



# Growth and Instability in Indian Frozen Scampi Export

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## Abstract

Giant freshwater prawn (*Macrobrachium rosenbergii*) or scampi is an important product in the Indian seafood export basket, the predominant form being frozen scampi. An analysis of the scampi export from India for the period 1995 to 2009 is attempted in this paper. The compound growth rates, market concentration and instability indices of the Indian scampi export were analyzed. The quantity and value of frozen scampi export from India increased by 67.22 and 117% respectively over the period, largely aided by the rapid growth of aquaculture. The study concentrates on major markets viz., Belgium, Canada, Germany, Japan, Netherlands, UAE, USA and UK since more than 80% of the scampi exports from India were to these markets. Results showed low and negative growth of Indian scampi export in terms of quantity, value and unit value for the period of study. There was evidence of high market concentration of Indian scampi export to various countries. High degree of instability in Indian scampi export was revealed using Absolute difference method and Coppock's instability index (CII). The study revealed that India's scampi export was concentrated mainly to those countries, which is either less desirable (low growth & high risk) or least desirable (low growth & low risk) category which in turn affects the economic growth of the country. The causes for the export instability index have also been discussed.

**Keywords:** Compound growth rate, market concentration, instability index, variability, frozen scampi

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Received 14 June 2011; Revised 05 June 2012; Accepted 11 June 2012

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## Introduction

Seafood export is a major foreign exchange earner contributing 1.1% to India's total export earnings ([www.commerce.nic.in](http://www.commerce.nic.in)). The plateauing of marine production and rising demand for seafood products resulted in increasing importance of aquaculture. The share of aquaculture in the world fish production will be around 45% in the year 2020 (MPEDA, 2007). Scampi (*Macrobrachium rosenbergii*), is a seafood product with high demand in the international market. At the global level, China dominates with 65% of total scampi export while other major exporting countries are India, Bangladesh, Brazil, Thailand, Taiwan, Ecuador and Malaysia ([www.nabard.org](http://www.nabard.org)). India is expected to become the largest producer of aquaculture products in the coming years and a leader in export of scampi (MPEDA, 2007). During the year 2009, the area and production of scampi in India was 8153 ha and 6568 t respectively and the quantity and value of Indian scampi export were 3400 t and \$ 34 million respectively (Source: MPEDA). Scampi is exported as block frozen (66.28%) and IQF (33.72%), as headless or head-on forms.

Managing and stabilizing export instability is a priority for the exporting countries to maximize earnings (Sarada et al., 2006). This study examines the export performance of scampi from India by assessing growth, market concentration and export instability.

## Materials and Methods

Export data of scampi for the present study were collected from Marine Products Export Development Authority (MPEDA), Cochin. Country-wise, time-series export data were collected for 15 years viz., 1995 to 2009. The major importing countries selected for the study were USA, UK, Germany, Netherlands, Canada, UAE, Belgium and Japan, as 80% of frozen scampi export from India was to these countries. The data on area and production of scampi in India were also collected from MPEDA.

Export growth, market concentration and export instability were the criteria studied.

The growth of Indian frozen scampi export in terms of quantity, value and unit value was estimated using Compound Growth Rate (CGR) by fitting exponential trend distribution (Aswathy et al., 2006).

$$Y = ab^x$$

Where,

Y – Quantity/Value/ Unit Value of Indian frozen scampi export

x – Time period (in years)

a – Constant

b – Coefficient value

$$\text{CGR (\%)} = (\text{Antilog 'b'} - 1) \times 100$$

Market concentration is defined as the percentage of the total export of a given type of commodity that is attributable to particular country over the years. In the present study, Hirschman Market Concentration Index (HMCI) was used for working out the market concentration. Market Concentration Index (MCI) was calculated separately for quantity and value of Indian frozen scampi exports. HMCI of quantity and value has been denoted as  $\text{HMCI}_{\text{quantity}}$  and  $\text{HMCI}_{\text{value}}$  respectively.

$$\text{HMCI} = \sqrt{\sum_{i=1}^n P^2}$$

Where,

HMCI – Hirschman Market Concentration Index

n – Number of importing countries

P – Percentage share of scampi export in terms of quantity or value

Instability Index (II) is the measure of assessing the degree and extent of stability of export as well as examining the risk associated with profitability and export earnings of a particular commodity. It refers to the degree of short run, year-to-year fluctuations in the export earnings. In this study, the extent of export instability index (EII) was calculated using two methods *viz.*, absolute difference method and Coppock's instability index (Devkota, 2004).

The absolute difference method was used for computing the instability index (Devkota, 2004).

$$\text{EII} = \frac{X_{t+1} - X_t}{X_t} \times 100, \text{ if } X_t > X_{t+1}$$

and

$$\text{EII} = \frac{X_{t+1} - X_t}{X_{t+1}} \times 100, \text{ if } X_{t+1} > X_t$$

Where,

EII = Export Instability Index

$X_t$  = Current year export value

$X_{t+1}$  = Subsequent year export value

Coppock's Instability Index (CII) method was used to assess instability (Rao, 2010; Reddy et al., 2010). It is calculated as follows:

$$\text{CII} = \{(\text{Antilog } \sqrt{\text{Vlog}}) - 1\} \times 100$$

Where, Vlog = logarithmic difference of  $\log X_{t+1}$  and  $\log X_t$

Risk assessment of Indian frozen scampi export has been done by looking at the relation between growth and instability graphically and by categorizing the importing countries into high growth-low risk, high growth-high risk, low growth-low risk and low growth-high risk (Reddy et al, 2010).

## Results and Discussion

Scampi is the second most important species cultured in India after black tiger shrimp. The area and production of scampi in India during the year 2000 was 26 775 ha and 16 564 t respectively (Source: MPEDA). Andhra Pradesh was the leading state in India accounting for 90% of scampi cultivation, followed by West Bengal and Orissa. However, it has been observed that the area and production of scampi had fallen by 70% and 60% respectively by 2009 (Fig.1). The major reason for this reduction was the unavailability of quality seed. The fall in production had also resulted in non-availability of raw material for the processing industry (MPEDA, 2007). There have been initiatives towards development of scampi hatchery and farms at subsidized cost, which needs widespread demonstration and popularization.

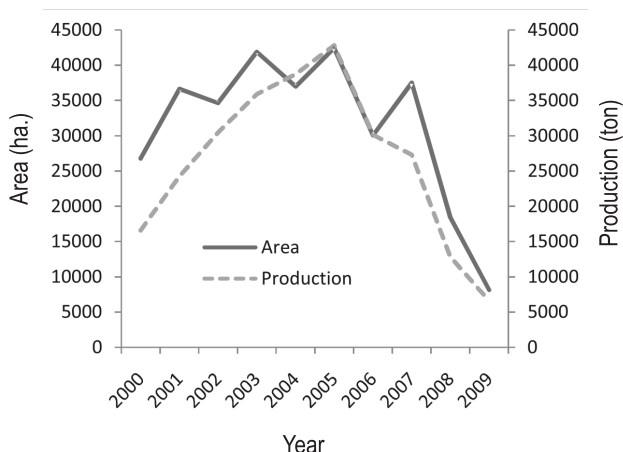


Fig. 1. Area and production of scampi in India (2000 – 2009)

Export share of aquaculture to the Indian seafood export was 15.3% in terms of quantity and 25.20% in terms of value (Anon, 2011) during 2010. Even though India is second in aquaculture production, the contribution to export is low when compared to countries like China, due to the demand in the domestic market. The export share of farmed shrimp and scampi together in seafood export was 41% in quantity terms and 50% in terms of value during 2010.

The quantity and value of export of frozen scampi from India was 4756 t and Rs. 2456.70 million during 2000. By the year 2009, the quantity and value of frozen scampi export had reduced by 28.80 and 32.71% respectively (Fig. 2). A 2-year moving average fitted to the export value to assess the seasonality of the scampi export resulted in a bell shaped curve (Fig.2), indicating the highly seasonal nature of export of this commodity (Pal, 1992).

During the period of study (1995 – 2009), country-wise exports revealed that the average scampi export in terms of quantity and value was high to

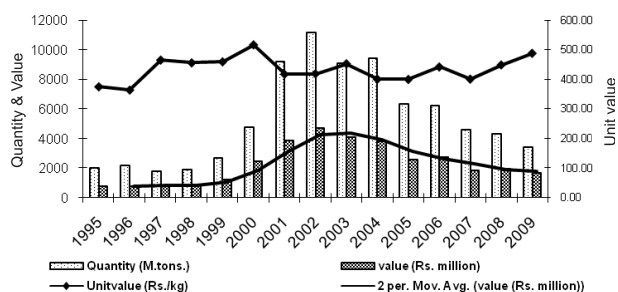


Fig. 2. Export performance of Indian frozen scampi – 1995 to 2009

USA (2043.53 t; Rs. 908.22 million) and low to Japan (87.42 t; Rs. 31.72 million). Next to USA, Belgium (900.88 t) and UK (804.63 t) were the major markets in terms of quantity while UK (Rs. 364.13 million) and Belgium (Rs. 362.73 million) in terms of value. The exports to the various countries studied have been varying over time and the unit value has also been fluctuating.

The Compound Growth Rate (CGR) of Indian frozen scampi export in terms of quantity, value and unit value during the period (1995 – 2009) for various markets showed that the CGR of quantity (CGR\_Q) was negative for all the countries except Netherlands, which also showed a very low growth (12.28%). The CGR of value (CGR\_V) was positive for Canada and Netherlands at 50.85 and 42.82% respectively and for the other countries, the CGR\_V showed negative growth (Table 1). The growth in terms of unit value (CGR\_UV) to all the major exporting countries was negative. Lack of value addition in almost all seafood products has resulted in low unit value realization as has been observed in other species as well (Gopal et al., 2009).

Table 1. Compound Growth Rate (CGR) of Indian frozen scampi export

	CGR_Quantity	CGR_Value	CGR_Unit Value
USA	-65.77	-60.42	- 61.61
UK	-64.71	-59.28	- 61.87
Belgium	-48.50	-48.5	- 61.7
UAE	-59.32	-50.69	- 61.09
Germany	-45.48	-31.93	- 62.05
Canada	-1.80	50.85	- 62.19
Netherlands	12.28	42.82	- 64.41
Japan	-33.81	-10.5	- 61.63

Analysis of market concentration using HMCI showed decreasing and fluctuating trend over the 15 year period studied. Overall decrease in HMCI from 9.44 to 9.01% for quantity and 52.62 to 38.78% for value indicated market diversification during the period of study (Sarada et al., 2006). Values of  $HMCI_{quantity}$  ranged between 8 and 10, and  $HMCI_{value}$  between 36 and 72 (Table 2). This showed higher influence of value in deciding market concentration of scampi than quantity exported (Tahir, 1985). Ranking of scampi importing countries based on

Table 2. Hirschman Market Concentration Index (HMCI) of Indian frozen scampi (1995 – 2009)

(in %)

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
HMCI <sub>quantity</sub>	9.44	9.57	8.52	8.87	9.40	9.27	9.69	9.69	9.73	9.61	9.62	9.70	9.19	9.37	9.01
HMCI <sub>value</sub>	52.62	50.77	36.47	34.03	43.35	41.42	60.26	72.08	54.96	54.13	44.83	43.00	39.74	42.26	38.78

HMCI showed that the top five markets both in terms of quantity and value were USA, UK, Belgium, UAE and Germany (Table 3). There was no change in the rank of countries for HMCI<sub>quantity</sub> and HMCI<sub>value</sub>.

Table 3. HMCI based ranking of Indian frozen scampi exports to different countries

Country	Ranking	
	HMCI <sub>quantity</sub>	HMCI <sub>value</sub>
USA	1	1
UK	2	2
Belgium	3	3
UAE	4	4
Germany	5	5
Canada	6	6
Netherlands	7	7
Japan	8	8

Export instability index (EII) for Indian frozen scampi export over 15 years was studied for the selected markets using absolute difference method and is presented in Fig. 3. The EII was fluctuating for most countries over the 15 years. The lowest and highest EII recorded was for USA at 2.85 and 65.24% and the same for UK was 0.06 and 65.54%. The overall lowest EII for Indian frozen scampi was 0.06% (2003) in UK and the highest 99.11% (1997) in Germany. The countries viz., Germany, Canada, Netherlands and Japan expressed frequent high EII values with more than 98% instability during the period of study. Fluctuation in export quantity of scampi during the period was the main reason for high EII (Sarada et al., 2006).

Coppock's Instability Index (CII) of Indian frozen scampi export (Table 4) revealed that among the countries studied, the highest and the lowest instability were observed in Netherlands (521.99%) and UAE (41.05%) for quantity, and Netherlands

(719.30%) and UAE (50.12%) value. But, in terms of unit value, the highest and the lowest instability was in Netherlands (108.14%) and USA (15.22%). Countries were ranked based on degree of instability by CII method in terms of quantity, value and unit value. Netherlands and Japan were the top two countries showing high instability in terms of quantity, value and unit value. Both quantity and value instability was low for UAE and the unit value instability was low for USA. This again reinforces

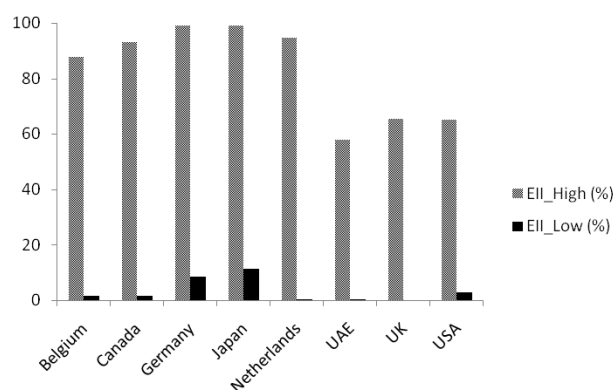
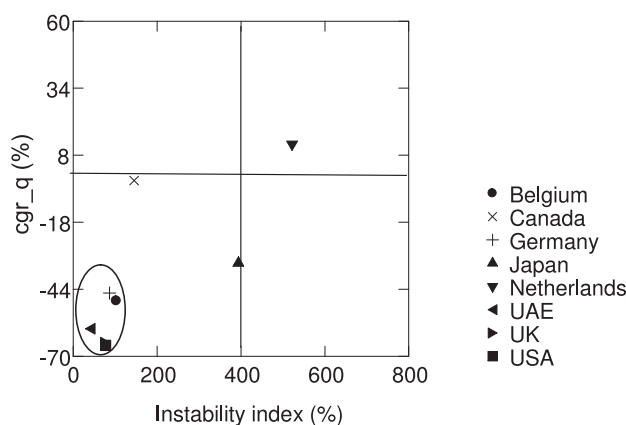


Fig. 3. Export Instability Index (EII) of Indian frozen scampi



\* cgr<sub>q</sub> = Compound Growth Rate of Quantity

Fig. 4. Growth Vs Instability of Indian frozen scampi (quantity)



Table 4. Export instability index using Coppock’s Instability Index (CII) method

(in %)

Countries	Quantity	Rank	Value	Rank	Unit value	Rank
USA	77.75	6	76.52	5	15.22	8
UK	76.97	7	75.65	6	18.40	6
Belgium	103.02	4	113.60	4	19.56	4
UAE	41.05	8	50.12	8	19.56	4
Germany	86.91	5	73.62	7	22.61	3
Canada	145.41	3	168.30	3	18.34	7
Netherlands	521.99	1	719.30	1	108.14	1
Japan	394.05	2	510.30	2	67.09	2

the fact that export value was mainly influenced by the quantity exported rather than unit value.

Risk assessment of Indian frozen scampi export revealed that in terms of quantity, Belgium, Canada, Japan and Netherlands were the least desirable countries falling in the low growth-high risk category and USA, UK, UAE and Germany were the less desirable destinations falling in the low growth-low risk category (Fig. 4). In terms of value, Belgium, Japan and Netherlands were the least desirable destinations (low growth-high risk) and USA, UK, UAE, Germany and Canada were the less desirable destinations (Fig. 5). No single country falls under high growth – low risk category as the most desirable destination for Indian frozen scampi export (Reddy et al., 2010). This indicates that at present scampi exports from India is mainly to destinations which are falling either under less

desirable (low growth – low risk) or least desirable (low growth – high risk) category.

From the study, it was evident that export growth in terms of quantity, value and unit value was low with growth being mostly negative. Growth in area and production of scampi also showed a decreasing trend. High market concentration with high instability in scampi export from India has been observed. Scampi export was mainly focused to less desirable and least desirable destinations and attempts at identifying competitive and stable market destinations are necessary. Instability in quantity has largely influenced the scampi export. Hence, there is a need to increase scampi production and ensure steady supply of raw material to the seafood processing industry.

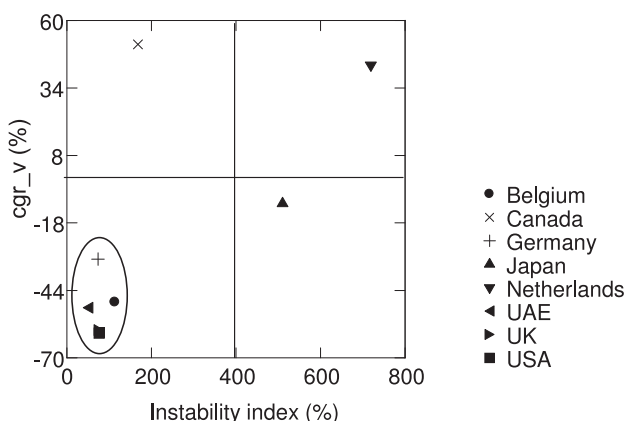
**Acknowledgement**

The authors express their sincere thanks to the Director, Central Institute of Fisheries Technology, Cochin for granting permission to publish this paper.

**References**

Anon (2011) Seafood exports poised for a giant leap – Breakthrough in scampi research marine products 1.1% of the total export earnings. Min. of Commerce & Industry, Govt. of India. [www.http://commerce.nic.in/pressrelease](http://commerce.nic.in/pressrelease) (Accessed 10 September 2011)

Aswathy, N. and Sathiadhas, R. (2006) Socio-economic impact assessment of monsoon trawl ban on marine fisheries sector of Kerala, India. In: Proceedings of the symposium on Improved Sustainability of fish production systems and appropriate technologies for utilisation, pp 781-792, 16-18 March 2005, Kochi



\* cgr\_v = Compound Growth Rate of Value

Fig. 5. Growth Vs Instability of Indian frozen scampi (value)

- Devkota, S.C. (2004) Causes of Export Instability in Nepal, International Trade 0410002, Economics Working Paper Archive (EconWPA)
- Gopal, N., Jeyanthi, P., Geethalakshmi, V. and Unnithan, G.R. (2009) Indian finfish exports – an analysis of Export performance and Revealed comparative advantage. *Agr. Econ. Res. Rev.* 22(2): 291-297
- [http://www.nabard.org/modelbankprojects/fish\\_prawn.asp](http://www.nabard.org/modelbankprojects/fish_prawn.asp). (Accessed 05 October 2011)
- Lam, N.V. (1980) Export instability, expansion and market concentration: A methodological interpretation. *J. Dev. Econ.* 7(1): 99-115
- MPEDA (2007) MPEDA Vision Document, pp 1-24, The Marine Products Export Development Authority, Min. of Commerce and Industry, Govt. of India
- Pal, S. (1992) Agricultural exports of India: issues of growth and instability. *Ind. J. Agr. Econ.* 47 (2): 185-193
- Rao, R. (2010) Performance of pulses during pre and post WTO period in Andhra Pradesh: district wise analysis. *J. Food Legumes.* 23(2): 135-142
- Reddy, A., Amarender and Mishra, D. (2010) Growth and Instability in Chickpea production in India: A State level analysis. [http://ssrn.com/abstract = 1499577](http://ssrn.com/abstract=1499577) (Accessed 14 March 2012)
- Sarada, C., Ravishankar, T., Krishnan, M. and Anandanarayanan, C. (2006) Indian seafood exports: Issues of instability, commodity concentration and geographical spread. *Ind. J. Agr. Econ.* 61 (2): 238-252
- Tahir, J. M. (1985) Concentration of exports and export earnings instability: The case of Jordan, *Studies in Economics and Finance.* 9(1): 65-81