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Marine fisheries growth, performance and institutional arrangements in Tamil Nadu

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Abstract

This paper reveals the growth and instability of Tamil Nadu Marine fish production during the recent decade (2001 to 2010), across the year - districts wise and month wise. Emphasis is made to review the marine fisheries policies of Tamil Nadu to analyze its coherence with the marine fish production. From the study, it is observed that the growth and instability performance was rather steady during 2006-07 to 2010-11 than the earlier years (2001-02 to 2005-06). Further the study has also evolved the importance of marine fisheries policies for the social security of marine fishers; thereby providing a significant picture of Tamil Nadu marine fisheries for the policy makers, who are repeatedly confronted with the problem of insufficient data.

Keywords: Fisheries policies, compound growth rate, instability index and TNMFRA

1. Introduction

Marine fisheries have innate significance in providing food security, income generation and livelihood for the fishers of the coastal districts of India. Indian fisheries sector contributes about 1.1% of total GDP and 5.3% of agricultural GDP^[1]. Tamil Nadu has the coast length of 1076 km consisting of 13 coastal districts and 591 marine fishing villages. On an average, Tamil Nadu's marine fish production is about 10 to 12% of that of India's production^[11]. It is seen that the marine fish production has increased tremendously over the decades, with the modernization of fishing crafts and technology, thereby resulting in fluctuation of the same, thus rendering intense debate on growth and instability. It also has implication on food supply and macroeconomic stability. Hence, fisheries growth and a sustained stability of fish production have gained its due importance. Instability in fish production also affects the price stability and consumer purchasing power^[2, 10].

The growth and instability of marine fish production have been studied intentionally to know the performance of the marine fish production of Tamil Nadu. The CII and CV have been used to measure the instability index to evaluate the performance^[5, 8, 12]. Earlier studies have meagerly calculated the growth and instability not addressing the sources of growth and performance. In this paper, attempts have been made not only to compute the growth and instability of Marine fish production at the district level (year wise and month wise) but also to interpret its association with the fisheries policies of Tamil Nadu.

2. Materials and methods

The present study aims at estimating the marine fish production status of Tamil Nadu as a whole for the recent decade 2001-02 to 2010-11. The month wise and district wise marine fish production data of Tamil Nadu were sourced from the Tamil Nadu State Fisheries Department, Government of Tamil Nadu. The growth rate was calculated using Compound Growth Rate (CGR) technique and instability, using Coppock Insatiability Index (CII) and Coefficient of variation (CV) technique. The fisheries policies were sourced from the official page of Tamil Nadu Government (2000 to 2011). India's marine fish production statistics was collected from Handbook on fisheries statistics - 2014, published by Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Government of India.

2.1 Growth rate formula

The compound growth rate was estimated by fitting the exponential function for the marine fish production during 2001 to 2010.

$y_t = y_0(1+r)^t$ Assuming multiplicative error term in the above equation, model may be linearized by logarithmic transformation $\log y_t = \log \alpha + t \log \beta + \epsilon$ Where, $\log y_t$ denotes marine fish production of Tamil Nadu, t at time t , α is the constant, β is a coefficient containing the growth rate and ϵ is an error term. $r = \exp(b) - 1$ Where, b = expresses the rate of change and when multiplied by 100 gives the percentage growth rate

2.2 Measure of Instability

The Coppock Instability Index (CII) was applied to estimate the extent of variability in marine fish production of Tamil Nadu (2001 to 2010). This technique was created by Coppock⁴ and this technique has also been used in fisheries to estimate the extent of instability.

$$C.I.I = [Antl \log \sqrt{\log V} - 1] * 100$$

$$\log V = \frac{[\log(\frac{X_{t+1}}{X_t}) - m]^2}{N - 1}$$

Where, X_t = export in the year “t”, N = number of years, M – Arithmetic mean of the difference between the logs of x_{t+1} , x etc. and $\log v$ = logarithmic variance of the series. The coefficient of variance (CV) is used as the usual measure of variability and is intended to measure the instability index; CV is estimated to find out the variation or fluctuation in the marine fish production of Tamil Nadu.

$$\text{coefficient of variation} = \frac{\text{Standard deviation}}{\text{Mean}} * 100$$

2.3 Analysis

The Thanjavur, Tiruvarur and Nagapattinam marine fish productions have been considered as a single district as Nagapattinam for computing the results of marine fish production, due to lack of sufficient data. The remaining districts are considered as a separate representation. To analyse the trend line, the annual growth rate has been used in this study.

3. Results and Discussion

3.1 Marine Fish Production Trend - Tamil Nadu versus India

Marine fish production trend of India and Tamil Nadu from 2001-02 to 2010-11 is presented in Table 1. In Tamil Nadu, the marine fish production has augmented from 373861 tonnes (2001-02) to 424824 tonnes (2010-11). It is also inferred that Tamil Nadu and India have an average decadal growth rate (2001-10) of 13.63% and 14.83% respectively (Table 1). Particularly, in the year 2005-06, the production growth rate was found to be at its peak with 26.66% for Tamil Nadu. But, the growth rate for India had also hit the highest point of 7.39% in 2006-07. While the entire study period has registered a positive growth rate for Tamil Nadu except the year 2004-05 (-19.27%), India had witnessed negative growth during many parts of the decade viz., 2003-04, 2004-05 and 2007-08

Table 1: Annual growth rate of India and Tamil Nadu (Production in tonnes)

S. no.	Year	Tamil Nadu		India		Share of Tamil Nadu to India's marine fish production (%)
		Marine fish production	Growth rate (%)	Marine fish production	Growth rate (%)	
1	2001-02	373861	-	2829770	-	13.21
2	2002-03	379214	1.43	2989850	5.66	12.68
3	2003-04	381148	0.51	2941500	-1.62	12.96
4	2004-05	307693	-19.27	2778870	-5.53	11.07
5	2005-06	389714	26.66	2816050	1.34	13.84
6	2006-07	392191	0.64	3024170	7.39	12.97
7	2007-08	393266	0.27	2919500	-3.46	13.47
8	2008-09	397117	0.98	2978190	2.01	13.33
9	2009-10	401128	1.01	3103840	4.22	12.92
10	2010-11	424824	5.91	3249460	4.69	13.07
11	2001 -10	-	13.63	-	14.83	-

3.2 Marine Fish Production Trend – At District level

Marine fish production of Tamil Nadu was examined at the district level to portray a lucid picture of the same (Figure 1). In Chennai district, marine fish production has enhanced from 11477 tonnes (2001-02) to 34282 tonnes (2010-11), depicting a positive and upward trend line throughout the analysis period. It is also observed that Chennai has the highest annual growth rate of 88.98% in 2006-07 and the lowest growth rate of -23.26% in 2004-05. Tiruvallur district has recorded a rise in production from 2430 tonnes (2001-02) to 9644 tonnes (2010-11) thus having a positive linear production trend line, with the highest growth rate of 119.81 tonnes in 2005-06. Districts such as Kancheepuram, Viluppuram, Cuddalore, Nagapattinam, Thoothukudi and Tirunelveli has witnessed a decadal (2001-02 to 2010-11) average growth rate of 13.17, 172.22, 24.39, 5.63, 28.40 and 46.76% respectively (Table 2).

The maximum negative annual growth rate was observed in four districts, namely Kancheepuram, Pudukkottai, Ramanathapuram and Kanyakumari. The analysis showed that all districts of Tamil Nadu had a negative growth rate in 2004-05 and it varied from -7.96 (Tirunelveli) to -24.93% (Cuddalore). It was also seen that the Pudukkottai, Ramanathapuram and Kanyakumari district had declined trend line with an average of -10.86, -5.85 and -14.87% respectively. The remaining districts of Tamil Nadu had a positive trend line in marine fish production from 2001 to 2010.

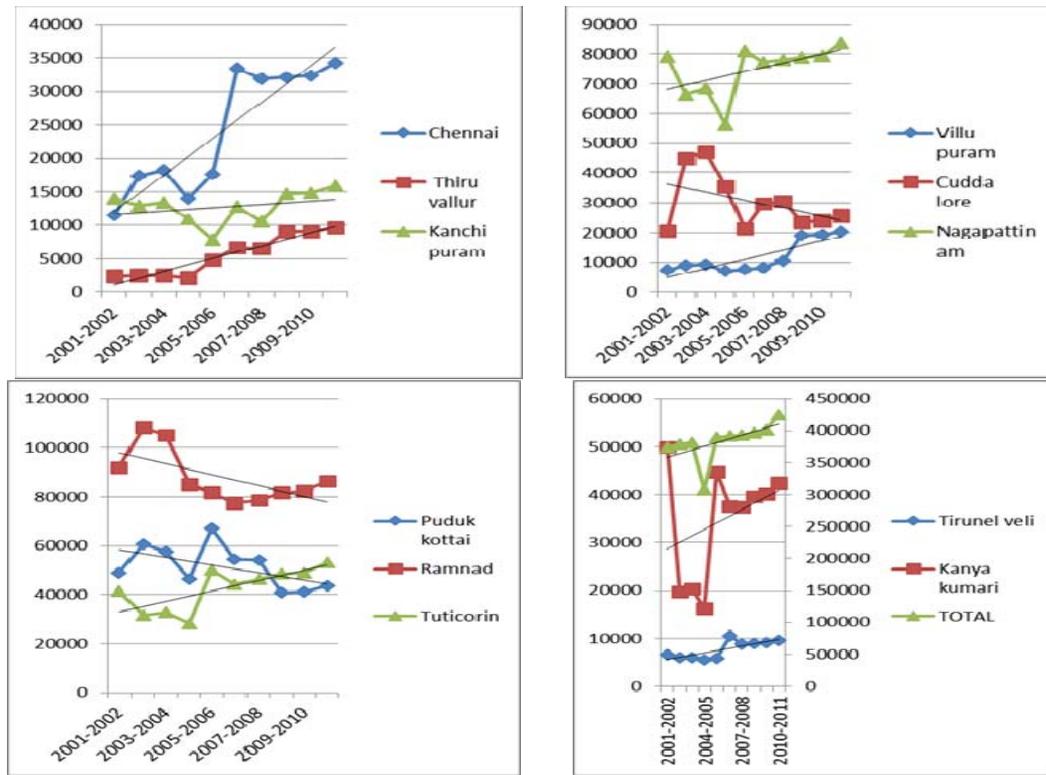


Fig 1: District wise and year wise Marine fish Production trend and Trend line

Table 2: District-wise growth rate of marine fish production

S.no.	Year	Chennai	Thiruvallur	Kanchipuram	Villupuram	Cuddalore	Nagapattinam	Pudukkottai	Ramnad	Tuticorin	Tirunelveli	Kanyakumari	Tamil Nadu
1	2001-02	-	-	-	-	-	-	-	-	-	-	-	-
2	2002-03	51.78	7.90	-7.37	17.66	119.36	-16.09	23.33	17.92	-23.75	-9.34	-60.68	1.43
3	2003-04	4.95	0.08	3.70	3.42	4.69	3.17	-5.07	-2.79	4.19	1.43	3.83	0.51
4	2004-05	-23.26	-16.69	-18.69	-20.92	-24.93	-17.55	-19.26	-19.26	-14.17	-7.96	-20.04	-19.27
5	2005-06	25.86	119.81	-28.42	5.62	-39.58	43.28	44.53	-3.71	77.69	3.45	174.08	26.66
6	2006-07	88.98	38.93	64.05	7.69	38.56	-4.50	-18.70	-5.52	-11.68	83.62	-16.06	0.64
7	2007-08	-4.57	-2.03	-17.58	28.05	2.96	1.06	-0.86	1.59	4.59	-16.12	-0.30	0.27
8	2008-09	0.74	37.78	38.84	81.93	-22.41	1.02	-24.25	3.86	4.64	1.74	5.93	0.98
9	2009-10	1.00	1.00	1.00	1.00	2.25	0.63	1.00	1.00	1.00	1.00	1.10	1.01
10	2010-11	5.79	5.96	6.75	5.70	5.51	5.28	5.80	4.94	8.56	5.90	6.14	5.91
11	2001 - 10	198.71	296.87	13.17	172.22	24.39	5.63	-10.86	-5.85	28.40	46.76	-14.87	13.63

3.3 Growth and Instability – District wise

The district and year wise growth and instability of marine fish production of Tamil Nadu are presented in Table 3. The results illustrate that, in Tirunelveli (0.12), Thiruvallur (0.10), Villupuram (0.05), Kanchipuram (0.04), Chennai and Tuticorin (0.03), Nagapattinam (0.02) and Kanyakumari (0.01) the CGR was higher than Cuddalore (-0.01), Pudukkottai and Ramnad (-0.02). The CII was highest in the case of Thiruvallur (133.87%), followed by Chennai (113.18%), Villupuram (106.30%) and Tirunelveli (56.55%). All other districts had less significant instability index (of below 50%). The Chennai, Thiruvallur and Villupuram

district had a growth rate with higher instability index when compared to other district except Cuddalore, Pudukkottai and Ramnad (occurrence of negative growth rate). Notably, Tirunelveli district accounted excellent growth with less instability, compared to other district. The present finding does not agree with that of Hazell [7], who found that instability, was the consequence of growth. The same was opposed by Mahendradev [9] (the Negative relationship between growth and instability). It is noteworthy that Chattopadhyay [3] has reported the positive and negative relationship between growth and instability which goes hand in hand with the present findings.

Table 3: District-wise Marine fish production of Tamil Nadu (2001-02 to 2010-11)

Sl.no	District	CII	CGR
1	Chennai	113.18	0.03
2	Thiruvallur	133.87	0.10
3	Kanchipuram	28.98	0.04
4	Villupuram	106.30	0.05
5	Cuddalore	40.23	-0.01
6	Nagapattinam	18.46	0.02
7	Pudukkottai	27.81	-0.02
8	Ramnad	19.44	-0.02
9	Tuticorin	43.59	0.03
10	Tirunelveli	56.55	0.12
11	Kanyakumari	33.68	0.01
12	Tamil Nadu	29.52	0.01

3.4 Growth and Instability – Month wise

The month wise CGR, CII and CV of Tamil Nadu for the decade 2001 to 2010 is specified in Table 4. Computation of Tamil Nadu marine fish production using CGR reveals an elevated growth across both periods, say; 2006-2010 has acknowledged a higher growth rate than 2001-05. A similar trend has been reflected in the case of Instability and CV with an extremely unstable 2001-05 phase and a much stable/steady 2006-2010 phase. Likewise, 2004-05 and 2005-06 has consequently experienced the highest negative growth rate of -30.26 and -0.97%. Highest CII of 124.98% and maximum CV of 53.68% were also encountered in the same year, 2004-05 which has further attributed to the zero marine fish production in January 2005 (Figure 2).

Table 4: Tamil Nadu marine fisheries Month wise- CGR and CII in '000 tonnes

S.no.	Year	CII	CGR	CV
1	2001-2002	47.34	3.85	16.95
2	2002-2003	10.10	-0.09	18.86
3	2003-2004	50.66	2.51	21.34
4	2004-2005	124.98	-30.26	53.68
5	2005-2006	18.49	-0.97	12.60
6	2006-2007	58.72	2.81	22.75
7	2007-2008	52.37	2.49	23.15
8	2008-2009	70.71	5.46	25.32
9	2009-2010	70.71	5.45	25.32
10	2010-2011	70.70	5.37	25.26

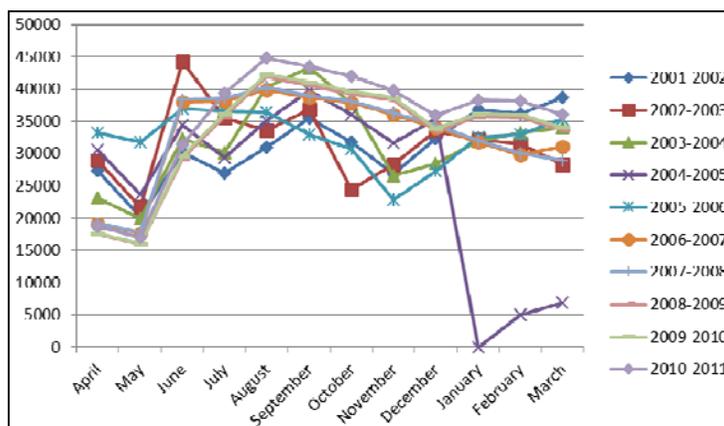


Fig 2: Month and year wise marine fish production of Tamil Nadu during 2001 to 2010

3.5 Fisheries policy – a review (2001-02 to 2010-11)

Tamil Nadu Marine Fisheries Regulation Act (TMFRA) was introduced in 1983 to promote fisheries development and management. The main objective of TMFRA was to ensure sustainable development of marine fisheries with due concern

for ecological integrity and biodiversity. The act calls for adopting fisheries management regimes in order to protect the socio-economic status of marine fishers. Nevertheless, post-Tsunami, the diesel subsidy has been increased by Rs.4.13/litre resulting in a steep rise of subsidy from Rs.1.20/litre

(2004-05) to Rs. 5.33/litre (2005-06). Correspondingly, the engine-purchasing subsidy was also enhanced from Rs.10000 to Rs. 20000, which has further led to the rapid development of fishing activities. Consequently, the 100% sales tax relief for diesel has been condensed from Rs. 5.33/litre (2005-06 to 2008-09) to Rs.3/litre (2009-10). On the contrary, engine purchase cost subsidy has been improved from Rs 10000 (2004-05) to Rs 30000 (2009-10)^[6] and it is being continued till date. With all these enhanced subsidies, marine fish production swiftly reached the saturation level, in the Post-Tsunami phase.

4. Growth and performance

Tami Nadu marine fish production has been performing more or less stable with the instability index varying between 47.33% and 70.71% except in 2002, 2004 and 2005. In 2004 – 05 there has been a high instability of fish production which could have been attributed by the low marine fish catch (3.0769 lakhs tonnes) when compared to the other years of the decade (3.9327 lakhs tonnes) In 2005, January marine fish production was zero, followed by 0.05 lakhs in February and 0.068 lakhs in March. However, during the period 2008-09 to 2010-11, the performance of marine fish production has been much stable with the instability index spinning around 70%, CV (25%) and Growth rate (5%). This study has also come up with some significant conclusion revealing the production trends of different districts. From the district wise study, it is evident that Tirunelveli district has performed better in production than all other districts of Tamil Nadu. Most of the districts have shown the positive production trend line except Kanyakumari, Ramanathapuram and Pudukkottai. However, there had been a dip in production in 2004-05, resulting in a spiky negative growth rate. The reason was obviously associated with the occurrence of Tsunami. The Government of Tamil Nadu sprung up with the relief assistance, together with the Central Government in order to re-establish the fishing activities. The overall performance of Tamil Nadu in Marine Fish Production can be elucidated as being stable, as long as CII is less than 70.

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