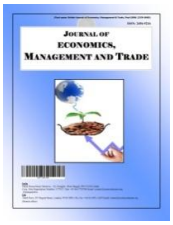

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Analytical Study on Indian Fisheries Sector: Trends in Trade Performance

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Authors' contributions

This work was carried out in collaboration between all authors. Authors SSG, MPP and SVR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MPP and SVR managed the analyses of the study. Author SVR managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The present study was conducted to examine the market wise and product wise growth, instability and direction of fish export from India. This study was based on secondary data on market wise and product-wise marine export in terms of quantity and value was collected from different sources like Marine Products Export Development Authority of India and Indiastat. The analytical tools like Markov Chain Analysis were employed to analyze the movement (direction) of export of fish over time, Compound Annual Growth Rate analysis was used to estimate the growth in export and Cuddy-Della Valle method was used to estimate the extent of instability in export of fish over a period of time. The findings reveals that, In 2018-19, South East Asia was the major importer of Indian fish in terms of quantity with 32.10 per cent and USA was the leading importer in terms of value with 34.81 per cent. Except China, growth in fish export of to all countries was positively significant. South East Asia has recorded a highest growth in fish export. Markets like USA, China and SEA were more instable markets for Indian fish products. Among these China was the most instable fish export market both in terms of quantity (42.38) and value (52.90). Japan, European

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Union and Middle East were the more stable international markets for India fish. Among these markets European Union was the least instable (more stable) market with instability index of 7.13 and 11.53 in terms of quantity and value. With respect to reliability of markets USA, European Union, China and South East Asia are the more loyal among importers of Indian fish as reflected by higher probability of 0.90, 0.87, 0.88 and 0.90 respectively. In 2018-19,among all fish products exported frozen shrimp was the leading product both in terms of quantity of 6,14,154 MT (44.10% tot total export) and value of Rs.31,801 crore (68.26% of total exported value). With respect to product wise growth, all items have shown significant positive growth but dried items have recorded a highest significant and positive growth of 14.40 per cent in terms of quantity and 19.43 per cent in terms of value.Frozen shrimp was the most instable exported fish product both in terms of quantity (31.55) and value (43.60) followed by dried items (29.65 in quantity and 26.63 in values).

Keywords: Fish products; export; markov chain; transitional probability matrix; compound annual growth rate and instability.

1. INTRODUCTION

The fisheries and aquaculture activities have the significant role to play in Indian context across various facets of the economy viz., providing nutritional (food) security, generating income by export earnings, officering employment to more than 14 million people, etc. In India, the fish rearing is undertaking across diverse resources ranging from deep sea to lakes in mountains. India resumed the position of 3rd rank and 2nd rank in global fisheries and aquaculture production. The total fish production in India during 2017-18 was 12.60 million metric tonnes including 65 per cent of Inland fish and it contributes about 6.3 per cent to the global fish production. In India, states such as Gujarat, Maharashtra, Karnataka Kerala, and Tamil Nadu are the top five states in fish production.

As per as the export fish, more than 50 different types of fish and shellfish products are being exported by India to more than 70 countries across the world. Further, among different export items under the agriculture, fish and fish products have the substantial share with total annual export earring of Rs.45,000 crores during 2017-18 which accounted for about 10 and 20 per cent to total and agriculture export from India, respectively. During the period 2018-19, the contribution of fisheries to the overall GPD was 0.91 per cent and to that of Agriculture GDP was 5.23 per cent. Thus international trade significantly contributed in employment and income generation. Even though performance of Indian seafood industry' is spectacular, its full potential is yet to be tapped (DGFT, Ministry of Commerce, Department of Commerce, India's Foreign Trade Policy 2004-07, GoI).The present study attempted to analyze growth and instability in export of Indian marine products to major importing countries viz., Japan, USA, South-east Asia, European Union and Middle East and also product wise growth and instability in export. This attempt was made in order to identify the most desirable destination for marine products export from India. Considering the importance of marine products export in Indian economy, the forecast of marine products export in terms of quantity was also done using Markov Chain approach, to provide likely figures of exports for the years to come. This will enable the policy makers and exporters to plan for adequate quantity of exportable surplus every year.

Though fish market has great potential for exchange at international market, at gross root level most of the fish producer lack the techniques related to packaging technology for international markets, lack of adoption in refined modern and mixed methods of techniques are required in intensive farming and other major issue for marine fishes and invertebrates government has to provide proper incentives and remove the restriction in the marketing of fish products.

In future the demand projections for fish can be met by 75% in coming decades, where future expansion of Chinese aquaculture remains challenging however, at country level at aggregate the productions of aquaculture are expected to rise with average growth rate of 4.5% annually over a period of 2010 to 2030 [1].

However, at the global production level, the fish supply will be of approximately 23 million tons by 2030, which will be contributed mostly by North America, Japan, and the rest of the East Asia and Pacific region which reaps the benefits of higher production gain in international markets both in terms of quantity and value [2]. On the other end, ornamental fish culture is gaining

much more importance at present, the Indian status in sector is considered as “Sleeping Giant” which contributes less than 1% for its untapped potential resources in India [3]. Hence, the future prospectus of this study can yield more importance on frozen products of fish and breeding techniques for better quality of fish production and its value additions will give better probability for young researcher in fish industry.

2. METHODOLOGY

2.1 Data and Source

Thisstudywas based on thesecondarydata were collected for a period of 2004-05 to 2018-19 from sources like Marine Products Export Development Authority, Kochi and Directorate General of Commercial Intelligence & Statistics, Department of Commerce.

2.2 Analytical Tools

a) Markov chain analysis (Transitional probability matrix)

Markov chain analysis analyzes the structural change in any system whose progress through time can be measured in terms of single outcome variable. In the present study, the dynamic nature of trade patterns that is the gains and losses in export of Indian Fish products to major importing countries was examined using the Markov chain model. Markov chain analysis involves developing a transitional probability matrix ‘P’, whose elements, P_{ij} indicate the probability of exports switching from country ‘i’ to country ‘j’ over time. The diagonal element P_{ij} where i=j, measures the probability of a country retaining its market share or in other words, the loyalty of an importing country to a particular country’s exports.

In the context of current application, structural change was treated as a random process with seven importing markets (countries) for fish products the assumption was that the average export of fish from India amongst importing countries in any period depends only on the export in the previous period and this dependence was same among all the periods. This was algebraically expressed as [4].

$$E_{jt} = \sum_{i=1}^{r} E_{it-1} P_{ij} + e_{jt} \quad (1)$$

Where,

E_{jt} = Exports from India to the j^{th}country during the year t

E_{it-1}=Exports to the i^{th}country during the year (t – 1)

Pij=Probability that exports will shift from the i^{th} country to j^{th}country

ejt = Error-term which is statistically independent of Ejt-1

r = Number of importing countries (export destinations of India).

The transitional probabilities, which can be arranged in a (c x r) matrix, having following properties:

$$\sum_{i=1}^{r} \mathrm{Pij} = 1 \quad (2)$$

Where, $0 <= P_{ij} <= 1$ and Pij = 1 for all i = 1.

Thus, the expected export share of each country during period t is obtained by multiplying the exports to these countries in the previous period (t-1) with the transitional probability matrix. The probability matrix was estimated for the period 2004-05 to 2018-19.

The transition probability matrix (T)was estimated using linear programming (LP) framework by a method referred to as minimization of mean absolute deviation (MAD),

$$\text{Min, } OP^* + Ie \quad (3)$$

Subject to,

$XP^* + V = Y$

$GP^* = 1$

$P^* >= 0$

Where,

P^*_{ij} is a vector of the probabilities Pij;

O is a null vector

i is an appropriately dimensional vectors of areas

e is the vector of absolute errors

Y is the proportion of exports to each country.

X is a block diagonal matrix of lagged values of Y

V is the vector of errors

G is a grouping matrix to add the row elements of P arranged inP* to unity.

Prediction of quantity of fish export was made by usingthe Transitional Probability Matrix.

$B_t = B_0 * T$
$B_{t+i} = Bt+i-1 * T$

Where,

B_0 = Quantity exported in Base years
B_{t+i} = Quantity exported in next year (prediction)
T = Transitional probability matrix

b) Compound Annual Growth Rate Analysis

Growth rate in export of fish products to different trade destinations by India for a period of 15 years from 2004-05 to 2018-19 were estimated by using the exponential growth model [5].

$$Y_t = A\, B^t V_t \quad (1)$$

Where,

Y_t = Area / production / productivity or other variable under consideration in the year t
A = Intercept indicating Y in the base period (t = 0)
B = 1 + g
T = time period
V_t = Random disturbance term

Equation (1) was converted into the logarithmic form as follows to make it in a linear form:

$$\ln Yt = \ln A + t * \ln B + \ln V_t$$

This is of the following form

$$Qt = a + bt + U_t . \quad (2)$$

Where,

Qt = ln Y
A = ln A
B = ln B
Ut = ln V_t

The values of 'a' and 'b' were estimated by using Ordinary Least Squares estimation technique. Later, the original 'A' and 'B' parameters in equation (1) were obtained by taking antilogarithms of 'a' and 'b' values as;

A = Antilog (a)
B = Antilog (b)

Average annual compound growth rate (%) was calculated as follows:

$$g = (B - 1) * 100$$

c) Instability Analysis

The coefficient of variation was used as a measure to study the variability in export and import of pulses in India. The coefficient of variation or index of instability were computed using the following formula

$$\text{CV} = \frac{\text{Standard Deviation } (\sigma)}{\text{Mean (X)}}\, 100$$

Linear trend was fitted to the original data of import and export quantity and values of pulses, for the period of 15 years from 2000-01 to 2014-15. The trend coefficients were tested for their significance. Whenever the trend of series found significant; the variation around the trend rather than the variation around mean was used as an index of instability. The formula suggested by Cuddy and Della [6] was used to compute the degree of variation around the trend. That is coefficient of variation was multiplied by the square root of the difference between the unity and coefficient of multiple determination (r^2) was significant to obtain the instability Index.

$$\text{Instability Index} = \frac{\text{Standard Deviation } (\sigma)}{\text{Mean (X)}} \text{ x } 100 \text{ x } \sqrt{(1 - r2)}$$

r^2 = RSS/TSS = Goodness of fit
RSS = Regression Sum of Square
TSS= Total Sum of Square

Standard Deviation

$$\sigma = \sqrt{\frac{\Sigma\,(X - \mu)^2}{N}}$$

σ = population standard deviation
∑ = sum of
X = each value
μ = population mean
N = number of values in the population

3. RESULTS AND DISCUSSION

3.1 Growth and Instability in Export of Fish Products from India

Total export of fish from India during 2004-05, was about 4,64,329 tonnes and in 2018-19 this export has increased by four times to reach 13,92,559 tonnes (Table 1). In 2004-05 China

was the major importer of Indian fishwith 27.06 per cent in terms of quantity and But in terms of value European Union was the major destination with 27.37 per cent. In 2018-19 SEA became the major importer of Indian fish in terms of quantity with 32.10 per cent and USA has become the leading importer in terms of value with 34.81 per cent this is mainly because of appreciation of US dollar on account of excess demand for it. It is also important to note that, since 15 years Japan is one of the major markets for marine products especially for India, it has suffered a jolt as indicated by the decline in relative market shares. The share of Japan as a destination market of India's fishery exports has reduced from 18.09 per cent to 6.27 per cent in value terms and from 12.54 per cent to 6.04 per cent in terms of quantity exported between 2004-05 and 2018-19. The main reason for this is the drastic reduction of shrimp exports to Japan due to various reasons like slump in domestic production of shrimp, gradual erosion in preference among Japanese consumers etc [7].

Table 1. Performance of marine fish export from India (quantity in tonnes and value in rs. crore)

Year	2004-05				2018-19			
	Export		Share		Export		Share	
Market	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Japan	57832	1202	12.54	18.09	84080	2920	6.04	6.27
USA	50045	1556	10.85	23.41	281913	16220	20.24	34.81
EU	117742	1829	25.52	27.37	165571	6256	11.89	13.43
China	124826	693	27.06	10.43	225519	5673	16.19	12.18
SEA	63842	629	13.84	9.46	446966	10561	32.10	22.67
Middle East	16624	244	3.60	3.68	60232	1979	4.33	4.25
Others	30418	502	6.59	7.56	128278	2980	9.21	6.40
Total	461329	6647	100.00	100.00	1392559	46589	100.00	100.00

Source: Marine products export development authority, Kochi, Kerala, ministry of commerce & industry, Government of India; Note: Q- quantity in tonnes and V- value in rs.crore

Table 2. Growth and instability in export of fish products by India: 1995-96 to 2018-19

Year	CAGR (Per cent)		Instability Index	
Market	Qty.	Value	Qty.	Value
Japan	2.40**	8.22**	8.78	12.05
USA	15.72**	23.92**	33.82	36.77
EU	2.55**	10.54**	7.13	11.53
China	-6.28*	7.34**	42.38	52.90
SEA	19.90**	30.61**	23.67	24.02
Middle East	9.63**	18.03**	13.12	14.98
Others	8.83**	14.50**	18.30	14.83
Total	7.99**	17.16**	7.06	13.67

*Source: marine products export development authority, Kochi, Kerala, ministry of commerce & industry, Government of India; Note: 1.USA- United States of America, EU- European Union, SEA- South East Asia, CAGR- compound annual growth rate, IX- Instability Index (Cuddy & Della Valle method), 2.** indicates significance at 1 per cent probability level & * indicates significance at 5 per cent probability level*

Table 3. Direction of fish export from India (Transitional probability matrix*) - Markov chain approach (2004-05 to 2018-19)

	Japan	USA	EU	China	SEA	Middle East	Others
Japan	0.4815	0.0000	0.0465	0.0778	0.0000	0.0000	0.3940
USA	0.0427	0.9011	0.0121	0.0000	0.0000	0.0000	0.0438
EU	0.0000	0.0000	0.8789	0.0000	0.0000	0.0451	0.0759
China	0.1137	0.0000	0.0000	0.8862	0.0000	0.0000	0.0000
SEA	0.0035	0.0705	0.0000	0.0000	0.9093	0.0057	0.0108
Middle east	0.4224	0.0000	0.0000	0.0000	0.0000	0.5775	0.0000
Others	0.0000	0.0000	0.0769	0.0000	0.3717	0.0925	0.4587

*Source: marine products export development authority, Kochi, Kerala, ministry of commerce & industry, Government of India; Note: *data analysed for markov chain approach using lingo software package*

It is revealed from Table 2 that rate of growth in fish exported of to all countries was positively significant except China ranging from lowest growth of 2.40 per cent for Japan to highest growth of 19.90 per cent for South East Asia. South East Asian countries have recorded a higher growth both in quantitative terms and value terms because of relaxed sanitary standards prevailing in these countries which attract huge seafood export from India [8]. It is worth mentioning that even though proportionate of export of fish to Japan declined drastically but it grew at a significant rate of 2.40 per cent. Growth in value exported is more than the growth in quantity exported could be attributed to higher per unit price realization of exported shrimps [8].

Instability Index indicates how much a variable is stable (instable) over time. Higher index indicates of higher instability of a time series. It is revealed from Table 2 that USA, China and SEA are the more instable international markets for Indian fish products but among these China was the most instable (least stable) fish export market both in terms of quantity (42.38) and value (52.90) and Japan, European Union and Middle East were the more stable international markets for India fish. Among these markets European Union was the least instable (more stable) market with instability index of 7.13 and 11.53 in terms of quantity and value. The results are in line with findings of Das et al. [9].

3.2 Direction of Trade in Indian Fish Export

The direction of trade of Indian fish to different countries was studied byestimating the transitional probability matrix using the Markov chain framework. It indicatesthe reliability of an importing country to particular country's exports. To analyse the exports offish, seven major countries (regions) of the world were considered. The average exports from India to other countries wereconsidered for the overall analysis.

3.3 Change of Direction of Trade of Indian Fish

Transitional probabilities of fish export to different destinations from India are presented in Table 3 showing a rough idea of change in direction of trade over a period of fifteen years. There were seven major destinations, which imported Indian fish viz., Japan, USA, European Union, China, South East Asia and Middle East. The exports to remaining countries were taken together under the 'other' countries. The diagonal elements in a transitional probability matrix indicate the probability of retention of the trade, while, the row elements indicate the probability of loss in trade on account of competing countries. The elements in the column indicate the probability of gain in trade from other competing countries.

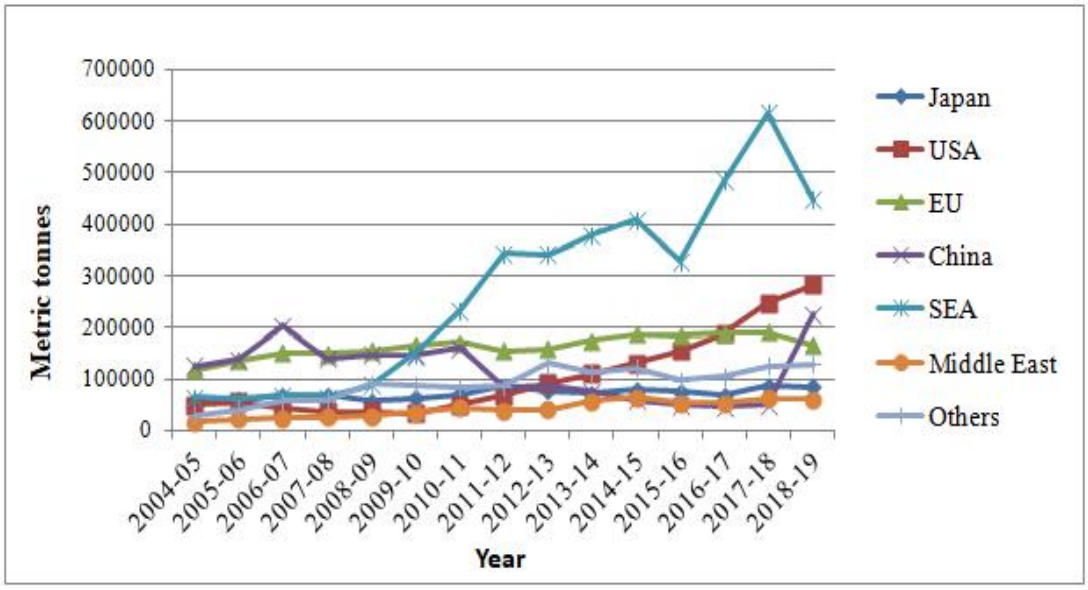

Fig. 1. Trends in fish export (2004-05 to 2018-19)

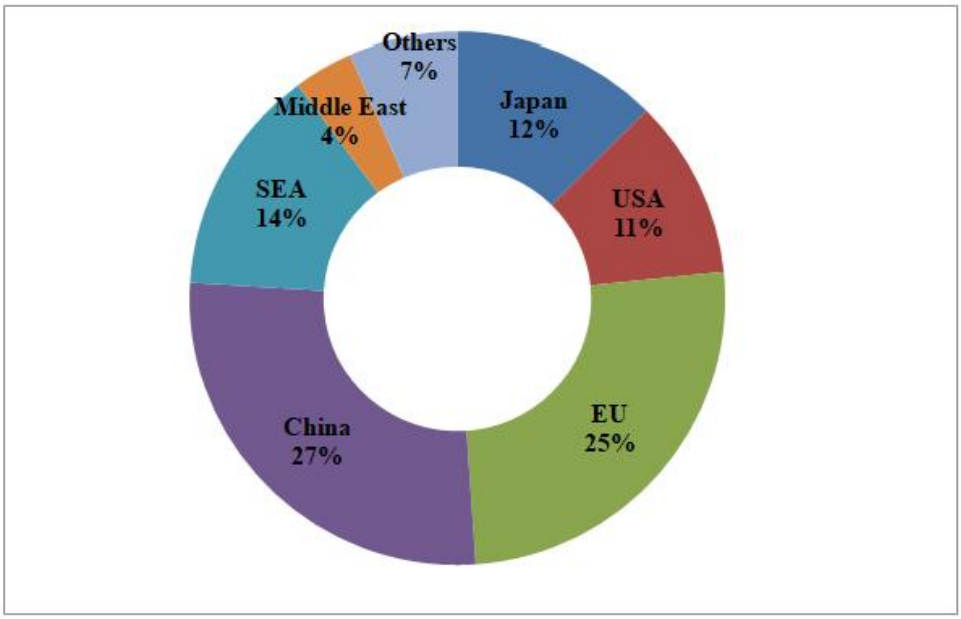

Fig. 2. Share of different destinations to total fish export (2004-05)

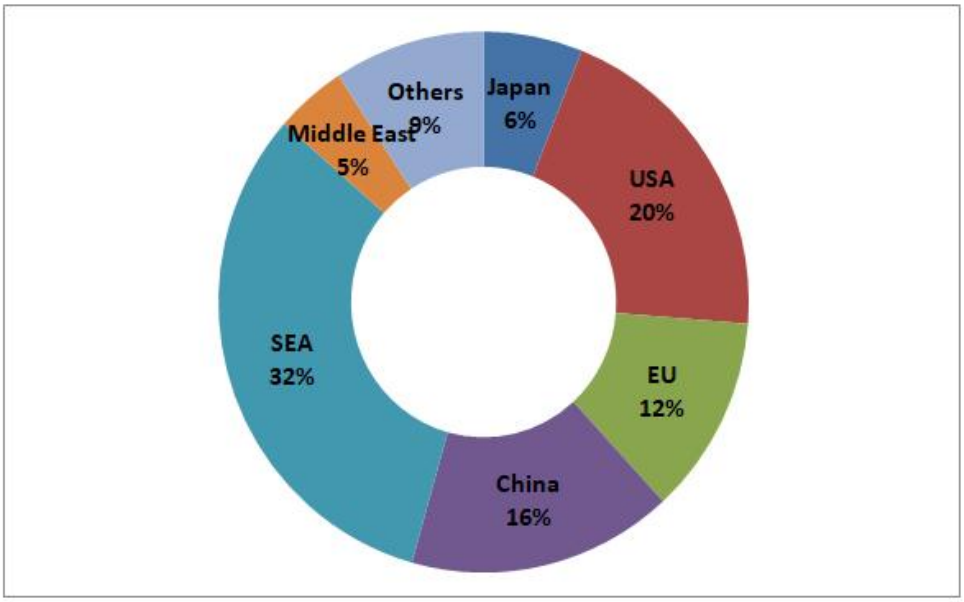

Fig. 3. Share of different destinations to total fish export (2018-19)

It is evident from the Table 3 that with respect to reliability of export USA, European Union, China and South East Asia are the more loyal among importers of Indian fish as reflected by higher probability of 0.90, 0.87, 0.88 and 0.90 respectively. This means the probability that USA retained its export share of 90 per cent likewise European Union retained its share by 87 per cent, China by 88 per cent and South East Asia by 90 per cent. Higher probabilities of these countries indicate that these countries are more reliable and loyal in importing Indian fish. Destinations like Japan, Middle East and Others are relatively instable with lower probability of 48 per cent, 57 per cent and 45 per cent respectively. The results are inconformity with findings of Manjunath et al. [10].

Table 4. Actual and predicted values of fish exports (Qty in Metric tonnes)

Market	Japan		USA		EU		China		SEA		Middle east		Others	
Year	A	P	A	P	A	P	A	P	A	P	A	P	A	P
2004-05	57832 (12.54)	51421 (11.15)	50045 (10.85)	49596 (10.75)	117742 (25.52)	109117 (23.66)	124826 (27.06)	115120 (24.96)	63842 (13.84)	69358 (15.04)	16624 (3.60)	18088 (3.92)	30418 (6.59)	48557 (10.53)
2005-06	59785 (11.67)	56373 (11.01)	55817 (10.90)	54537 (10.65)	136842 (26.72)	126820 (24.77)	137076 (26.76)	126128 (24.63)	60140 (11.74)	69640 (13.60)	22270 m(4.35)	23097 (4.51)	40234 (7.86)	55491 (10.84)
2006-07	67437 (11.01)	67678 (11.05)	43758 (7.14)	44200 (7.22)	149773 (24.45)	139678 (22.80)	203513 (33.22)	185600 (30.30)	67650 (11.04)	82673 (13.50)	23585 (3.85)	26026 (4.25)	56924 (9.29)	66696 (10.89)
2007-08	67373 (12.44)	60999 (11.26)	36612 (6.76)	37490 (6.92)	149381 (27.58)	139402 (25.74)	139792 (25.81)	129125 (23.84)	63818 (11.78)	79950 (14.76)	25752 (4.75)	27428 (5.06)	58972 (10.89)	67226 (12.41)
2008-09	57271 (9.05)	57691 (9.57)	36877 (6.12)	39501 (6.55)	155161 (25.74)	146408 (24.29)	147312 (24.44)	135004 (22.40)	88953 (14.76)	114369 (18.97)	27177 (4.51)	31532 (5.23)	90083 (14.94)	78238 (12.98)
2009-10	62690 (9.24)	63287 (9.33)	33444 (4.93)	40666 (5.99)	164800 (24.29)	155003 (22.85)	144290 (21.27)	132747 (19.57)	149353 (22.01)	168871 (24.89)	34907 (5.15)	36671 (5.41)	88953 (13.11)	81089 (11.95)
2010-11	70714 (8.70)	73680 (9.06)	50095 (6.16)	61635 (7.58)	170963 (21.03)	160631 (19.76)	159147(19.57)	146538 (18.03)	233964 (28.77)	244050 (30.02)	43983 (5.41)	42235 (5.20)	84225 (10.36)	84192 (10.36)
2011-12	85800 (9.95)	71161 (8.26)	68354 (7.93)	85843 (9.96)	154221 (17.89)	147053 (17.06)	84515 (9.80)	81572 (9.46)	343962 (39.90)	345108 (40.04)	38155 (4.43)	38999 (4.52)	87014 (10.09)	92133 (10.69)
2012-13	76648 (8.26)	69522 (7.49)	92447 (9.96)	107341 (11.57)	158357 (17.06)	153908 (16.58)	87776 (9.46)	83750 (9.02)	340944 (36.73)	358573 (38.64)	41419 (4.46)	45087 (4.86)	130623 (14.07)	109867 (11.84)
2013-14	71484 (7.27)	73617 (7.48)	110880 (11.27)	126708 (12.88)	174686 (17.76)	166873 (16.97)	75783 (7.70)	72720 (7.39)	380061 (38.63)	387525 (39.40)	58040 (5.90)	53999 (5.49)	112822 (11.47)	102136 (10.38)
2014-15	78772 (7.49)	78958 (7.51)	129667 (12.33)	145743 (13.87)	188031 (17.89)	179775 (17.10)	59519 (5.66)	58874 (5.60)	409931 (38.99)	417620 (39.73)	64608 (6.15)	59294 (5.64)	120716 (11.48)	110787 (10.54)
2015-16	75393 (7.97)	72475 (7.66)	153695 (16.25)	161682 (17.10)	186349 (19.70)	176654 (18.68)	50042 (5.29)	50213 (5.31)	328900 (34.77)	335350 (35.46)	53905 (5.70)	50438 (5.33)	97609 (10.32)	98906 (10.46)
2016-17	69039 (6.08)	70536 (6.22)	188617 (16.62)	204143 (17.99)	189833 (16.73)	180352 (15.89)	45443 (4.00)	45643 (4.02)	484819 (42.72)	479586 (42.26)	52973 (4.67)	51558 (4.54)	104224 (9.18)	102915 (9.07)
2017-18	85651 (6.22)	85912 (6.24)	247780 (17.99)	266752 (19.37)	190314 (13.82)	183850 (13.35)	49701 (3.61)	50709 (3.68)	616707 (44.78)	607186 (44.10)	62220 (4.52)	59581 (4.33)	124871 (9.07)	122983 (8.93)
2018-19	84080 (6.04)	105170 (7.55)	281913 (20.24)	285543(20.51)	165571 (11.89)	162706 (11.69)	225519 (16.19)	206396 (14.82)	446966 (32.10)	454107 (32.62)	60232 (4.33)	56665 (4.07)	128278 (9.21)	121710 (8.74)
2019-20		111824 (8.03)		2,89,317 (20.78)		1,60,707 (11.54)		1,91,091 (13.73)		4,58,159 (32.91)		53,909 (3.87)		1,27,026 (9.13)
2020-21		112299 (8.07)		2,93,004 (21.05)		1,59,714 (11.48)		1,78,044 (12.79)		4,63,820 (33.33)		52,741 (3.79)		1,32,143 (9.49)
2021-22		110728 (7.96)		2,96,725 (21.32)		1,59,302 (11.45)		1,66,520 (11.97)		4,70,869 (33.84)		52,528 (3.77)		1,34,825 (9.69)

Source: data analysed for markov chain using lingo software package.Note: A- Actual, P- Predicted; Figures in parentheses indicate per cent to total

Table 5. Commodity wise export performance of marine fish from India

Export (Quantity in Metric tonnes and value in Rs. crore)						
Year	**1995-96**		**2005-06**		**2018-19**	
Commodity	**Qty.**	**Value**	**Qty.**	**Value**	**Qty.**	**Value**
Frozen Shrimp	95724	2357	145180	4272	614145	31801
Frozen Fin Fish	100093	372	182344	999	338933	4917
Frozen Cuttlefish	33845	261	49651	549	60210	1976
Frozen Squid	45025	320	52352	576	101101	2507
Dried items	7506	45	14167	133	95296	1323
Others	14084	147	68469	718	182873	4066
Total	296277	3501	512164	7245	1392559	46589
Share (per cent)						
Year	**1995-96**		**2005-06**		**2018-19**	
Commodity	**Qty.**	**Value**	**Qty.**	**Value**	**Qty.**	**Value**
Frozen Shrimp	32.31	67.32	28.35	58.96	44.10	68.26
Frozen Fin Fish	33.78	10.63	35.60	13.79	24.34	10.55
Frozen Cuttlefish	11.42	7.46	9.69	7.58	4.32	4.24
Frozen Squid	15.20	9.14	10.22	7.95	7.26	5.38
Dried items	2.53	1.29	2.77	1.84	6.84	2.84
Others	4.75	4.20	13.37	9.91	13.13	8.73
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: marine products export development authority, Kochi, Kerala, ministry of commerce & industry, Government of India

Table 6. Commodity-wise growth and instability in India's marine products exports: 1995-96 to 2018-19

Year	**CAGR (Per cent)**		**Instability Index**	
Commodity	**Qty.**	**Value**	**Qty.**	**Value**
Frozen Shrimp	7.58**	11.16**	31.55	43.60
Frozen Fin Fish	4.63**	12.18**	18.63	19.94
Frozen Cuttlefish	3.93**	11.15**	11.75	13.73
Frozen Squid	5.12**	11.17**	18.29	23.91
Dried items	14.40**	19.43**	29.65	26.63
Others	12.26**	15.95**	15.07	9.27
Total	6.79**	11.87**	10.85	24.72

Source: marine products export development authority, Kochi, Kerala, ministry of commerce & industry, Government of India

With respect to loss in share of export, Japan has lost 39 per cent to others, China lost 11 per cent to Japan, and Middle East lost 42 per cent to Japan and Others lost 37 per cent to South East Asia. This means loss of share for any country is gain for other and vice-versa.

3.4 Projections of Indian Fish Exports to Major Importing Countries

The market share projections of Indian fish to the major importing countries were computed up to 2021-22 using the transitional probability matrix (Table 3). The actual and projected values are also presented Table 4 for easy understanding. The projections are based on actual and estimated values from 2004-05 to 2018-19.

It is evident from the Table 4 that the actual export share of Japan had increased from 12.54 per cent to 6.04 per cent of total Indian exports between 2004-05 and2018-19. But the quantity exported had increased from 57,832 MT to 84,080 MT during this period. Projected export value also showed the similar declining trend in the same period. And the projected value of export to Japan for 2021-22 would be 1,10,728 MT (7.96% to total projected export of fish).

Countries like European Union and China experienced a sharp decline in actual and predicted values of export from 25.52 per cent to 11.89 per cent for EU andfrom 27.06 per cent to 16.19 per cent for China between 2004-05 and 2018-19.As per projections exports would go down to 1,59,302 MT in case of EU and 1,66,520 MT in case of China by 2021-22.

Table 7. Export performance of marine products in total country export and agricultural export of India (value: rs. in crore)

Years	Total country export	Agricultural export	Marine export	% share of marine export in	
				Country total export	Agricultural export
1990-91	43,198	1206	856	1.98	70.99
1995-96	10,6,353	20,398	3501	3.29	17.16
2000-01	20,3,571	28,657	6444	3.17	22.49
2005-06	45,6,418	45,711	7245	1.59	15.85
2006-07	57,1,779	57,768	8364	1.46	14.48
2007-08	65,5,864	74,673	7621	1.16	10.21
2008-09	84,0,755	81,065	8608	1.02	10.62
2009-10	84,5,534	84,444	10,049	1.19	11.90
2010-11	11,36,964	1,,13,047	12,901	1.13	11.41
2011-12	14,65,959	1,82,801	16,597	1.13	9.08
2012-13	16,34,318	2,27,193	18,856	1.15	8.30
2013-14	19,05,011	2,62,779	30,213	1.59	11.50
2014-15	18,96,348	2,39,681	33,442	1.76	13.95
2015-16	17,16,384	2,15,396	30,421	1.77	14.12
2016-17	18,49,434	2,26,652	37,871	2.05	16.71
2017-18	19,56,515	2,51,564	45,107	2.31	17.93
2018-19	23,07,726	2,74,571	47,665	2.07	17.36

Sources: 1. directorate general of commercial intelligence & statistics, department of commerce, Government of India; 2. marine products export development authority, Kochi, Kerala, ministry of commerce & industry, Government of India

With regard to USA and South East Asia both actual and estimated values have increased substantially between 2004-05 and 2018-19. For USA actual values have increased from 10.85 per cent to 20.24 per cent (by 2,31,868 MT) and for SEA actual values have rose from 13.84 per cent to 32.10 per cent (by 1,00,693 MT) in the same period. Projections also revealed that fish exports to both these destination markets would shoot up to 2,96,725, MT (21.32%) to USA and 4,70,869 MT (33.84%) to SEA.

Both Middle East and Others markets have seen increased exports from 3.60 per cent to 4.33 per cent and from 6.59 per cent to 9.21 per cent in Middle east and Others respectively.

3.5 Commodity Wise Export of Marine Fish from India

Fish products like Frozen Shrimp, Frozen Fin Fish, Frozen Cuttlefish, Frozen Squid and Dried items are the major items exported from India. In 1995-96 among all fish products exported Frozen Fin Fish was the major exported item in terms of quantity with 1,00,093 MT (33.78% of total export) but in terms of value frozen shrimp was the major fish product exported with value of 2357 crore Rs. (67.32% to total exported value). By 2018-19, frozen shrimp took the first place both in terms of quantity and value. The quantity of this item exported in 2018-19 was 6,14,154 MT (44.10% tot total export) with value of Rs. 31,801 crore (68.26% of total exported value).

3.6 Commodity-Wise Growth and Instability in India's Marine Products Exports

Growth and instability in export of different fish products were estimated for a period of 15 years from 1995-96 to 2018-19. It is evident from the Table 6 that all items have shown significant positive growth in this period but dried items have recorded a highest significant and positive growth of 14.40 per cent in terms of quantity and 19.43 per cent in terms of value.

With respect to product wise instability in export of frozen shrimp was the most instable exported fish product both in terms of quantity (31.55%) and value (43.60%) followed by dried items (29.65 % in quantity and 26.63% in value). This high instability indicates that demand for frozen shrimp and dried items are highly fluctuating. The results are in contrast to the findings of Shinoj et al. [7] wherein his results indicate that frozen shrimp was one of the most stable item in international market with instability index of 4.60 in quantity and 9.76 in value.

3.7 Share of Marine Export to Total Export and Agricultural Export from India

Share of marine export to total export and agricultural export is presented in Table 7. It is indicated that in 1995-96 marine export was Rs. 3501 crore which is 3.29 per cent of total export and 17.16 per cent of agricultural export. Although there has been an increase in fish exports, its share remain more or less same in agricultural export but its share has decreased in total exports to 2.07 per cent.

4. CONCLUSION

The findings has yield some important different conclusions from the study, they are

- Presently SEA is the major importer of Indian fish in terms of quantity but in terms of value is USA has become the leading importer this is because of the low prices in SEA and more in USA.
- There has been a significant positive growth in quantity exported of fish except China. But growth in export to SEA is more than other markets both in quantity and value.
- Since there is low instability in exported quantity and value for EU, India can think of exporting more to this market as there is an assured market with respect to prices. And should reduce the export to China as there is a high instability in value (price).
- Even though USA, EU, China and SEA are more loyal to Indian fish exports, India can think of exporting more to EU and SEA as there is a low instability in value (price) in these markets.
- As per projections, exports to SEA would increase substantially and exports to EU would decrease by 2021-22; efforts should be taken to encourage exports to this market as there is a low instability in prices and also reliability of this market on Indian fish.
- There has been an increasing demand for frozen shrimp, export of this product also has increased over time but this product is earning more per unit exports. Hence there is a further scope to enhance the export of this product so that India can earn more from trade.
- Instability in export of frozen shrimp is more both in terms of quantity and value. Hence by achieving sustainable production and minimizing trade restrictions, stability can be achieved in quantity exported and in earnings.
- The major challenge is to obtain the competitive prices for Indian fish products and increasing the selective shrimp breeding techniques and bringing new improved strains in the market is challenge for Indian fish producers at international markets.
- The future prospectus of Indian fish is to establish a large scale production and breeding facilities and infrastructure related to export quality checking which can offer focused training and assistance to breeders, stakeholders engaged in best quality fish can be produced and which increases the export basket quantity of our country to rest of the world markets.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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