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**CAUGHT IN THE 'NET':  
FISH CONSUMPTION PATTERNS OF  
COASTAL REGIONS IN INDIA**

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**June 2015**

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Patterns of Coastal Regions in India*

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# Caught in the 'Net': Fish Consumption Patterns of Coastal Regions in India

Lavanya Ravikanth and K. S. Kavi Kumar

## Abstract

*Fish is an important source of food and livelihood for people. Owing to their proximity to the sea, coastal communities have long depended on this resource to meet their nutritional needs. Does this, however, still hold true today? This paper analyses the fish consumption patterns of rural and urban populations in coastal States and Union Territories (UTs) in India, and how these have changed over time. The analysis is based on unit record data on fish consumption obtained from National Sample Surveys conducted in 1983 and 2009-10. Distributional aspects of fish consumption both within and across coastal States/UTs, and over time are assessed. The results suggest that despite an increase in fish production over time, people living close to the coast in almost all States and UTs report a decline in consumption. Among other things, the paper explores the role of trade in explaining the wedge between production and consumption.*

**Keywords:** *Fish consumption; Nutritional intake; Distributional issues*

**JEL Codes:** *D10; D60; R10*

## **ACKNOWLEDGEMENT**

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## **INTRODUCTION**

Summarising a 1966 survey of possibilities of increasing food production to meet India's nutritional requirements, Kent (1987) notes that, "fish is one item in our requirements of food that has the largest potential for increased production causing, at the same time, no strain on India's limited land resources. ... For a country with such low levels, qualitatively of food consumption, as India, fish ought to command high priority in the solution of India's long term food problem" (pp. 161). With excessive dependence on cereals, the Indian diet is often characterised by both energy as well as protein deficiency, which can be met through fish consumption. Fish is less costly compared to other animal protein sources. In comparison to vegetables and grains, fish is relatively expensive on the basis of weight but it is quite inexpensive in terms of nutritional value.

Coastal States and Union Territories directly have access to a wealth of resources (and indeed services) that the seas provide owing to their location. Access to fish as a food source is an important resource provided by the sea. Marine fish production in India has gradually been increasing over the years from about 15 Lakh tonnes in 1979-80 to about 33 Lakh tonnes in 2012-13 (DADF, 2014). The coastal State/UT-wise production of marine fish over time shows that this increase in fish production is uniform across coastal States/UTs, except for Maharashtra and Pondicherry, which record a decline in marine fish production over time (Table 1). The table shows that more recently, Kerala and Gujarat have emerged as the top two marine fish producing states, whereas Maharashtra and Andhra Pradesh are the bottom two States in this respect among the major states. It is interesting to note however that Maharashtra was in the top two marine fish producing states in 1982-83. West Bengal has recorded the highest percentage change in marine fish production over the two time periods, moving it up from a rank of 9 in 1982-83 to a rank of 5 in 2009-10 of the top marine fish producers.

However the contribution of marine fisheries to the overall fish production in India has been steadily declining with the percentage share reducing from 71 percent in 1950-51 to 36 percent in 2013-14.

**Table 1: Production of Marine Fish – Coastal States and Union Territories**

Coastal State/UT	Prodn. in 1982-83 (t)	Prodn. in 2010 (t)	Prodn. Rank in 1982-83	Prodn. Rank in 2010	Percent Change in Prodn. (1982-83 – 2010)
Kerala	3,48,443	6,08,281	1	1	75
Gujarat	1,96,437	6,01,079	4	2	206
Tamil Nadu	2,35,953	5,09,036	3	3	116
Karnataka	1,27,968	3,85,761	5	4	201
West Bengal	22,444	3,59,354	9	5	1501
Odisha	33,490	2,90,986	8	6	769
Andhra Pradesh	1,26,004	2,41,441	6	7	92
Maharashtra	2,67,527	2,41,054	2	8	-10
Goa	35,874	89,442	7	9	149
Pondicherry	12,985	10,861	10	10	-16

**Source:** CMFRI Annual Reports (1982-83 and 2010-11).

A reasonable hypothesis to make is that, due to their ease of access to marine fisheries, coastal States/UTs are likely to be higher consumers of fish compared to non-coastal States/UTs. However some caveats are in order- a) higher access alone may not lead to higher fish consumption and cultural and religious factors play an important role in State-wise patterns of fish consumption. For e.g., although a top producer of marine fish, Gujarat has historically been a relatively low fish consuming state owing to the aforementioned factors (as will become clear in the analysis that follows), and b) inland fish production in 2009-10 was close to 49 Lakh tonnes (DADF, 2014), far exceeding that of marine fish production in the same year, which implies that access to inland fisheries also determines fish consumption patterns across States. Having said that, it is the coastal States that are also the highest

producers of inland fish (West Bengal and Andhra Pradesh being the top two inland fish producers today), which would only lend support to the hypothesis stated earlier. Taking as given that coastal States/UTs are higher consumers of fish compared to other States, it would be interesting to analyse the within-coastal State/UT patterns in fish consumption, how this has changed over time and the factors leading to the same.

The aim of this paper is to analyse the distributional aspects of fish consumption across coastal states and Union Territories and across two time periods namely 1983 and 2009-10, which correspond to the two NSSO consumer expenditure quinquennial survey rounds, namely 38 and 66 respectively, from which the data on fish consumption come. It may be noted that the NSSO data does not make a distinction between marine and inland fish consumption and so the results presented here pertain to total fish consumption. The analysis was undertaken at the level of the coastal State/UT. Goa (denoted by GA<sup>^</sup> or Goa<sup>^</sup> in the figures and tables appearing in the next section) includes Daman and Diu as the NSSO 38<sup>th</sup> Round pooled data from these two UTs, thus, we estimated fish consumption similarly from the NSSO 66<sup>th</sup> Round data as well. Lakshadweep is missing from the analysis since data on fish consumption for this UT from the NSSO 38<sup>th</sup> Round is missing. In addition to per capita quantity of fish consumption (measured in kg per person per month) and average monthly per capita value of fish consumption (measured in Rupees per person per month) across regions and sectors (rural and urban), the analysis also focussed on distributional issues by comparing the fish consumption levels across Monthly Per Capita Expenditure (MPCE) quartile classes.

The results indicate that barring a couple of coastal states (Kerala and West Bengal), all other states recorded a decline in per capita fish consumption over the past two decades. Given that the period also witnessed significant increase in fish – both marine and inland –

production, the decline in consumption levels is puzzling and worrisome. The paper argues that fish exports provide part of the explanation for the disturbing trend in the consumption of this nutritionally rich source of diet. The rest of the paper is organized as follows: The next section provides a brief review of literature on fish demand patterns in India. The third section presents the patterns and trends of fish consumption across income classes and regions of India based on NSS data. The section also presents the broad classification of coastal states/regions based on the fish consumption and distributional trends. The fourth section explores the possible factors, including the trade in fish, for explaining the observed trends in fish consumption and concludes.

## **LITERATURE REVIEW**

An early study by NCAER (1980) on fish consumption in India observed that fish consumers constituted more than 50 percent of the total population. The per capita monthly consumption, however, varied significantly across the country. FAO (2014) in a recent study based on household surveys estimated the per capita national average annual consumption of fish and fish products as 2.85 kg in 2010. The annual consumption levels varied from 22.7 kg per person in the coastal state of Kerala to mere 0.03 kg per person in the Northern state of Himachal Pradesh. In quantity terms, people in the lowest income quintile consume about four times lesser amount of fish and fish products than those in highest quintile. Similarly, people in urban areas consume a higher quantity of fish and fish products than those in rural areas.

Bhatta (2000) estimated the annual per capita fish consumption at 8.2 kg for the lowest income groups which increased to 14.16 kg., 11.43 kg., and 14.89 kg. for the middle, rich and very rich income groups respectively. Similarly, Kumar (2004), based on National Sample Survey Organisation (NSSO) data, reported that in Karnataka the per capita fish consumption increased from 7.6 kg in 1983 to 12.6 kg 1989. During the

same period the fish consumption was 18.4 kg and 23.9 kg respectively in Kerala. In most of the coastal states pelagic fish constituted the major part of the fish consumption basket and in general the per capita consumption showed an upward trend over the years.

In a cross-country analysis, Dey and Garcia (2008) studied demand for fish in Asia. The study found the income elasticities to be positive implying that fish is considered as a normal good by the rich as well as the poor in the region. The study also highlighted the preference of most Asian households for freshwater species as these fish species exhibited less variability in demand (compared to the marine fishes) with the increase in income. The estimated income elasticities suggest that fish consumption among the poorer households responds more to income changes than the richer households. Thus, as the Asian countries become rich, the demand for fish can be expected to come from the low-income households that comprise the bulk of the Asian population. Overall, the price and income elasticities for all fish types were found to be higher among the poorer sections of the economy compared to the richer sections. Thus, while the poorer households consider seafood and fishery products as luxury commodities, the rich simply consider them as basic food items.

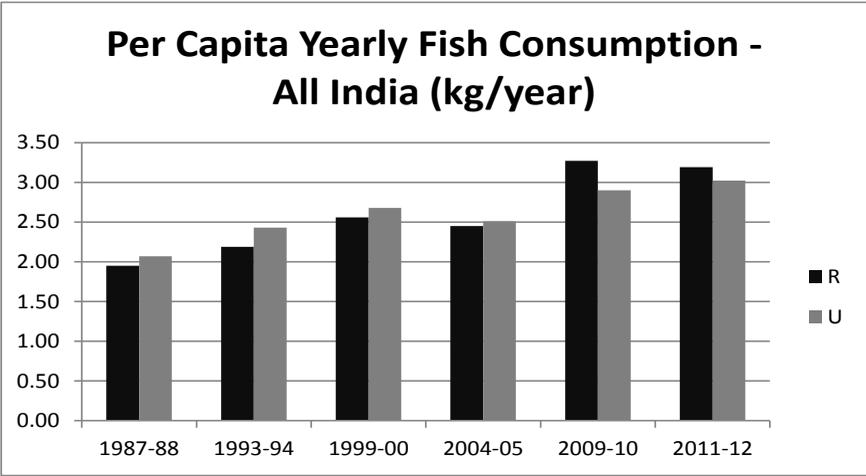
Salim (2013) in a study of the fish consumption pattern across urban middle-income consumers in India notes that domestic prices were 20-25 percent more than the export price. The study highlighted the role of reduced availability of fish for domestic consumption coupled with high prices in leading to a demand-supply mismatch, even in the urban regions, that requires policy intervention to ensure food security.

## **FISH CONSUMPTION – PATTERNS AND DISTRIBUTION**

A recent study by NCAER (2014) analysed the changing food consumption pattern in India and argued that fish consumption has

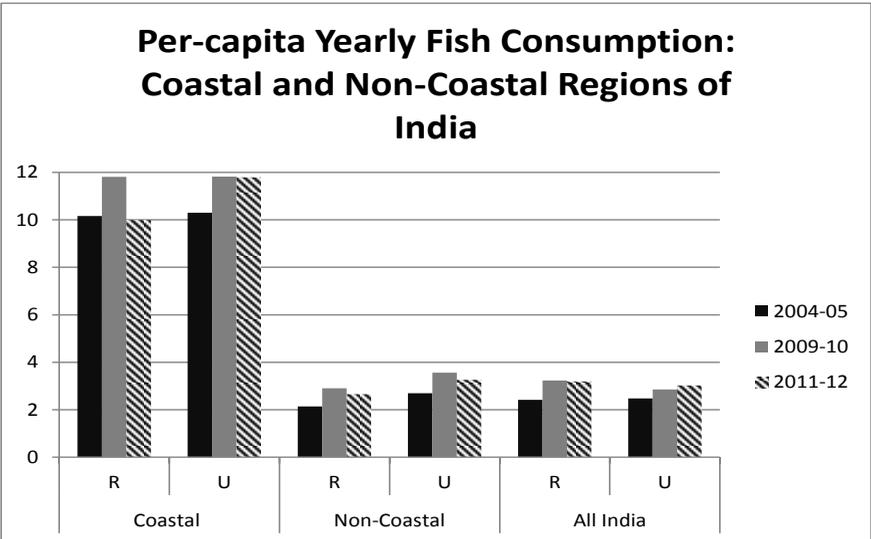
registered a steady increase in both rural and urban areas of India over the period 1987-88 and 2009-10. Figure 1 shows per capita annual consumption of fish in rural and urban areas of India over the past two decades. Though the figure shows an increasing trend in the consumption of fish, it must be noted that the data sourced from several rounds of National Sample Survey is not strictly comparable due to changes in the reference period followed, especially in the recent rounds. While most rounds of NSS used the uniform recall period (URP) – wherein the consumption expenditure data are collected using a 30-day recall period for all items including fish, some recent rounds of NSS used the modified mixed recall period (MMRP) – wherein the consumption expenditure data for some commodities including fish are collected using a 7-day recall period. The most two recent rounds of NSS (2009-10 and 2011-12) that use comparable recall period for assessing fish consumption among households show a declining trend in per-capita fish consumption, especially in the rural areas.

Figure 2 shows the per-capita yearly fish consumption in recent years in the rural and urban areas of coastal and non-coastal regions of India. As highlighted in earlier studies, the coastal regions consume, on an average, a higher quantity of fish compared to the non-coastal regions. The drop in fish consumption in the most recent years (2009-10 and 2011-12) has been much sharper in the rural areas of coastal regions than the other parts of India. This trend is worrying from the food security perspective and it would be informative to analyse the fish consumption patterns among the coastal states in greater detail.



Source: Various NSS Reports.

**Figure 1: Per-capita Annual Fish Consumption in India**



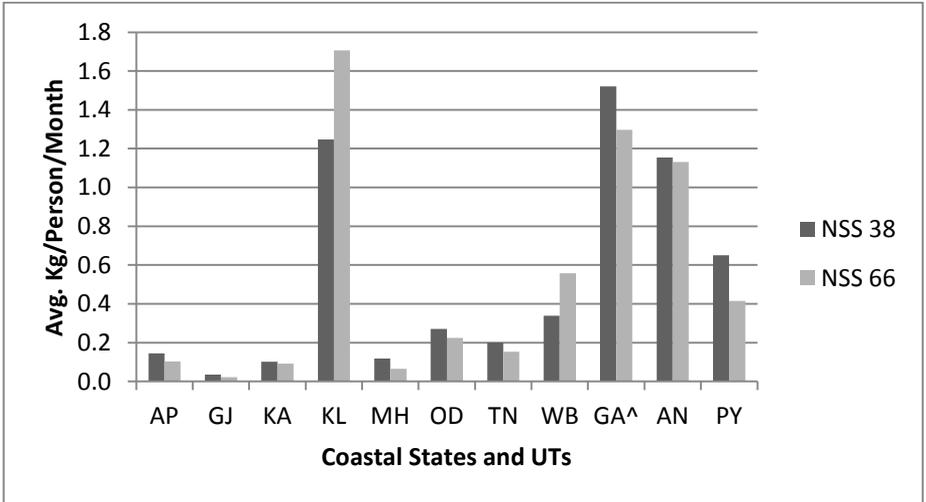
Source: Various NSS Reports.

**Figure 2: Per-capita Annual Fish Consumption in Coastal and Non-Coastal Regions of India**

As mentioned above, this paper analyses the distributional aspects of fish consumption across coastal states and Union Territories of India across two time periods namely 1983 and 2009-10, which correspond to the two NSSO consumer expenditure quinquennial survey rounds, namely 38 and 66 respectively. Note that the NSSO data does not make a distinction between marine and inland fish consumption and so the results presented below pertain to total fish consumption. The analysis was undertaken at the level of the coastal State/UT. Goa (denoted by GA^ or Goa^ in the figures and tables appearing in the next section) includes Daman and Diu as the NSSO 38<sup>th</sup> Round pooled data from these two UTs, thus, we estimated fish consumption similarly from the NSSO 66<sup>th</sup> Round data as well. For comparability, fish consumption based on 30-day recall period has been considered for both the years, even though in 2009-10, NSSO reported fish consumption primarily based on 7-day recall period considering that it better captures the household expenditure on this perishable commodity. For analysing the distributional aspects of fish consumption patterns, the study uses sector-specific monthly per capita expenditure (MPCE) quartile classes.

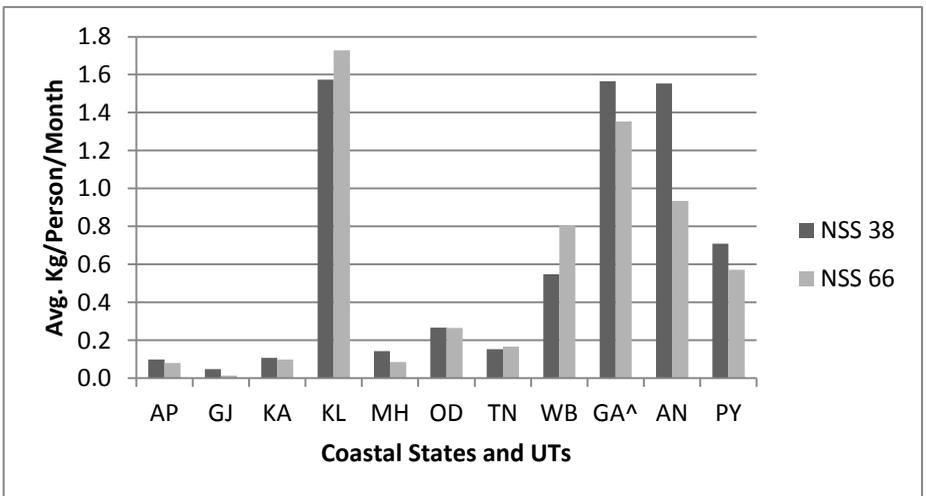
### **Trend in Quantity of Fish Consumption**

In terms of the quantity of fish consumption across coastal States and UTs considered in this analysis, Kerala and Goa are the top two fish consuming states and Gujarat has the lowest per capita fish consumption, across both NSS rounds and both sectors (i.e. rural and urban populations – see Figures 3 and 4 below). Average monthly per capita quantity of fish consumption for the rural population has fallen among all States and UTs between the two time-periods (or NSS Rounds) except in Kerala and West Bengal, where it has risen. In addition to Kerala and West Bengal, average monthly per capita quantity of fish consumption among the urban population has also increased marginally in Tamil Nadu and remained the same in Odisha over-time.



Source: Own calculations based on NSS data.

**Figure 3: Comparison of Average Fish Consumption across Coastal States/UTs and NSS rounds (in Kg/Person/Month) – Rural**



Source: Own calculations based on NSS data.

**Figure 4: Comparison of Average Fish Consumption across Coastal States/UTs and NSS rounds (in Kg/Person/Month) - Urban**

The relative ranking of States/UTs in terms of their average monthly per capita quantity of fish consumption within each NSS Round is presented in Table 2, where a rank of '1' represents the highest consuming State/UT on a per capita basis and '11', the lowest. In the rural sector, Goa and Kerala were the two highest consumers, whereas Karnataka and Gujarat were the two lowest consumers in 1983. Moving to 2009-10, Kerala remained at the top, with Andaman and Nicobar Islands taking the second spot, and Maharashtra slipped into the bottom two along with Gujarat that remained consistently at the bottom both over time and across sectors. The percentage fall in the quantity of fish consumed among the rural population across the two rounds has been drastic for Maharashtra (45 percent). West Bengal, on the other hand, recorded a 64 percent increase in the quantity of fish consuming among rural population over time.

The picture changes only slightly for the urban sector. Gujarat remained at the bottom across both rounds as before, with Andhra Pradesh taking the second last spot in both rounds. The top two consumers are the same as in the rural sector in both rounds. The percentage decline in the quantity of fish consumed among the urban population is significant for Gujarat across the two rounds by about 70 percent. In addition, Maharashtra, Goa and Andaman and Nicobar Islands all record a percentage fall in per capita quantity of fish consumed in excess of 40 percent.

**Table 2: Relative Ranking of States/UTs in terms of (quantity of) Fish Consumption across NSS Rounds**

<i>State/UT</i>	<i>Rural</i>				<i>Urban</i>			
	<i>Cons. Rank – NSS 38</i>	<i>Cons. Rank – NSS 66</i>	<i>Rank Δ (NSS 38 – NSS 66)</i>	<i>percent Δ in Qty. Cons.</i>	<i>Cons. Rank – NSS 38</i>	<i>Cons. Rank – NSS 66</i>	<i>Rank Δ (NSS 38 – NSS 66)</i>	<i>percent Δ in Qty. Cons.</i>
Kerala	2	1	+1	37	1	1	=	10
Andaman and Nicobar Islands	3	2	+1	-2	3	2	+1	-40
Goa <sup>^</sup>	1	3	-2	-33	2	3	-1	-43
West Bengal	5	4	+1	64	5	4	+1	47
Pondicherry	4	5	-1	-36	4	5	-1	-19
Odisha	6	6	=	-17	6	6	=	0
Tamil Nadu	7	7	=	-24	7	7	=	9
Andhra Pradesh	8	8	=	-28	10	10	=	-18
Karnataka	10	9	+1	-11	9	8	+1	-8
Maharashtra	9	10	-1	-45	8	9	-1	-40
Gujarat	11	11	=	-38	11	11	=	-70

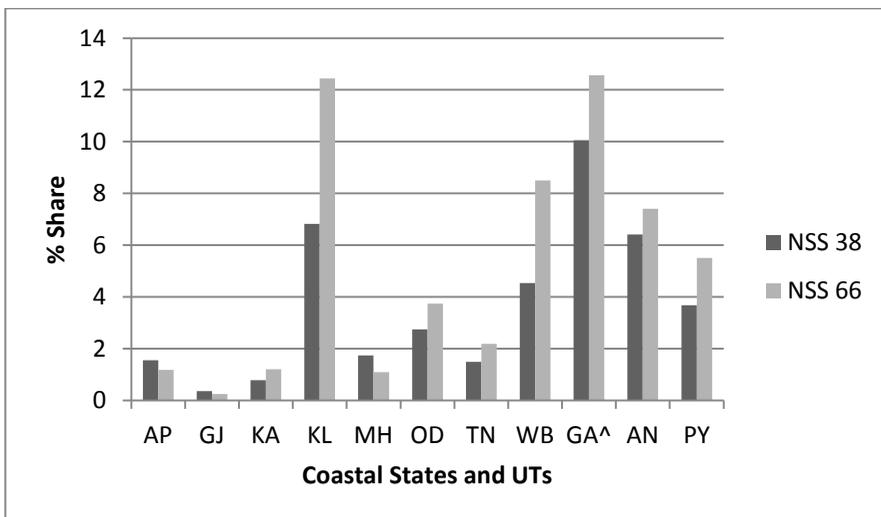
**Source:** Own calculations.

Analysis of the fish consumption patterns across expenditure quartiles and NSS rounds indicates that there are certain States that consistently exhibit similar patterns in both the rural and the urban sectors. Andhra Pradesh and Maharashtra have increasing fish consumption across quartiles within each round, but decreasing fish consumption across time and all quartiles, across both rural and urban sectors; Karnataka exhibited an increasing trend in fish consumption across quartiles and over time for two expenditure quartiles; and Kerala and West Bengal show an increasing trend in fish consumption both across quartiles and over time among both the rural and the urban populations. Gujarat exhibits a declining trend in fish consumption over time and across both sectors, however its within-round fish consumption pattern across quartiles is declining throughout for the urban sector, whereas it is declining only among the highest income group for the rural sector. Tamil Nadu's fish consumption pattern differs across the two sectors, in that it is declining over time across all expenditure classes among the rural population but it is increasing over time across the

middle income group among the urban population. Goa's fish consumption pattern is one of a declining trend among all income groups in the urban sector, whereas among the rural population fish consumption increases over time in the second quartile only. Odisha exhibits an increase in fish consumption over time among the lower half of the rural population whereas it exhibits an increase in fish consumption over time among the lower three-quarters of the urban population.

### **Trend in Expenditure on Fish**

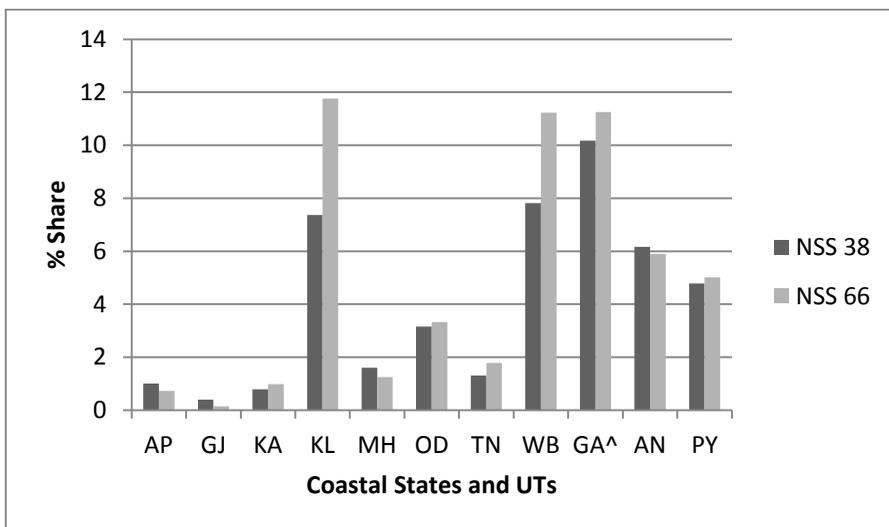
Turning now to the share of average monthly per capita value of fish consumption (in Rupees per person per month) as a percentage of average monthly per capita value of total food consumption (again in Rupees per person per month), Figure 5 shows that among the rural population this percentage share has declined in Andhra Pradesh, Gujarat and Maharashtra over time, whereas it has increased in all other coastal States and UTs over time. This implies that on average the rural populations in these three states were spending a lower share of their total food expenditure on fish in 2009-10 compared to what they were spending in 1983. This is in line with the trend observed in the quantity of fish consumed in these states. Similarly, for West Bengal and Kerala, the average quantity of fish consumption as well as the share of expenditure on fish to total food expenditure has increased over time. However, the fact that Karnataka, Odisha, Tamil Nadu, Goa, Andaman and Nicobar Islands and Pondicherry have on average reduced their quantity of fish consumption over time but their expenditure share on fish to total food expenditure has in fact increased over time implies that despite spending a larger proportion of their total food budget on fish in 2009-10, they are still unable to consume the same quantity of fish in 2009-10 as they did in 1983. In other words, these States are unable to catch up with the rise in fish prices over time as the quantity consumed does not appear to be commensurate with the increase in the expenditure on fish consumption over time.



**Source:** Own calculations based on NSS data.

**Figure 5: Percentage Share of the Expenditure on Fish to Total Food Expenditure - Rural**

For the urban population (Figure 6), this trend is similar, except that Andaman and Nicobar Islands in addition to Andhra Pradesh, Gujarat and Maharashtra, all record a decline in their shares of expenditure on fish to total food expenditure. Here again, Karnataka, Odisha, Goa, Andaman and Nicobar Islands and Pondicherry all record an increase in their share of expenditure on fish consumption and a corresponding decline in the quantity of fish consumed over time.



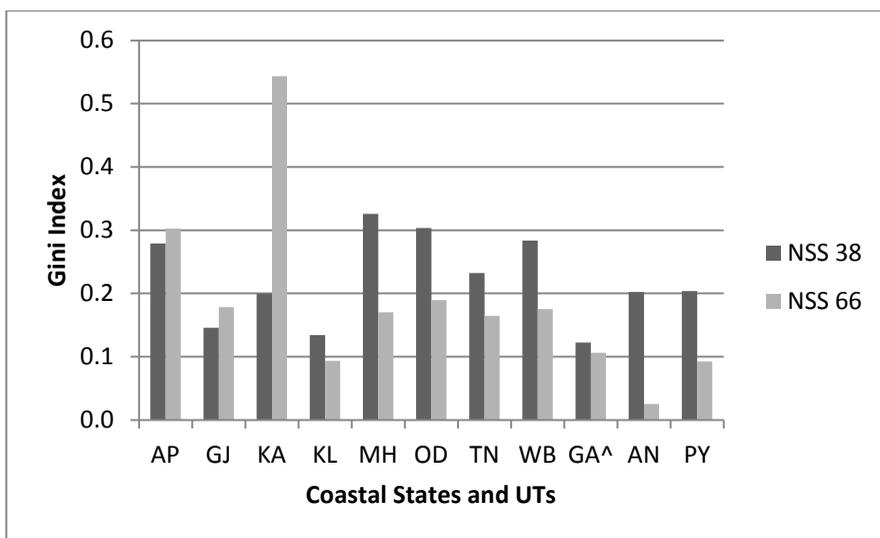
Source: Own calculations based on NSS data.

**Figure 6: Percentage Share of the Expenditure on Fish to Total Food Expenditure - Urban**

An examination of the percentage expenditure shares of fish consumption to total food consumption across both MPCE quartile classes and NSS rounds for the rural population indicates that the share of expenditure on fish consumption has declined across all income classes over time for Andhra Pradesh, Gujarat and Maharashtra, it has declined over the first two quartiles for Karnataka and the first and third quartiles for Goa over time, and it has increased over all income groups for Kerala, Odisha, Tamil Nadu and West Bengal over time. A similar trend is observed for the urban population, except that the share of expenditure on fish consumption has increased over time among the first three quartiles only for Odisha. The patterns in fish consumption among coastal States and UTs observed both across time and expenditure classes, within the rural and urban sectors, broadly indicate that per capita fish consumption has declined over time for all States excluding Kerala and West Bengal. However, the expenditure shares of fish consumption to total food consumption have increased over time for more or less all States except Andhra Pradesh, Maharashtra and Gujarat.

### Trend in Consumption Inequality

To assess the extent of inequality in fish consumption across the population we present here state-wise estimates of the Gini coefficient that measures the inequality in per capita quantity of fish consumption. Gini coefficients have been estimated in STATA using grouped data of the mean per capita fish consumption in each MPCE quartile class and the population weights corresponding to the quartile classes. They have been calculated separately for the rural and urban populations in each coastal State/UT for each of the two time-periods under consideration. Figure 7 depicts state-wise Gini coefficients for the rural population in the two NSS rounds and Table 3 presents the relative ranking of states on the basis of their Gini coefficients, with 1 representing the state with the highest inequality in fish consumption among its rural population.



Source: Own calculations based on NSS data.

**Figure 7: Trend in Measure of Consumption Inequality – Rural**

**Table 3: Gini Coefficients of Fish Consumption and Relative Ranking of States/UTs across NSS rounds – Rural**

<i>State/UT</i>	<i>Gini Coefficient</i>		<i>Gini Coeff. Rank</i>		<i>Rank Change</i>	<i>percent Change in Gini Coeff.</i>
	<i>NSS 38</i>	<i>NSS 66</i>	<i>NSS 38</i>	<i>NSS 66</i>	<i>(NSS 38 – NSS 66)</i>	
Karnataka	0.200	0.543	8	1	+7	172
Andhra Pradesh	0.279	0.302	4	2	+2	8
Odisha	0.303	0.190	2	3	-1	-38
Gujarat	0.146	0.178	9	4	+5	22
West Bengal	0.284	0.175	3	5	-2	-38
Maharashtra	0.326	0.170	1	6	-5	-48
Tamil Nadu	0.232	0.164	5	7	-2	-29
Goa^	0.122	0.106	11	8	+3	-13
Kerala	0.134	0.093	10	9	+1	-30
Pondicherry	0.204	0.092	6	10	-4	-55
Andaman and Nicobar Islands	0.202	0.025	7	11	-4	-88

**Source:** Own calculations based on NSS data.

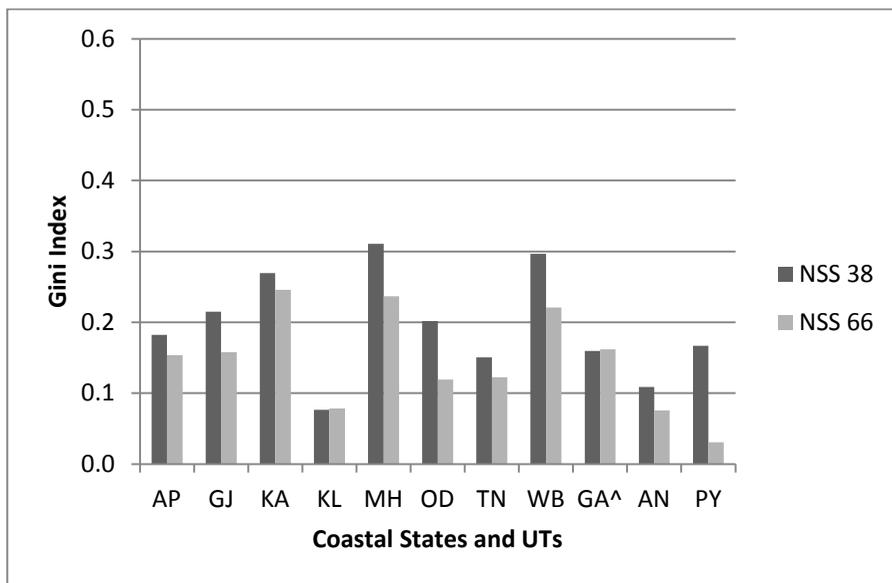
Inequality in the per capita quantity of fish consumption among the rural population was the highest in Maharashtra followed by Odisha and West Bengal, and it was the lowest in Goa in 1983. In 2009-10, inequality of fish consumption was the highest in Karnataka followed by Andhra Pradesh and Odisha, and it was the lowest in Andaman and Nicobar Islands among the rural population. Consumption inequality has increased in Karnataka, Andhra Pradesh and Gujarat, whereas it has reduced in all other States/UTs over time. The rank change in Table 3 indicates the change in the relative position of States on the basis of their Gini coefficients from 1983 to 2009-10. A positive rank change indicates that consumption inequality has increased over time relative to other States; a negative rank change indicates the converse. Five States are in a relatively worse-off position than they were before including Karnataka, Andhra Pradesh, Gujarat, Goa and Kerala, although in the latter two States consumption inequality has decreased among their respective rural populations over time.

Karnataka has recorded a sharp increase in inequality between 1983 and 2009-10 (an increase of 172 percent) placing it in first position in the relative inequality ranking across States. As has been mentioned above the mean per capita quantity of fish consumption of Karnataka was relatively low compared to other States and also that the same had declined over time. Further, consumption pattern across income quartiles revealed that Karnataka's mean per capita fish consumption declined in 2009-10 (to almost zero) for the first two quartiles from 1983 levels, whereas it increased considerably for the higher income groups during the same period. These two points taken together could explain the sharp rise in the Gini index for Karnataka from 0.2 in 1983 to 0.54 in 2009-10. In percentage terms, Andaman and Nicobar Islands has recorded the biggest decline in consumption inequality among its rural population over time (i.e. Gini index has declined by 88 percent). Kerala and West Bengal are the only two States whose per capita fish consumption has increased over time across all income classes. This is reflected in their Gini index that shows a decline over time implying a relatively more equal distribution of fish consumption across all classes of the rural population in 2009-10 compared to 1983. Despite this, West Bengal still ranks as the fifth most unequal State in terms of fish consumption in 2009-10. Kerala on the other hand has the lowest level of consumption inequality among all Coastal States, which may at least partly be attributable to its relatively high level of per capita fish consumption in comparison to other States. In addition to Karnataka, Andhra Pradesh and Gujarat also record an increase in consumption inequality over time and a corresponding decline in mean per capita fish consumption over time. In the case of Andhra Pradesh, the within-round mean fish consumption increased sharply between the third and the fourth quartile. The, more or less, even fall in mean fish consumption across all income classes over time seems to further exacerbate this inequality in consumption among the rural population in 2009-10 compared to 1983 (although only by about 8 percent). In the case of Gujarat, the within-round mean fish consumption decreased between the third and the fourth quartile, while it increased otherwise. Over time, the fall in mean fish consumption across income classes is uneven with the

higher income groups recording a bigger decline in mean consumption compared to the lower income groups. The already low per capita consumption amongst the highest income group and the relatively bigger fall in their consumption in 2009-10 compared to 1983 together explain the overall rise in consumption inequality among the rural population of Gujarat. Among the remaining coastal States, Odisha, Maharashtra, Tamil Nadu and Goa have all recorded declines in mean per capita quantity of fish consumption over time and a corresponding reduction in consumption inequality over time. A closer inspection of the per capita fish consumption across income classes for all these States reveals that the biggest decline in mean fish consumption over time has occurred in the fourth (and in some cases the third) quartile which seems to be driving overall consumption inequality downwards. In other words higher equality in consumption is attained in 2009-10 at the expense of lower levels of consumption especially for the higher income groups. This is in line with the finding that the price and income elasticities for all fish types tend to be higher among the poorer sector of the economy compared to the more affluent members of society (Dey *et. al.*, 2008). This implies that the poorer households often consider seafood and fishery products as luxury commodities, especially the high-value species, while the rich simply consider them as basic food items.

Comparing consumption inequality across the rural and urban populations (see Figure 8 and Table 4 for inequality measure in the urban sector), we find that in general the extent of inequality is lower among the urban population in both NSS rounds. There are some exceptions, however; inequality was higher for the urban rather than the rural populations of Karnataka, West Bengal, Goa and Gujarat in 1983, and Maharashtra, West Bengal, Goa and Andaman and Nicobar Islands in 2009-10. The relative rankings of States on the basis of their Gini coefficients have not changed dramatically for the urban population over time. Karnataka, Maharashtra and West Bengal have the highest inequality (in that order) in 2009-10, and these three States occupied the top three positions in terms of their inequality ranking in 1983 as well

(with a slight change in order). While Kerala had the lowest consumption inequality in 1983, Pondicherry took its place in 2009-10. Karnataka, Goa, Tamil Nadu and Kerala, have all gone up in their relative inequality rankings (i.e. consumption becoming more unequal among the urban population) in 2009-10 compared to 1983. Odisha and Pondicherry have both slipped down the inequality rankings by quite a margin in 2009-10 compared to 1983, which is also evident by the percentage change in their Gini coefficients over the two time periods (a decline of 41 and 82 percent respectively). Inequality in consumption improved among the urban populations of all States over time, barring some negligible increases in inequality for Goa and Kerala. Goa, however, has seen the biggest increase in its relative inequality ranking among States; moving up from a rank of 8 in 1983 to 4 in 2009-10.



Source: Own calculations based on NSS data.

**Figure 8: Trend in Measure of Consumption Inequality – Urban**

**Table 4: Gini Coefficients of Fish Consumption and Relative Ranking of States/UTs across NSS rounds – Urban**

<i>State/UT</i>	<i>Gini Coefficient</i>		<i>Gini Coeff. Rank</i>		<i>Rank Change</i>	<i>percent Change in</i>
	<i>NSS 38</i>	<i>NSS 66</i>	<i>NSS 38</i>	<i>NSS 66</i>	<i>(NSS 38 – NSS 66)</i>	<i>Gini Coeff.</i>
Karnataka	0.269	0.246	3	1	+2	-9
Maharashtra	0.311	0.237	1	2	-1	-24
West Bengal	0.297	0.221	2	3	-1	-25
Goa^	0.159	0.162	8	4	+4	1
Gujarat	0.215	0.158	4	5	-1	-27
Andhra Pradesh	0.182	0.154	6	6	=	-16
Tamil Nadu	0.150	0.122	9	7	+2	-19
Odisha	0.202	0.119	5	8	-3	-41
Kerala	0.077	0.078	11	9	+2	2
Andaman and Nicobar Islands	0.109	0.075	10	10	=	-31
Pondicherry	0.167	0.031	7	11	-4	-82

**Source:** Own calculations based on NSS data.

It was noted earlier that for the urban sector, the mean per capita quantity of fish consumption declined over time for all states except Kerala, West Bengal and Tamil Nadu, the latter recording only a minor increase in mean consumption over time. In Kerala, mean consumption increased only for the third and fourth income quartile classes over time and not at all for the first two quartiles, which may explain the marginal increase in the inequality index over time for this state. In Tamil Nadu, the within-38<sup>th</sup> round and across quartile mean fish consumption increased sharply for the third and fourth quartiles, falling slightly between the first and second quartiles. In the 66<sup>th</sup> round, mean fish consumption increased significantly more than the mean consumption in the previous round for the second and third quartiles and declined for the fourth quartile in comparison to 1983 levels. As a result the inequality index for Tamil Nadu declined in 2009-10 compared to 1983 by about 20 percent. In West Bengal, mean consumption increased across all quartile classes (relatively more for the second and third quartiles than for the first and fourth) in 2009-10 compared to 1983

levels leading to a reduction in the inequality index for this State by about 25 percent. In the case of Karnataka, the relatively bigger decline in mean consumption for the highest income group and the marginal increase in mean consumption for the second and third income classes in 2009-10 compared to 1983 have led to a small decrease in its inequality index over time. In Odisha, the slight increase in mean consumption across the first three income groups and the corresponding larger decline in mean consumption for the fourth quartile class in 2009-10 compared to 1983 have led to a significant decline in its inequality index over time by about 40 percent. In all other cases (Andhra Pradesh, Maharashtra, Goa and Gujarat), the relatively bigger fall in mean per capita fish consumption across the higher income groups relative to the fall in mean consumption in the lower income groups between the two NSS rounds has reduced inequality in consumption for these States over time. This implies that consumption inequality has declined at the cost of lower levels of consumption for all income groups but particularly for the higher income groups. In other words, the decline in consumption among the rich is driving inequality downwards. The fact however remains that all individuals were consuming less, on average, in 2009-10 than they were in 1983.

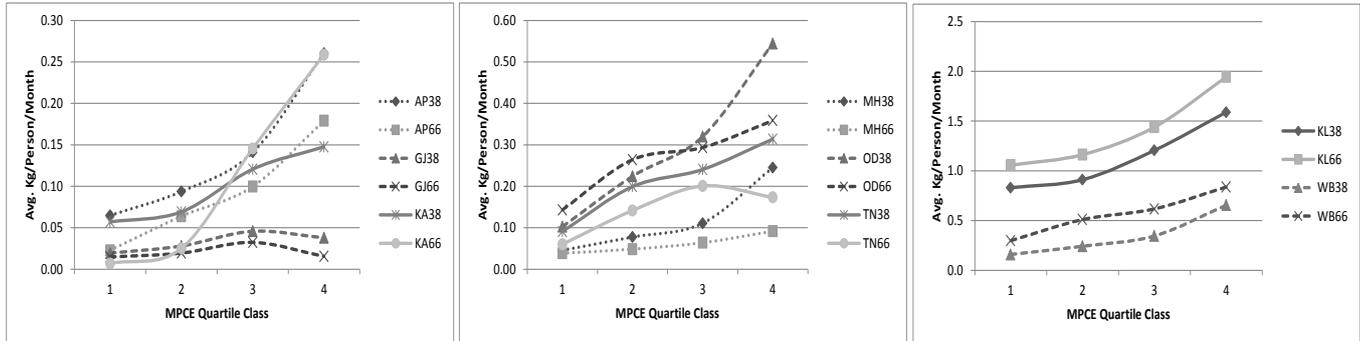
### **Grouping of States**

Putting together the trends discussed above on mean consumption, mean expenditure share and inequality index, the states can be categorised into three broad groups in the rural and urban sectors. Figures 9 and 10 show the groupings for the rural and urban sectors, respectively. Table 5 provides a summary of the approach followed for grouping the states.

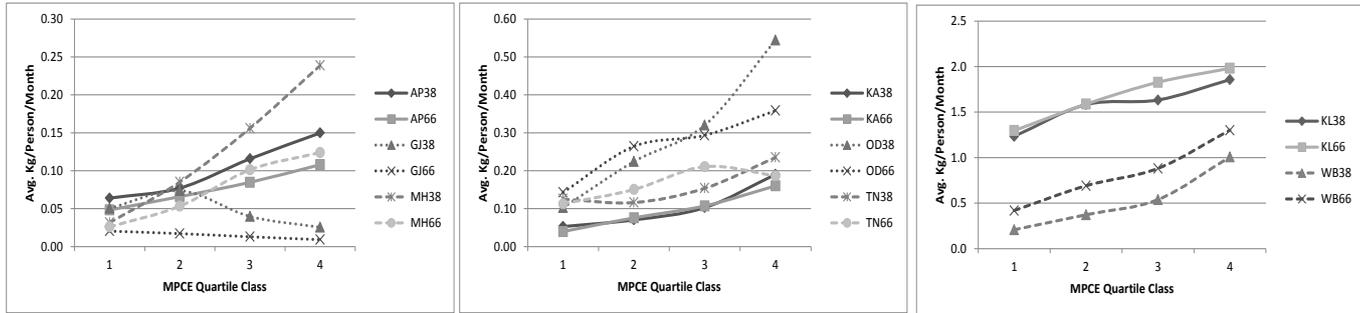
**Table 5: Index of State Groupings Based on Changes over Time – Rural and Urban**

Group	Rural			Urban		
	Mean Consumption	Inequality	Mean Expenditure Share	Mean Consumption	Inequality	Mean Expenditure Share
1	Fall	Rise	Fall, except KA	Fall	Fall	Fall
2	Fall	Fall	Rise, except MH	Fall/Same	Fall	Rise
3	Rise	Fall	Rise	Rise	Fall/Same	Rise

**Note:** Groups 1, 2 and 3 are depicted in the left, middle and right panels respectively, in Figures 9 and 10; KA – Karnataka; MH – Maharashtra; Goa belonged to Group 2 in both the rural and urban sectors.



**Figure 9: Grouping of Coastal States Based on Fish Consumption – Rural**

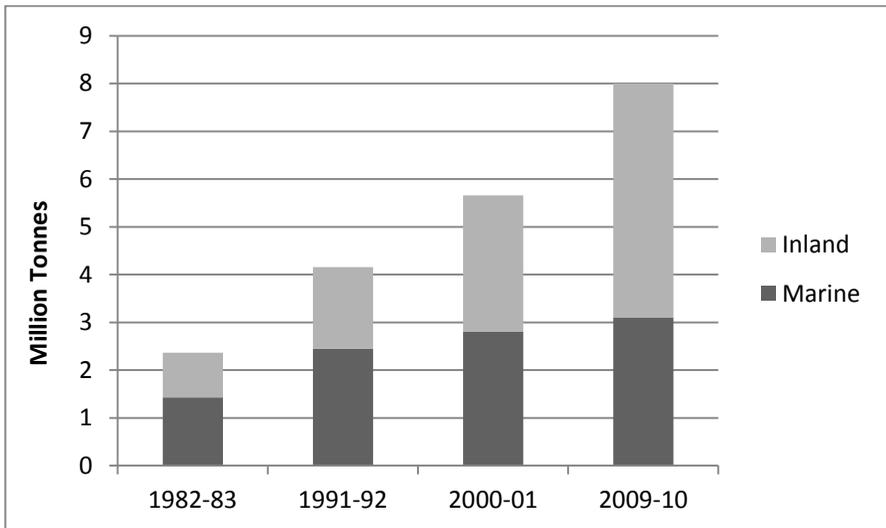


**Figure 10: Grouping of Coastal States Based on Fish Consumption – Urban**

## ROLE OF TRADE AND CONCLUSIONS

This section focuses on the factors responsible for the fall in fish consumption in coastal regions over time. In particular we examine how trade may affect the affordability and availability of marine fish for consumption by the coastal population.

We start with a discussion of fish production. Table 1 at the beginning of this paper showed that, by and large, marine fish production across all coastal regions has increased over time. At the aggregate level, Figure 11 shows that marine fish production has been increasing from 1982-83 to 2009-10 albeit at a decreasing rate. In 2009-10 marine fish production was approximately twice that of marine fish production in 1982-83. Marine fish production increased drastically between 1982-83 and 1991-92 by about 70 percent; it increased by 15 percent over the next nine-year period; and, it increased by a further 10 percent in 2009-10 compared to 2000-01 levels.

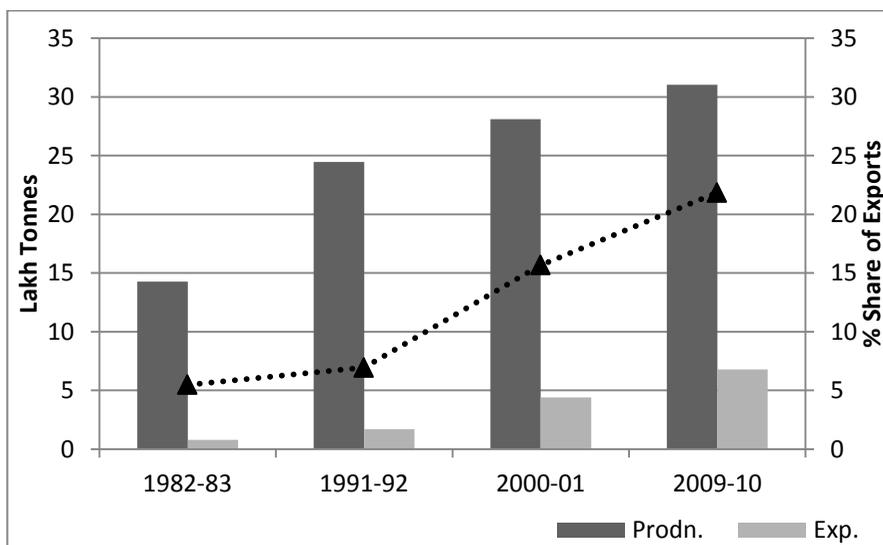


**Figure 11: Marine and Inland Fish Production Over Time (in Million Tonnes)**

It was noted at the start of the paper that the NSS data on fish consumption does not distinguish between marine and inland fish consumption. The analysis that preceded this section, therefore, looked at the changes in total fish consumption (i.e. both marine and inland) over time, which we observed was declining in almost all coastal regions over time. Thus, it is imperative that we also look at the changes in inland fish production to build a true picture of the divergence between fish consumption and production over time. Figure 11 shows that inland fish production has increased rapidly over time, equalling marine fish production in 2000-01 and overtaking the same in 2009-10. In 2009-10, inland fish production was more than five times that of inland fish production in 1982-83. Data on inland fish production across all Indian States (DADF, 2014) indicate that the coastal States produced a relatively higher quantity of inland fish compared to non-coastal States in 2009-10, with West Bengal and Andhra Pradesh topping the list of the biggest inland fish producers (1338 and 1013 thousand tonnes respectively). Coastal States and UTs accounted for 64 percent of the overall inland fish production in 2009-10. Having said that, it is worth mentioning here that although coastal regions produce, and therefore have access to, inland fish (to varying degrees), it is their preference for marine versus inland fish that determines which they consume. People from Southern India prefer marine fish and thus depend on capture fisheries, whereas people from East and North-East India prefer freshwater fish (FAO, 2005). Returning to Figure 11, we see that total fish production (both marine and inland) increased by almost three and a half times between 1982-83 and 2009-10. Thus, while per capita fish consumption within coastal regions declined over time, total fish production increased over time.

One factor that may be responsible for the discrepancy between fish production and consumption is marine fish exports. Figure 12 shows that volume of marine fish exports have increased between the period 1982-83 and 2009-10 by a factor of 9. Marine fish exports grew at a faster rate in the 1990s, the decade of trade liberalisation, than in any

other decade. Marine fish exports grew by 159 percent between 1991-92 and 2000-01. Marine fish exports as a percentage of total marine fish production also more than doubled during this time period (from 7 percent in 1991-92 to 16 percent in 2000-01). The share of marine fish exports as a percentage of marine fish production was 5 percent in 1982-83 and it grew to 22 percent in 2009-10. It is important to note that the comparison here between marine fish production and marine exports as opposed to total fish production (including both inland and marine fish production) and marine exports is due to the fact that as the name suggests, marine fish exports comprise mainly of different types of marine fish including finfish, cuttlefish, lobsters and shrimp. Among all species of marine fish that are exported, shrimp accounts for the largest share of total fish exports in terms of both quantity and value (19 percent and 42 percent respectively in 2009-10; MPEDA statistics). In other words, inland fish production mainly caters to domestic consumption, whereas a proportion of marine fish production is exported.



**Figure 12: Marine Fish Production, Marine Fish Exports, and Percentage Share of Marine Exports to Production**

Sathiadhas *et. al.* (1995) note that 50 percent of marine fish available for domestic consumption is consumed fresh in and around the landing centres, 43 percent is consumed in demand centres located up to a distance of 200 kilometres from the coast and only 5 percent goes to centres located beyond 200 kilometres (the remainder may be put down to spoilage at landing centres and at various points of the distribution channel). This is largely due to the fact that fish is a highly perishable food commodity and inadequate storage and transport facilities prevent marine fish from being consumed in the mainland (Hassan *et. al.*, 2012). But the fact that an export market for fish exists, and has been growing over time, implies that the infrastructure to process, store and transport fish out of the country does exist. The question then arises as to why such infrastructure has developed for the export market, whereas it has not for the domestic market. Hassan *et. al.* note that fish processing, storage and the implementation of safety and quality control measures are highly capital intensive. Domestic retail suppliers comprise of mainly small traders; truck, cycle/rickshaw or head-load vendors who use ice for storage and cannot afford capital intensive storage facilities. As a result domestic consumers are often confronted with poor quality or degraded fish since the ice used to preserve fish is often not made from good quality water. Moreover, what restricts domestic traders in adopting technologies that would ensure better quality fish is that they are unable to transfer such costs to domestic consumers given that it is the low and middle income consumers who form the majority of fish eaters (Hassan *et. al.*, 2012). On the other hand, urban upper income class fish consumers are able to afford the price rise that the availability of better quality and variety of fish necessitates. Thus, modern domestic supply chain outlets and supermarkets that provide the necessary infrastructure (cold storage etc.) to preserve fish and fish products have developed to some extent, especially in big cities. However, this is still a niche market serving a relatively small section of the population. The really big traders in the market, therefore, tend to be the exporters who can not only afford the investment in infrastructure needed to process and preserve

fish but they are also able to sell fish at a premium in the export market thereby making a profit on their investment. In 2009-10, the biggest importers of marine fish from India were the European Union, South-East Asia, China, Japan, Middle East and USA and the total value of marine fish exported was Rs. 10,049 Crores (MPEDA Statistics) signifying that the fish export market is large and very lucrative. Therefore, this, together with the fact that the share of marine fish exports has increased over time (see Figure 12), indicates that marine fish production seems to be increasingly catering to the export market rather than the domestic market, which would explain the fall in domestic fish consumption in coastal regions over time. This is especially true for the Southern Coastal States that primarily depend on marine fish for their consumption. Furthermore it is the lower and middle income groups who suffer the most in terms of decreased consumption due to the non-availability of good quality fish at affordable prices. This has serious implications for the food and nutritional security of the poor in coastal regions.

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