# Trends in Indian seafood trade with special reference to frozen shrimp export- Retrospective and Prospective

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***Abstract:*** *Marine products exports from India accounts for 18.54% of the total agricultural exports from India and it is an important foreign exchange earner. The Gross Domestic Product from fisheries during 2012-13 at constant prices was Rs.78053 crores and during 2013-14 the GDP from fisheries increased to Rs. 96824 crores, marking an increase of 24.04 % (Government of India, 2016) and marine product exports serves as an important tool for development in the country. With a value of Rs. 33,441.60 crores in 2014-15 Indian Marine products exports crossed all previous records in marine product export. This paper analyses the trends in Indian marine products exports based on past 54 years, data covering the period 1962-63 to 2014-15 with focus on relative composition of the export basket adopting the projected marine product export from India for the next 10 years from 2015-16 to 2024-25 with special reference to frozen shrimp export .The results showed that the quantity of exports will decrease from 1084138.61 tonnes during 2015-16 to 1018298.3 tonnes during 2025-26 and the value will increase from Rs 42862.41 crores to Rs 170181.361crores . The correlation study reveals the dependence of Indian marine product export industry on prawn production .The forecasted values of frozen shrimp export from India reveals the high potential of the shrimp industry and it reaches 456314 tonnes in quantity and 30,820.13 Rs.Crores and 5035.22 million U.S $ in 2024-25.*

***Key Words:*** *Marine product, fish, export, Frozen shrimp.*

## 1. INTRODUCTION:

India, a blessed country with rich natural resources with 8,129 Km of coastline and 0.53 m.sq.km continental shelf. Table 2 gives a brief idea about Indian fishery resources . There are 52,982 traditional crafts, 73,410 motorised traditional crafts and 72,749 mechanized boats operating in Indian waters. (Government of India ,2016) . During 1990s coastal aquaculture emerged as a sunrise sector in India. New economic policy paved way for rapid growth of India's marine product exports. India's contribution to global fish production increased from 3.26 % in 1985 to 4.41% in 1997. Compared to growth in world fish production , fish production in India has increased at a faster rate mainly due to increasing volume of inland fish production. Since 1991, brackish water shrimp farming has been a growth area after the process of economic liberalisation. In spite of the high export value of the tiger shrimp, the production potential of brackish water aquaculture remained under utilised in terms of both area and yield. (Krishnan and Prathap,2002) . According to World Bank reports India is set to emerge as the top economies of the World by 2016 ahead of China. (World bank, 2015) .With a population of 1.295 billion, the GDP of India is $ 2.049 trillion at market prices. According to IMF world economic out look April 2015 , India ranks seventh globally in terms of GDP and expected to grow at 7.5% in 2016. (IMF, 2015). Accounting for about 5.4% of the global fish production, India today is the second largest fish producing nation in the world. India is also a major producer of fish through aquaculture and ranks second in the world after China. Being an important sector in India, fisheries provides employment to millions of people and contributes to food security of the country. India blessed with a coastline of 8,118 Kms, Exclusive Economic Zone 2.02 million sq.km and a continental shelf of .53 million square kilometre contributed 5.68% to the global fish production during 2011(Hand book of fisheries Statistics, 2014). Presently, fisheries and aquaculture contribute 0.83 per cent to the national GDP, and 4.75 per cent to agriculture and allied activities (Government of India , 2014). The Gross Domestic Product (GDP) from fisheries during 2012-13 at constant prices was found to be Rs.78053 crores and contribution of fisheries to the GDP IS 0.83%. (Government of India , 2014).

## 2. OBJECTIVES OF THE STUDY:

- To analyse the trend in marine product export from India since 1961-62.
- To analyse the trends in frozen shrimp exports from India from 1995-96 to 2014-15
- To forecast the projected values of marine product export from India and frozen shrimp exports and the export potential of Indian marine products.
- To analyse the dependency of Indian marine product export industry on shrimp production.

- To suggest measure for policy making.

The study is mainly done using the secondary data collected from the publications of Government of India, State Directorate of fisheries, Government of Kerala, Central Marine Fisheries Research Institute, Marine Products Export Development Authority etc. The statistical methods used were correlation analysis and testing of hypothesis using t test and quadratic trend analysis. Data relating to the period of 1961-62 to 2014-15 was used for analysis.

## 3. RESULTS AND DISCUSSION:

The Indian fisheries sector during 1950-51, produced 752 MT of which marine fish (0.5 million MT) accounted for 71 percent and during 1960-61 total fish production has increased to 1160 MT. During 1990-91, the figure reached 38.36 Million MT, and by 1999-2000, the total production has grown to 5.6 million MT, but contribution of marine catches came down to 50 percent at 2.8 million MT, the fall being due to increased production in inland and culture sectors. A detailed account of total fish production in India during the period 2000-01 to 2012-13 is provided in table 1. In 2012-13 the total fish production reached an all time high of 9040 MT. Marine production has also remained static since 1993-94.

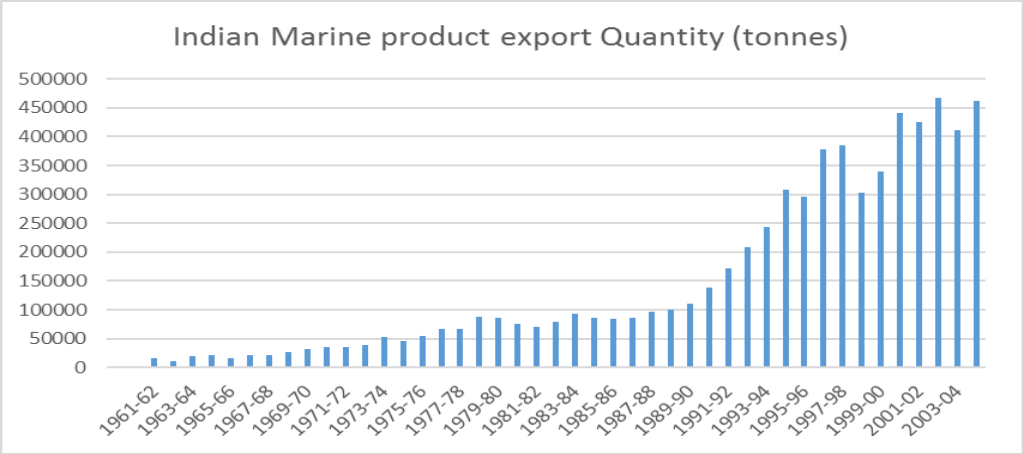
**Table :1 Total fish production from India**

| Year | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| India | 5655.3 | 5955.9 | 6199.6 | 6399.4 | 6304.7 | 6572 | 6869 | 7127 | 7616 | 7998 | 8231 | 8666 | 9040 |

Source: Handbook of Fisheries Statistics, 2014

Vivekanandan reported that the catches from inshore waters are found to have reached their full potential (Vivekanandan, 2002) and further increases could only come from the cheaper species (e.g., small pelagics), supporting the contention that fishing effort in recent years has concentrated on specific high-value varieties (Salagrama, 2004).

**Fig : 1 Quantity(tonnes) of marine product export from India from 1961-62 to 2003-04**




Source: MPEDA, 2016

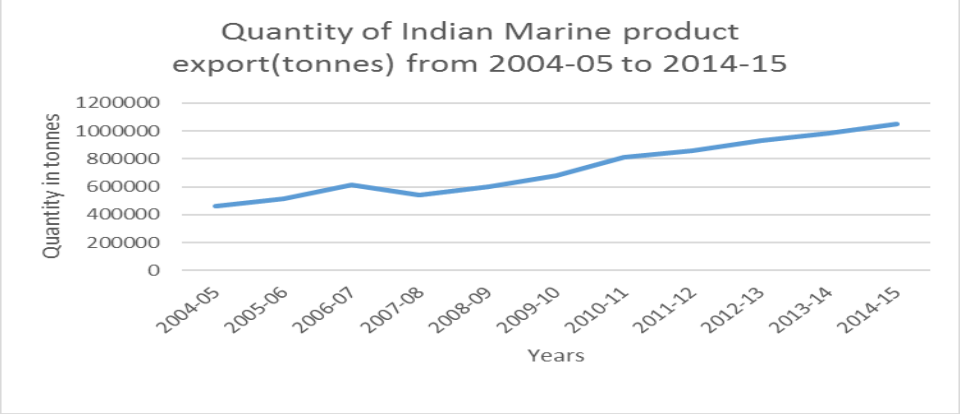
During 1961-62 the marine product export from India was 15732 tonnes and it decreased to 11161 tonnes during 1962-63 and records a negative growth of 29.06% , but in 1963-64 there was an increase of 70.75%. It was during the first two decades after India's independence the foundations of modern fisheries sector was laid. Before 1960, when Indian marine exports were dominated by dried items and the markets of Indian marine products were largely confined to neighbouring countries like Sri Lanka, Myanmar (formerly Burma), Singapore etc. This situation changed with the development of technology/modernization; dried products gave way to canned and frozen items. Till late of 1960, export basket of Indian marine products mainly consisted of dried items like dried fish and dried shrimp. Although frozen items were present in the export basket from 1953 onwards in negligible quantities, it was only since 1961 the export of dried marine products was overtaken by export of frozen items leading to a steady progress in export earnings. With the devaluation of Indian currency in 1966 the export of frozen and canned items registered a significant rise. Frozen items continued to dominate the trade. Markets for Indian products also spread fast to developed countries from the traditional buyers in neighbouring countries. (Sricharan et al, 2012).The programmes of the fifth five year plan give further impetus to the development of the Indian fisheries, which stressed on an increased production of fish to meet the protein requirement in the Indian diet; improvement of socioeconomic

conditions of fishermen and realisation of enhanced foreign exchange earnings through the export of selected marine products. With the declaration of Exclusive Economic Zone in 1976, the programmes relating to deep sea fishing and provision of necessary infrastructural facilities are intensified. More and more under exploited areas have been exploited during this period. (Anon, 1978)

Because of the over dependence of shrimp there was a deceleration in the export growth during1980s. India did fairly well in the sixties and seventies in seizing the opportunity in providing by the fast growing Japanese market for shrimp by increasing the supply of fairly easily harvestable marine shrimp. Untill 1985 , India dominated the shrimp exports. But because of the stagnation in the shrimp production and the tremendous progress made by several other countries made India lag behind the marine products export growth. China and Indonasia overtook India in providing shrimps to Japan in 1988. (Cherunilam Francis,1996)

The depleting resources, energy crisis and resultant high cost of fishing have led to an increased realisation of the potential and versatility of aquaculture as a viable and cost effective alternative to capture fisheries. (Pillai, N.G.K and Pradeep K . Katiha, 2004). During pre -liberalisation period ie 1961-62 to 1991-92 quantity of marine products exported from India showed compound annual growth rate (CAGR) of 8% and value of marine products exported from India showed CAGR of 20.76%.

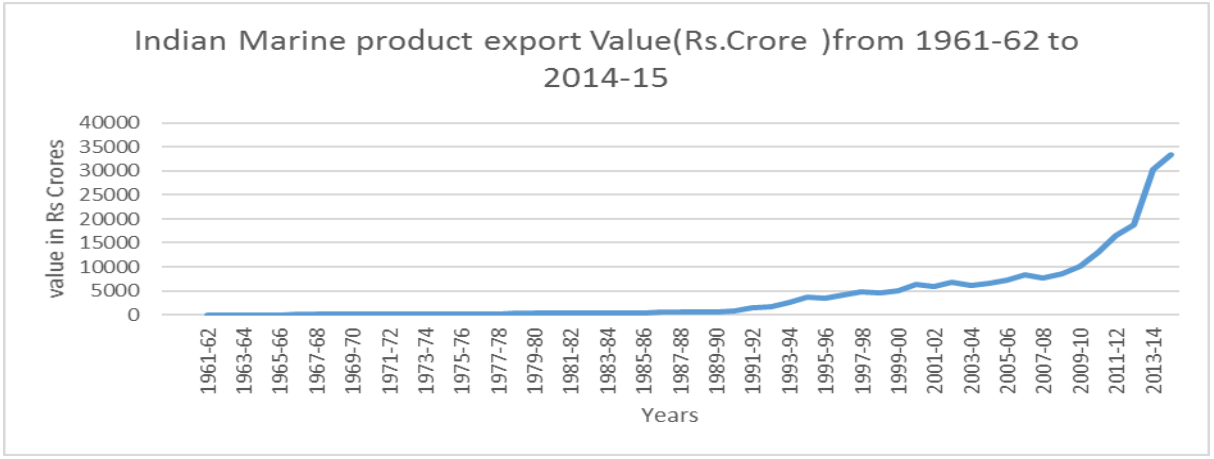
**Fig :2 Quantity of Indian marine product export from 2004-05 to 2014-15**




Source: MPEDA, 2016

Since 1991, the country has taken a series of measures to structure the economy and improve the balance of payments position .The new economic policy 1991 introduced changes in the areas of trade policies, monetary and financial political, fiscal and budgetary policies and pricing and institutional reforms. (Saxena Amrita, 2011). Tsunami of December 2004 has dealt a severe blow to the coastal marine fishery sector causing huge loss of lives, fishing crafts and gears in the state especially in Thiruvananthapuram, Kollam, Allappuzha and Ernakulam districts. The outbreak of the global financial crisis in 2008-09 led to the world trade in recession. India has been quite successful in diversifying its export markets from developed countries like the US and Europe to Asia and Africa, which has helped to a great extent in weathering the global crisis of 2008 and the recent global slowdown.(V.P.Ancy and Raju K.V, 2016)

**Fig:3 Indian marine product export value (Rs.Crore) from 1961-62 to 2014-15**



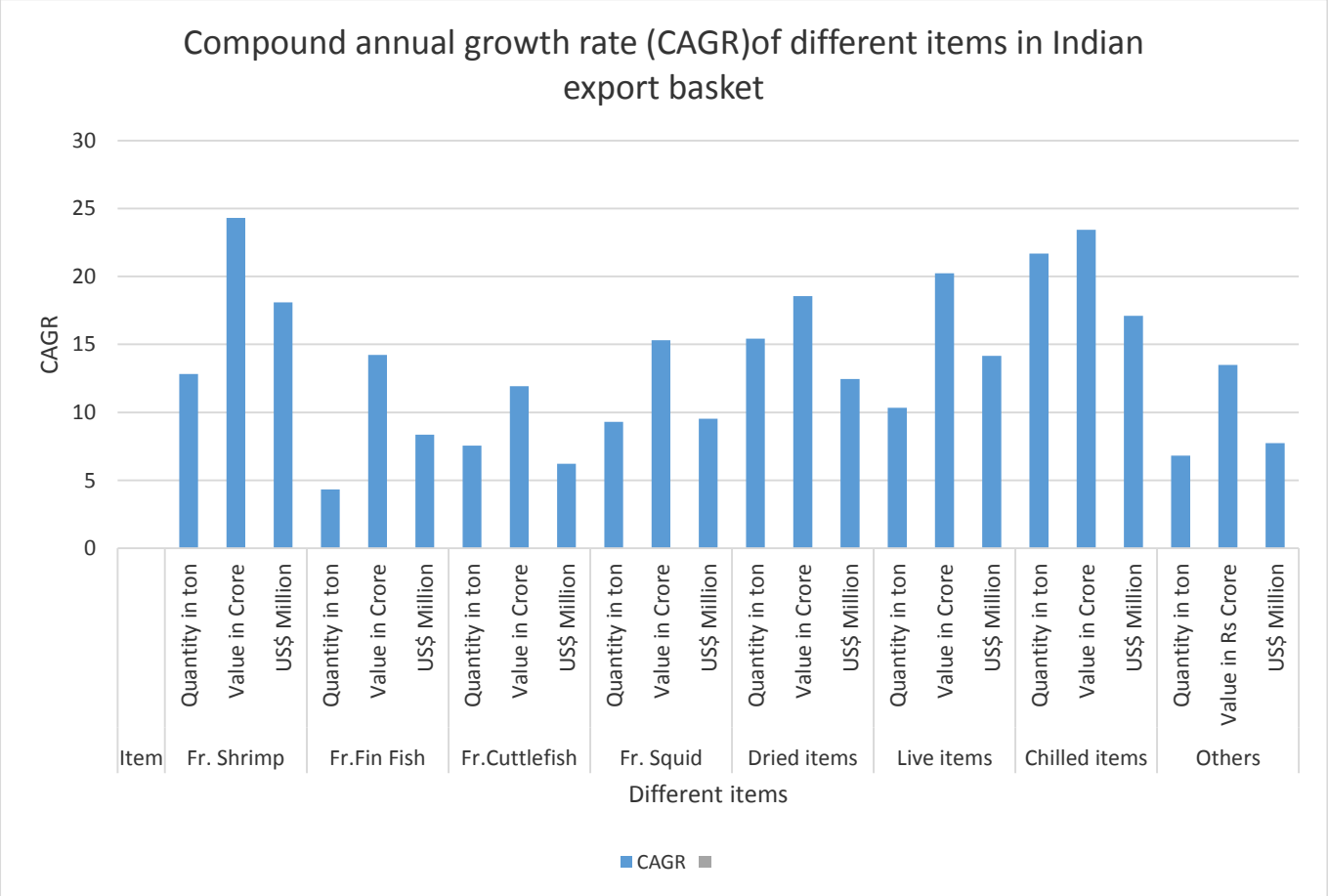

Source: MPEDA, 2016

During the financial year 2013-14, exports of marine products reached US $ 5007.70 million. Marine product exports, crossed all previous records in quantity, rupee value and US $ terms. Exports aggregated to 9,83,756 MT valued at Rs. 30,213.26 crores and US $ 5,007.70 million. Compared to the previous year, seafood exports recorded a growth of 5.98 % in quantity, 60.23% in rupee and 42.6 % growth in US $ earnings respectively. The unit value realization also reached to record high from USD/Kg 3.78 during 2012-13 to USD/Kg 5.09 during 2013-14 and recorded growth of 34.55%. The increased production of *L. Vannamei* shrimp, has helped to achieve higher exports. (MPEDA, 2015). During the financial year 2014-15, exports of marine products reached an all-time high of USD 5511.12 million. Marine product exports crossed all previous records in quantity, rupee value and USD terms. Exports aggregated to 10,51,243 MT valued at Rs. 33441.61 crores and USD 5511.12 million. Compared to the previous year, seafood exports recorded a growth of 6.86 % in quantity, 10.69% in rupee and 10.05 % growth in USD earnings. (MPEDA , 2016)

## 4. COMPOSITION OF INDIAN EXPORTS:

Frozen shrimp, finfish, cuttlefish, squid and the dried fishery items are the major items in the Indian export basket . Among which frozen shrimp and finfish continues to be the major items of export. Shrimp alone accounts for the major share of the export earnings by marine products. Inclusion of shrimp in different forms to the export basket of India essentially triggered the the marine product export growth of India. During 2013-14 percentage share of the value from export of frozen shrimp to the total export value of India was 64.10% and during 2014-15 it has increased to 67.185%. Bhattacharya (2004) noticed, a structural change in the product mix of Indian marine exports between 1960-61 to 1999-2000. He highlighted the shift from exports of low value dried items to high value frozen and canned items during 1970s and 1980s which is largely responsible for higher growth in earning. A study from IIFT, 2001 observed a decline in price competitiveness of shrimp, due to the rising trend in domestic prices. The rising trend in domestic prices can be attributed to the acute shortage of raw material for the processing industry, other support facilities like fishing harbours, landing centres, ice plants, cold storage etc. Shinoj et al (2009) observed that India's export basket has got diversification and is showing a dent towards low value exports routed to South East Asian and Middle East countries at the expense of premium priced shrimp which used to find markets in Japan.

**Fig 4**: **Item wise Compound Annual Growth Rate of different items in the Indian Export basket, from 2007-08 to 2014-15**




Source: Estimated

Considering the export value , Frozen shrimp shows highest compound annual growth rate of 24.3%, followed by chilled items 23.42%.

**5. QUADRATIC TREND ANALYSIS:**

This is perhaps the best and most objective method of trend analysis. In this case appropriate type of trend equation is at first selected, and then the constants involved in the equation are estimated on the basis of data in hand. Usually a polynomial of a suitable degree is chosen either for the original variable or for a transformed variable and its constants determined by the method of least squares. ( A.M.Goon et al, 1987)

For quadratic trend,

$T_t = a_0+a_1t+a_2t^2$

and the normal equations are

$\sum y = na_0 +a_1 \sum t+a_2\sum t^2$

$\sum ty =a_0\sum t+a_1\sum t^2+a_2\sum t^3$

$\sum t^2y=a_0\sum t^2+a_1\sum t^3+a_2\sum t^4$

Merits of least square method

1. Being a mathematical method , it is free from subjective error
2. Unlike the method of moving averages this method gives the trend values of all the years.
3. This is the only method for forecasting or prediction. One objective of time series analysis is forecasting, this method is more important and popular than other methods of trend determination.

Demerit

1. In comparison with other methods of trend determination this method is complicated and require more time. (Hazarika Padmalochan, 2012)

**Table :4 Trend analysis of marine product export quantity**

| Year | t | y(Quantity in tonnes) | ty | $t^2$ | $t^4$ | $t^2$*y |
|---|---|---|---|---|---|---|
| 2008-09 | -3 | 602834 | -1808502 | 9 | 81 | 5425506 |
| 2009-10 | -2 | 678436 | -1356872 | 4 | 16 | 2713744 |
| 2010-11 | -1 | 813091 | -813091 | 1 | 1 | 813091 |
| 2011-12 | 0 | 862021 | 0 | 0 | 0 | 0 |
| 2012-13 | 1 | 928215 | 928215 | 1 | 1 | 928215 |
| 2013-14 | 2 | 983756 | 1967512 | 4 | 16 | 3935024 |
| 2014-15 | 3 | 1051243 | 3153729 | 9 | 81 | 9461187 |
| **Total** | **0** | **5919596** | **2070991** | **28** | **196** | **23276767** |

$\sum t = 0$ and $\sum t^3 = 0$ n=7

The normal equations are found to be,

$5919596 = 7a_0+28\ a_2$

$2070991 = 28\ a_1$

$23276767 = 28\ a_0+196\ a_2$

$T_t = a_0+a_1t+a_2t^2$

The trend equation is given by,

$T_t = 864781.17+73963.96t-4781.15\ t^2$

**Table : 5 Projected Quantity of marine products exports from India in the coming years**

| Year | Projected values of Marine product export Quantity(tonnes) |
|---|---|
| 2015-16 | 1084138.61 |
| 2017-18 | 1115072.22 |
| 2018-19 | 1136443.53 |
| 2019-20 | 1148252.54 |
| 2020-21 | 1150499.25 |
| 2021-22 | 1143183.66 |
| 2022-23 | 1126305.77 |
| 2023 -24 | 1099865.58 |
| 2024-25 | 1063863.09 |
| 2025-26 | 1018298.3 |

**Source: Estimated**

During 2017-18 the projected value of quantity of marine products exports from India shows 2.85% increase compared to 2015-16. From 2023-24 the export quantity shows a decreasing trend and the compound annual growth rate of projected values of quantity wise marine products from India from 2015-16 to 2025-26 is -0.62%.

**Table : 6 Trend analysis of marine product export Value (Rs.Crores)**

| Year | t | y(Value in Rs Crores) | ty | t2 | t4 | t2*y |
|---|---|---|---|---|---|---|
| 2008-09 | -3 | 8607.94 | -25823.82 | 9 | 81 | 77471.46 |
| 2009-10 | -2 | 10048.53 | -20097.06 | 4 | 16 | 40194.12 |
| 2010-11 | -1 | 12901.46 | -12901.46 | 1 | 1 | 12901.46 |
| 2011-12 | 0 | 16597.23 | 0 | 0 | 0 | 0 |
| 2012-13 | 1 | 18856.26 | 18856.26 | 1 | 1 | 18856.26 |
| 2013-14 | 2 | 30213.26 | 60426.52 | 4 | 16 | 120853 |
| 2014-15 | 3 | 33441.6 | 100324.8 | 9 | 81 | 300974.4 |
| **Total** | **0** | **130666.28** | **120785.24** | **28** | **196** | **571251** |

$\sum t = 0$ and $\sum t^3 = 0$ n=7

The normal equations are found to be,

$130666.28 = 7a_0+28\ a_2$

$120785.24 = 28\ a_1$

$571251 = 28\ a_0+196\ a_2$

$T_t = a_0+a_1t+a_2t^2$

The trend equation is

$T_t = 16353.011+4313.75\ t+578.40\ t^2$

**Table : 7 Projected marine products exports Value from India in the coming years**

| Year | Projected values of Marine product export Value(Rs.Crores) |
|---|---|
| 2015-16 | 42862.411 |
| 2017-18 | 52381.761 |
| 2018-19 | 63057.911 |
| 2019-20 | 74890.861 |
| 2020-21 | 87880.611 |
| 2021-22 | 102027.161 |
| 2022-23 | 117330.511 |
| 2023 -24 | 133790.661 |
| 2024-25 | 151407.611 |
| 2025-26 | 170181.361 |

Source: Estimated

The projected values of marine product exports from India during year 2015-16 is 42862.411 which shows 28.17% growth compared to 2014-15. During 2017-18 the projected value of marine products export comes to about Rs.52381.761 Crores which shows 22.20 % growth compared to the previous year. The compound annual growth rate of projected value of marine products exports from India from 2015-16 to 2024-25 is 14.78.

**6. Frozen shrimp export from India –Potential and Relevance:**

The shrimp culture in India has been commercially developed during last few years due to liberalization of economy, high profitability and good international trade prospectus. India's frozen shrimp exports is boosted by global shortage of farmed shrimp in South East Asian countries and heavy buying of U.S (Geethalakshmi et al, 2010). Inspite of the early mortality syndrome (EMS) and trace presence of antibiotics Indian shrimp exports have high potential (The Economics Times, 2014).

**Table : 9 Frozen shrimp Export from India from 1995-96 to 2014-15**

| **Item** | Fr. Shrimp | | | | | |
|---|---|---|---|---|---|---|
| | Quantity in ton | Value in Crore | US$ Million | % Growth Quantity | % Growth Rs.Crore | % Growth US$ Million |
| **1995-96** | 95724 | 2356.81 | 748.19 | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **1996-97** | 105427 | 2701.76 | 755.74 | 10.14 | 14.64 | 1.01 |
| **1997-98** | 101318 | 3140.56 | 866.36 | -3.9 | 16.24 | 14.64 |
| **1998-99** | 102484 | 3344.91 | 798.75 | 1.15 | 6.51 | -7.8 |
| **1999-00** | 110275 | 3645.22 | 846.62 | 7.6 | 8.98 | 5.99 |
| **2000-01** | 111874 | 4481.51 | 985 | 1.45 | 22.94 | 16.34 |
| **2001-02** | 127709 | 4139.92 | 871.03 | 14.15 | -7.62 | -11.57 |
| **2002-03** | 134815 | 4608.31 | 953.44 | 5.56 | 11.31 | 9.46 |
| **2003-04** | 129768 | 4013.07 | 876.64 | -3.74 | -12.92 | -8.06 |
| **2004-05** | 138085 | 4220.67 | 938.41 | 6.41 | 5.17 | 7.05 |
| **2005-06** | 145180 | 4271.51 | 970.43 | 5.14 | 1.2 | 3.41 |
| **2006-07** | 137397 | 4506.08 | 997.64 | -5.36 | 5.49 | 2.8 |
| **2007-08** | 136223 | 3941.62 | 980.62 | -0.85 | -12.53 | -1.71 |
| **2008-09** | 126039 | 3779.8 | 839.28 | -7.48 | -4.11 | -14.41 |
| **2009-10** | 130553 | 4182.35 | 883.03 | 3.58 | 10.65 | 5.21 |
| **2010-11** | 151465 | 5718.13 | 1261.81 | 16.02 | 36.72 | 42.9 |
| **2011-12** | 189125 | 8175.26 | 1741.2 | 24.86 | 42.97 | 37.99 |
| **2012-13** | 228620 | 9706.36 | 1803.26 | 20.88 | 18.73 | 3.56 |
| **2013-14** | 301435 | 19368.3 | 3210.94 | 31.85 | 99.54 | 78.06 |
| **2014-15** | 357505 | 22468.1 | 3709.76 | 18.60 | 16.00 | 15.54 |

Source: MPEDA , 2016

Here Compound Annual Growth Rate (CAGR) of frozen shrimp export quantity in ton is 6.81%. Shrimp has overtaken tuna as the most consumed seafood in USA with the per capita consumption being 4.4 pounds during 2005. Black Tiger (BT) and Scampi were the items preferred in US market from India. There is immense consumer demand for Indian black tiger shrimp as it is of better quality than the white Vannamei type found in USA. India therefore has a cutting edge over other shrimp exporters. However Indian shrimp exports have been negatively affected by rapid changes in the value of dollar against the Indian Currency and increasing competition by other countries that harvest vannamei shrimp with lower production cost and shorter duration of culture compared to Indian black tiger shrimp. India's advantage is that it can increase its production of shrimp by extending the farming area. The production costs in India are also lower. In the Japanese market, the demand for processed shrimp varieties such as tray pack, Sushi and bread battered items are gradually increasing. Taking into account of the growing demand for these products, Indian exporters should take up value addition of products. Diversification of markets has to be explored to bring the Indian shrimp trade to benefit (Geethalakshmi et al, 2010). Shyam et al noticed the post-Iiberalisation period generated a higher degree of instability for frozen shrimp, frozen lobster and others whereas a lesser degree of instability was noticed for frozen squid, frozen cuttlefish and fresh and frozen fish; and with regard to the markets, Japan, South East Asia and Middle East exhibited higher degree of instability when compared with the pre-Iiberalisation. In general, the results indicated that the post-Iiberalisation period produced a higher degree of instability when compared to the pre-Iiberalisation period. The competitiveness of the major marine products except for shrimp has decreased during the post-Iiberalisation period when compared with the preIiberalisation period. The rejection from European Union on account of the microbial, antibiotic and bacterial residues, quality issues and higher domestic demand threatens the competitiveness of squid, cuttlefish and pomfrets. (Shyam et al ,2004) . An important milestone in the Indian shrimp export industry is the adoption of Pacific white shrimp (*Penaeus vannamei*) as the most prominent species produced by India's growing aquaculture industry. Long known as a leader in black tiger (*Penaeus monodon*) farming, India's shrimp industry lobbied to have SPF (specific pathogen free) vannamei broodstock imported from the United States for cultivation. Pacific white shrimp takes less time to grow to market size, is more resistant to disease than black tigers, and is more affordable. Black tiger prices are currently about 25 to 30 percent higher than Pacific whites. The devaluation of India's Rupee (INR 100 equals USD 1.60; EUR 1.36), which has made its seafood products more attractive. U.S. buyers have obviously taken notice: According to the (U.S.) National Oceanic and Atmospheric Administration, shrimp imports (all product forms) from India through the first 11 months of 2014 exceeded 219 million pounds, about 16 percent more than the same period in 2013. The Indian Rupee has significantly decreased in value over the past quarter century, from about 6 US cents to less than 2 cents today. (Writ James, 2015).

**Table : 10 Projected values of Frozen shrimp export from India from 2016-17 to 2024-25**

| Year | Quantity in Tonnes | Value in Rs Crores |
|---|---|---|
| 2015-16 | 247696.0842 | 12789.93 |

| | | |
|---|---|---|
| 2016-17 | 256709.897 | 13423.4 |
| 2017-18 | 265723.7098 | 14056.87 |
| 2018-19 | 274737.5226 | 14690.33 |
| 2019-20 | 283751.3353 | 15323.8 |
| 2020-21 | 292765.1481 | 15957.27 |
| 2021-22 | 301778.9609 | 16590.74 |
| 2022-23 | 310792.7737 | 17224.21 |
| 2023-24 | 319806.5865 | 17857.68 |
| 2024-25 | 328820.3992 | 18491.14 |

Source: Estimated.

The compound annual growth rate of projected quantity of exports of frozen shrimp from 2015-16 to 2024-25 is 2.81 % and that of value wise export is 3.71%.

**7. India's prawn production and quantity of marine products export in tonnes - An Analysis.**

Correlation is a statistical method used to determine whether a relationship between variables exists. To analyse the strength of relationship, the numerical measure used is Pearson Product Moment Correlation coefficient (PPMC), named after Karl Pearson. The variables shrimp production from India (Quantity in tonnes) and total marine product export from India (Quantity in tonnes) were used to analyse the dependency of Indian marine product export industry on the prawn production.

Correlation coefficient 'r' is given by

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\{[n(\sum x^2)-(\sum x)^2][n(\sum y^2)-(\sum y)^2]\}^{1/2}}$$

Alternative hypothesis and null hypothesis

$H_0$: $\rho = 0$ , Null hypothesis ($H_0$) assumes that there is no correlation between the prawn production and export quantity.

$H_1$: $\rho \neq 0$, Alternative hypothesis assumes that there is significant relationship between prawn production and export quantity

Test statistic $t = r\sqrt{n-2}/1-(r^2)$ with degrees of freedom = n-2,most hypothesis involving the correlation coefficient are two tailed. Here level of significance $\alpha$ is taken as 0.05

**Table : 11 India's prawn production in tonnes and marine product export quantity in tonnes for correlation analysis .**

| year | X(Prawn production in Tonnes) | Y(Indian Marine Product Export in quantity in Tonnes) |
|---|---|---|
| 1999-00 | 33649 | 340000 |
| 2000-01 | 327316 | 440473 |
| 2001-02 | 313453 | 424470 |
| 2002-03 | 298164 | 467297 |
| 2003-04 | 308667 | 412017 |
| 2004-05 | 38262 | 461329 |
| 2005-06 | 655228 | 512163 |
| 2006-07 | 445683 | 612643 |
| 2007-08 | 437255 | 541701 |
| 2008-09 | 407634 | 602834 |
| 2009-10 | 436249 | 678436 |
| 2010-11 | 479915 | 813091 |
| 2011-12 | 508105 | 862021 |
| 2012-13 | 492936 | 928215 |
| 2013-14 | 504834 | 983756 |

Source: Hand book of Fisheries Statistics, 2014

Correlation coefficient (r) is found to be 0 .622 and coefficient of determination in 0 .38.ie about 38% of the variation in quantity exported is due to changes in prawn production. Other factors responsible for the variation are fluctuations in exchange rate, contributions by other components in exports. t value is found to be 2.73 and the table value of t for degrees of freedom 13 and level of significance 0.05 is found to be 2.160 . Since the test value falls in the critical region the null hypothesis is rejected. In other words there is a significant relationship between prawn production in tonnes and marine product export from India. The revival of shrimp aquaculture production in Thailand and Vietnam has resulted in a better supply situation in the international market. This has eased the price situation of shrimp in the world including India.

## 8. CONCLUSION:

India ,with a coast line of 8129 Kms, possess vast marine potential in terms of capture as well as culture fisheries. Therefore , growth in exports, in fact is the real barometer to measure the economic health of a developing country. With a total population of 1.295 billion , the economic development is possible only by the sustainable exploitation of India's precious marine resources. In India Fisheries sector contributes significantly to foreign exchange earnings, productive employment generation and nutritional security. More and more value added products can be added to export basket of India by utilising underexploited resources. The analysis shows after 10 years Indian marine product export reaches Rs.1,70,181.36 crores in value and 1018298.3 tonnes in quantity. From 2023-24 the export quantity shows a decreasing trend and the compound annual growth rate of projected values of quantity wise marine products from India from 2015-16 to 2025-26 is -0.62%.The decreasing pattern can be attributed to under utilisation of resources as well as non compatibility with foreign standards. The correlation study reveals the dependence of Indian marine product export industry on prawn production . The forcasted values of frozen shrimp export from India revealed the high potential of the shrimp industry . The compound annual growth rate of projected quantity of exports of frozen shrimp from 2015-16 to 2024-25 is 2.81 % and that of value wise export is 3.71%. By effectively utilising the potential resources at the right time India can increase the marine product export value and quantity to much higher realms.

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