.677	1	45	.000	1.268E5	-1.934E5		
Quadratic	.930	292.566	2	44	.000	2.079E3	6.945E3	-79.226	
Cubic	.946	250.353	3	43	.000	1.953E4	2.798E3	1 3 4 . 5 1 4	
-2.969									
Compound	.651	83.944	1	45	.000	3.484E4	1.042		
Power	.916	489.434	1	45	.000	1.047E4	.749		
S	.799	179.089	1	45	.000	11.798	-3.826		
Growth	.651	83.944	1	45	.000	10.459	.041		
Exponential	.651	83.944	1	45	.000	3.484E4	.041		
Logistic	.651	83.944	1	45	.000	2.870E-5	.960		

Table 3: Model Summary and Parameter Estimates total production of Jammu

	Model Summary					Parameter Estimates			
Equation	**R2**	**F**	**df1**	**df2**	**Sig.**	**Constant**	**b1**	**b2**	**b3**
Linear	.828	217.169	1	45	.000	-4.830E3	823.113		
Logarithmic	.570	59.652	1	45	.000	-1.587E4	1.058E4		
Inverse	.181	9.923	1	45	.003	1.800E4	-3.257E4		
Quadratic	.850	124.542	2	44	.000	-540.658	297.912	10.942	
Cubic	.901	130.143	3	43	.000	7.782E3	-1.679E3	112.847	
				-1.415					
Compound	.773	153.114	1	45	.000	1.391E3	1.079		
Power	.651	84.066	1	45	.000	368.927	1.085		
S	.300	19.311	1	45	.000	9.449	-4.028		
Growth	.773	153.114	1	45	.000	7.238	.076		
Exponential	.773	153.114	1	45	.000	1.391E3	.076		
Logistic	.773	153.114	1	45	.000	.001	.927		

year. Future production models showing a feeble increase in the production of trout (Table 5) may be attributed to various intensive trout culture and rearing units operating mostly under governmental supervision valley wide. Decline in the production of country fish (Schizothoracines) is attributed to its sensitive response to polluting environments unlike the mirror carps which have ability to withstand adverse environmental conditions (Table 5). On the other hand the Jammu fish which mainly comprise of hardy fishes like Indian major carps and exotic carps have ability to grow in natural as well as in captive habitats. It is the reason that statistical models reflect increase in fish production in future.

The results obtained showed that there is a continuous growth in fish production. On the basis of fitted models we present the forecasts of fish production as shown in Table 6. Kashmir valley has reached population of 6.907623 million (Bureau of census, India, 2013). The recommended intake of fish per capita for people of India is 13 kg (Manual of Fishery Statistics, Govt. of India 2011). It implies that we need 89.7million kg of fish in the state to ensure the eradication of protein deficiency against 161248 quintals (Fisheries department J & K) of fish presently got from both capture and culture practices. In other words, there is a huge gap between the demand and supply of fish. The 27781 Km. length of

Table 4: Model Summary and Parameter Estimates Dependent Variable of Jammu & Kashmir

	Model Summary					Parameter Estimates			
Equation	**R2**	**F**	**df1**	**df2**	**Sig.**	**Constant**	**b1**	**b2**	**b3**
Linear	.888	356.671	1	45	.000	2.831E4	3.965E3		
Logarithmic	.835	227.467	1	45	.000	-4.991E4	5.957E4		
Inverse	.402	30.234	1	45	.000	1.448E5	-2.260E5		
Quadratic	.927	278.035	2	44	.000	1.547E3	7.242E3	-68.277	
Cubic	.949	268.012	3	43	.000	2.732E4	1.119E3	247.303	
				-4.383					
Compound	.713	112.058	1	45	.000	3.611E4	1.045		
Power	.936	661.805	1	45	.000	1.071E4	.780		
S	.766	147.506	1	45	.000	11.914	-3.859		
Growth	.713	112.058	1	45	.000	10.494	.044		
Exponential	.713	112.058	1	45	.000	3.611E4	.044		
Logistic	.713	112.058	1	45	.000	2.769E-5	.957		

Table 5: Forecast of fish production in Jammu and Kashmir provinces

Year	Trout	Mirror carp	Country fish	Total production of Kashmir	Jammu Fish	Total production of the state
2014 – 15	2295.20	111118	40170.1	152896	38968.8	191865
2015 – 16	2441.32	110739	39779.2	152156	40328.0	192484
2016 – 17	2591.77	110247	39344.2	151257	41709.2	192967
2017 – 18	109643	109643	109643	150200	43112.2	193313
2019 – 20	2746.56	108927	38865.0	148985	44537.1	193523
2020 – 21	3069.14	108098	37774.0	147611	45983.9	193596
2021 – 22	3236.94	107156	37162.3	146079	47452.6	193533
2022 – 23	3409.07	106102	36506.3	144388	48943.1	193333
2023 – 24	3585.54	104935	35806.2	142539	50455.6	192996
2024 - 25	3766.34	103655	35061.8	140531	51989.9	192523

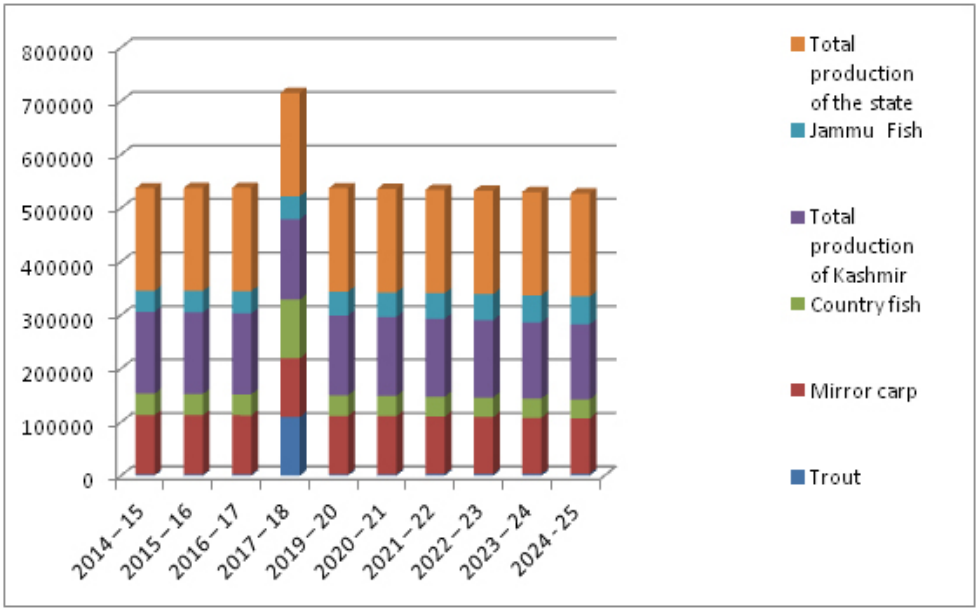

Fig. 1: Graph representing the forecasted fish production of Jammu and Kashmir provinces

Rivers / streams facilitates farming of more than 40 million tonnes of fish. Unscientific cultural practices, less availability of technical staff and non utilization of water resources up to their full potential might be the prime causes for the dwindling development of the sector in the valley. Moreover, when predicting the future development of fisheries sector and fish production, the graph doesn't show sharp increase as shown up till now. In other words we will not be able to increase our fish production up to the level to meet the demand of protein. This might be due to the non implementation of scientific methodology, less availability of the technical staff, lack of funds and oblivion to the technical knowhow in the field (Qayoom *et al*,. 2014). Hence the compendia for the same demands the adoption of scientific methods in both capture and culture fisheries to meet the protein demand and reduce malnutrition.

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