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Coastal Resource Management In Kanniyakuamari Coast, Tamil Nadu, India. Using Remote Sensing and Geographical Information System

Hajeeran Beevi.N, 2. Sivakumar.S, and 3. Vasanthi.R
1. Department Of Geography, Periyar E.V.R. College (Autunomus),Trichirappalli – 23. Tamil Nadu, India.
2. Department Of Geology, National College, Trichirappalli-1, Tamil Nadu, India.
3. Department of Industries & Earth Sciences, Tamil University, Thanjavur- 613 010, Tamil Nadu, India.

Abstract
The Coastal Resource Management of Kanniyakumari coast which is Located in the Southern Part of Tamil Nadu (India) is situated in this article. They study has made use of Socio economic data to identify the Resource Management status of the study Area. The software like ArcGis are used to demarcated the coastal Resource management of Kanniyakumari coast. The Total area 715 Sq.m. Kanniyakumari coast about 42 Fishing Landing Centers the distribution of fishing villages in Kanniyakumari coast. The total annual Fish production is 42716.60 tonnes during to 2011-212.

I. INTRODUCTION

Broadly speaking, natural resources are any elements of nature that can be used by humans including drinking water, oil and gas, minerals, sea food game animals, fodder, fuel wood, timber and pharmaceutical products usually, however, the term natural resources is used an economic sense to mean any resources occurring in nature that can create wealth and is controlled by a particular state or authority. Distinctions are made between living and non- living resources, as well. A non-renewable resource is a resource that is not replaced or is replaced only slowly by natural processes. Primary examples of non-renewable resources are minerals and the fossil fuels that is oil, natural gas and coal. A renewable resource, in contract, is a resource that is replaced rapidly by natural processes. Examples of resources are sunlight, and wild life products.

Coastal resources are rich in both terrestrial and marine natural resources. In recent years, sea weed and pearl forming have been encouraged as well as agriculture to prevent depletion of fishery resources.

The coastal zone is a finite "resources" in that it can only support a certain amount of activity before its limitations are realized. This process is often termed the "carrying capacity" of the coast. The coastal fishery is a highly productive sector in Tamil Nadu as well as in Kanniyakumari coast. It is also a source of valuable food and employment. An attempt has been made in this chapter to study the marine fish production and development and operational practices of Kanniyakumari coast, Tamil Nadu.

Social and environmental indicators research is experiencing a renaissance at present, especially in the arena of sustainability science. For example, the United Nations development programmes. Human Development Index (UNDP, 2000) provides a composite indicator of human well being, as well as indicator of gender disparity and poverty among nations – measures that has been used for more than one decade. Similarly, the World Bank (2001) provides data on the links between environmental condition and human welfare, especially in developing nations, to monitor national progress toward a more sustainability future. An index has been developed to measure the environmental sustainability of national economies.

Meanwhile, a set of indicator to monitor and assess ecological conditions for public policy decision has been proposed (National Research Council, 2000). Similarly, the U.S environmental protection agency (2002) is using a small set of environmental indicators to track progress in hazardous waste remedies. Finally, the social capital embodied in various communities has been surveyed in selected communities to determine a baseline, and a comparative assessment of American Social and civic engagement at the local level (Social Capital Community Benchmark Survey, 2002). Despite these efforts, is still no consistent set of metrics used to assess Vulnerability to environmental hazards, although there have been call for just such an index.

II. STUDY AREA

The study area selected for the present research is the Kannyakuamari coast of Tamil Nadu State extending from south of Tamirabarani river bank to India Ocean, in the south and a breadth of 10 km in

east – west direction. Thus totaling length of 71.5 km (east coast west coast 60km and 11.5 km and total area coverage is 715 km2) (Fig 1) it is bounded by the north latitudes 80˚04'N and 80˚17'N the east longitudes of 77˚32'E and 74˚54'E and falling in parts of survey of India topographic sheets (SOI) and 58 H/12, 58 H/8, 58 H/4, on 1:50000 scale. The study area has well developed network of roads and railway lines providing good linkages with major cities in Tamil Nadu and also with rest of the country. Many major towns of, Pilgrimage attraction (Kannyakumari,) tourist's importance are located in the study area.

Kannyakumari coast is bounded by Tirunelveli District the north and the Gulf of Manner is in the east, on the south and southwest bounded by Indian ocean and Arabian sea and the North West it is bounded by Kerala.

III. OBJECTIVES

The present study aims to analyses the important coastal resources through inventory and mapping with following objectives. To evaluate and to demarcate the natural resources of the coast of Kannyakumari using appropriate methods of assessment. in addition to that require details through pre-field investigation finding and demarcate the resource region. To assess Land Use and Land cover status for the past ten years with help of IRS IC (LISS III). To analyze the marine fish production in the study area. To identity impact zonation along the coastal zone with their environmental problems.To integrated coastal resources with their management strategies and planning.

IV. RESEARCH METHODOLOGY

Base map with all physical and cultural details has been prepared from the topographical sheets published by the Survey of India (SOI) on 1: 50000 scale. After having set up the objectives of the study primary and secondary base line data have been collected and analyzed in order to understand the existing condition of the study area (Profile) in detail on various physical economic and social attributes as it reveals the human relationship between man and resources of the study area. An understanding of such relationship is a path finder to any evaluation for an area to how present status could be preserved, changed or improved. 42 village papers have been referred for bringing socio-economic profile of the study area, apart from the published and unpublished report of different departments. Preparing Location map based on Gis. The fishery management of these sectors is delineated nearly 42 fishery villages to engage the fishing activities, and study included the collection of information, estimation of marine fish production, employment, and management activities, in addition to that field visit and coastal use by the public and interview by various respondents along the study area.

LOCATION MAP OF THE STUDY AREA

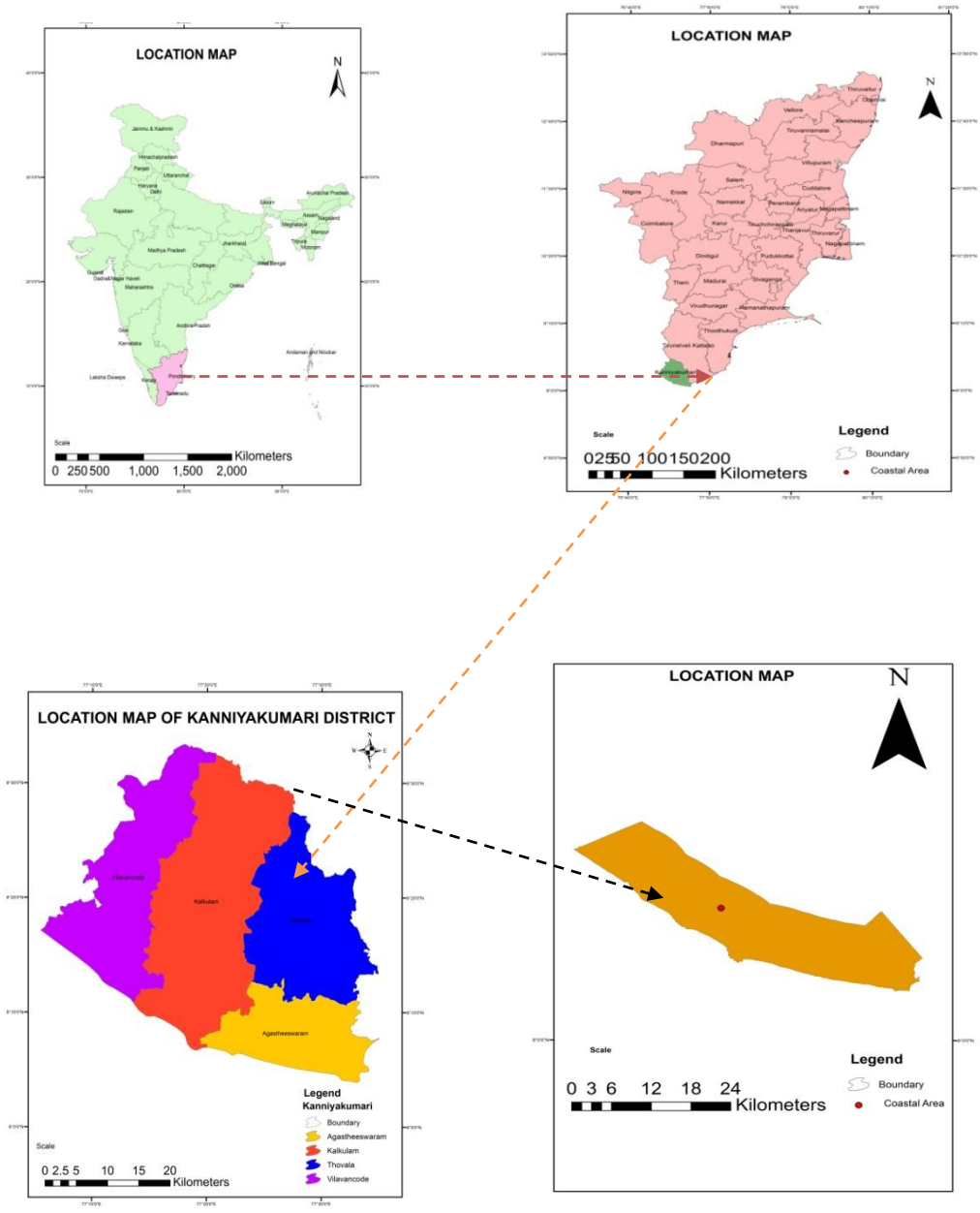

Figure 1

V. RESULTS AND DISCUSSION

5.1 MARINE FISH PRODUCTION IN TAMILNADU AND KANNIYAKUMARI COAST

Tamil Nadu is one of the leading maritime states of India and ranks third in marine fish production. Tamil Nadu has about 442 fishing villages and 356 fish landing centers and 8 fishing harbors. The total annual fish production is 426735.44 tonnes during the year 2011-2012. There are forty seven species catching in Tamil Nadu.

Kanniyakumari coast has about 42 fish landing centers (Fig2) the distribution of fishing villages in Kanniyakumari coast. The total annual fish production is 42716.60 tonnes during 2011-2012 is given in the table 4.1. Marine fish production is increasing from 29235 tonnes during 2001-2002 to 49951 tonnes during 2001-2012, in Kanniyakumari coast. But, marine fish production is increasing from 31, 7716 tonnes during 2001-2002 to 373861 tonnes during 2001-2003 and 426734.44 in 2011-2012 in TamilNadu. The prevalent fish production comes from capture fisheries. In marine fish production Kanniyakumari coast stands in the third rank during 2001-2002 and 2011-2012. The given figure 3 shows

the fish production of TamilNadu in the year 2001-2002, 2002-2003 and 2011-2012.

The marine fish production is included pelagic varieties and demarsal varieties. The demarsal species of fish are mostly bottom dwelling and pelagic species are surface living. Most of the economically valuable species like lobsters, cuttle fish, prawn, crabs and rays belonged to demarsal varieties. The other important demarsal varieties are pomfrets, soles, perches, shark, red mullets, catfishes and silver bellies. The contribution by the demarsal varieties is always more over TamilNadu and minimum in Kanniyakumari. The pelagic varieties included many sweaty fishes like caranx fishes, mural fish, seer fish, ribbon fish, flying fish, sardines and anchoviella. The contribution by the pelagic varieties is minimum over Tamil Nadu and maximum in Kanniyakumari coast.

The total number of fishing crafts in Kanniyakumari coast is 15 percent of the total number of crafts in Tamil Nadu; it is only contributed to 10.01 percent of the total fish production in the state in 2011-2012. This indicates the declining state in fish production of the crafts in the coast. Over the years, the relative share of the Kanniyakumari coast was low in 9.20 percent are increased in 2001-2002 is about 13, 36 percent are given in Table 1 and the figure 2

The terms catch landings and productions are used synonymously. Trends in marine fish production in Kanniyakumari coast are discussed in composition with the production of Tamil Nadu. The analysis is based on the secondary data collected from Director of Fisheries, Chennai.

The actual fish production of Tamil Nadu and Kanniyakumari are given in table 1 and Figure 2,3

Table 1
FISH PRODUCTION IN TAMILNADU AND KANNIYAKUMARI COAST

Year	Tamil Nadu	Kanniyakumari
1999-2000	299942	29235
2000-2001	307349	32178
2001-2002	317716	32291
2002-2003	330729	37740
2003-2004	341317	46440
2004-2005	350780	38310
2005-2006	356487	41652
2006-2007	377483	49716
2007-2008	373926	49951
2008-2009	372402	19643
2009-2010	373861	32107
2010-2011	379214	236345
2011-2012	426735.44	426735.44

FISH PRODUCTION IN TAMILNADU AND KANNIYAKUMARI COAST

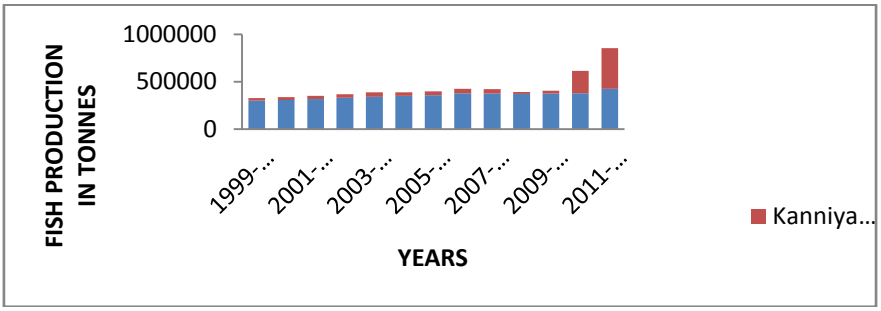

Fig 2

FISH PRODUCTION IN TAMILNADU AND KANNIYAKUMARI COAST

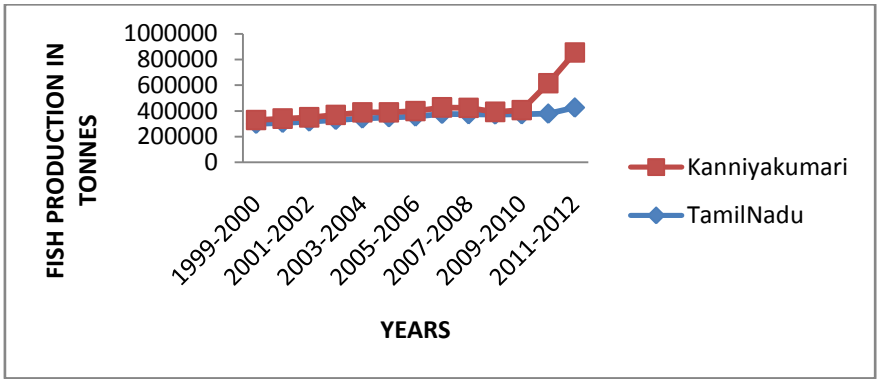

Fig 3

TREND ANALYSIS FOR TAMIL NADU FISH PRODUCTION

In order to assess the nature of fish production over the years, a linear trend line y = a+bx is fitted and the results are given below the table 2.

Table 2

MODEL SUMMARY FOR FISH PRODUCTION OF TAMILNADU

R	R2	ADJUSTED R2	Std. Error of the Estimate
0.958	0.918	0.910	8625.20660

From the above model summary Table2, the R^2 is 0.918 which indicates that the variability in marine fish production is 91.8 percent that is explained by variable x (year

Table 3

CO-EFFICIENT TABLE FOR THE PRODUCTION OF TAMILNADU

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig
	B	Std.Error	Beta		
Constant	298807.8	5308.44		56.289	.000
Year	7634.902	721.276	0.958	10.585	.000

From the table above co-efficient Table 3 the trend line as y=298807.80 + 7634.902x. Here 7634.902 are the annual increment rate of marine fish production of TamilNadu. Here, the co-efficient is significant.

TREND LINE OF FISH PRODUCTION IN KANNIYAKUMARI COAST DURING 1999-2012

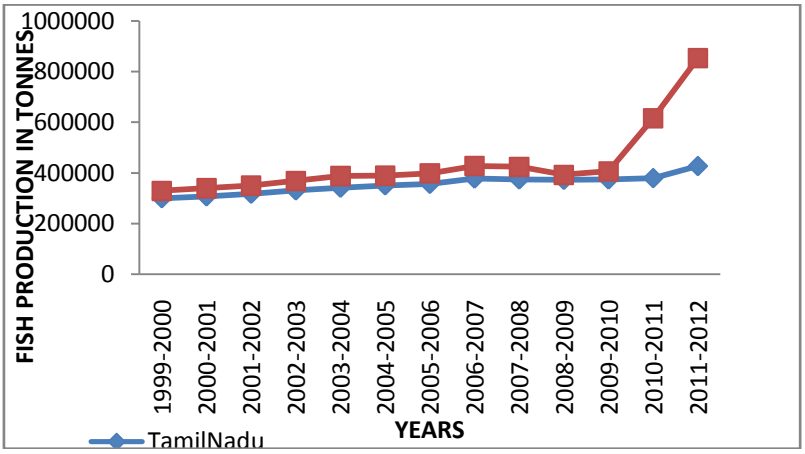

Fig 4

From the above trend line, it is Tamil Nadu increases steadily. It is predicted that the fish production for the year 2005-2005 as 405696.43 tonnes and for the year 2011-201 as 4, 26735.44 tonnes. Figure are shown in 4.

TREND ANALYSIS OF FISH PRODUCTION IN KANNIYAKUMARI COAST

In order to assess the nature of trend of fish production of Kanniyakumari coast, a linear trend line y = a+bx is fitted and the results are given below.

Table 4
MODEL SUMMARY FOR FISH PRODUCTION OF KANNIYAKUMARY COAST

R	R2	ADJUSTED R2	Std.Error of the Estimate
0.090	0.008	-0.102	9507.24637

From the model summary Tables 4, the R^2 is 0.008, which means that the variability in marine fish production is 0.8 percent, explained by the variable x.

Table 5
CO-EFFICIENT TABLE FOR FISH PRODUCTION OF KANNIAYAKUMARI COAST

Model	Unstandardized Coefficients		Standardized Coefficients	t	sg
	B	Std.Error	Beta		
Constant	66237.336	6962.Error		9.513	.000
Year	-246.100	906.480	-090	-271	-792

From the above co-efficient Table 5 the trend is y=66237.336-246.100x. Here 246.1 are the annual decrement rate of marine fish production of Kanniyakumari coast. However the co-efficient is non-significant

FISH PRODUCTION IN TONNES OF KANNIYAKUMARI COAST

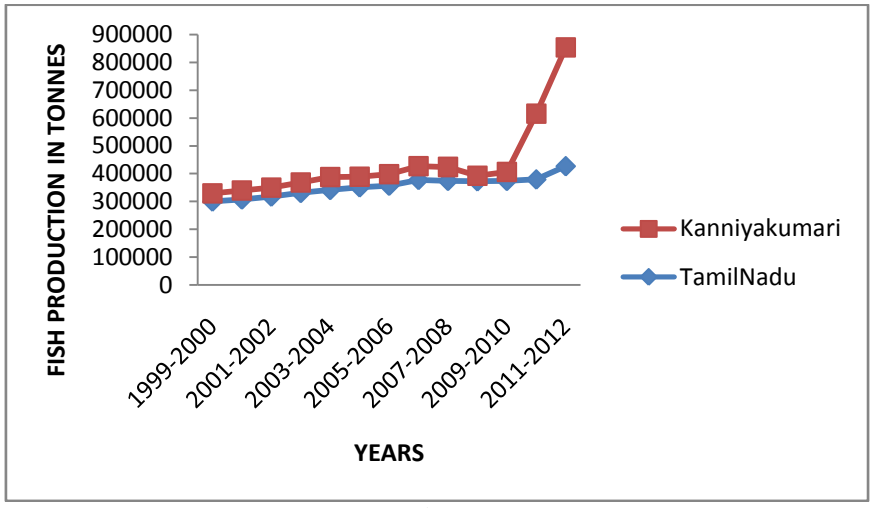

Fig 5

Figure 5 Trend line of fish production in Kanniyakumari coast During 1999-2001 to 2011-2012.From the above trend line it is understood that the trend line is not in increasing pattern. Using the above trend line, we cannot product for the future, as R^2 of the model is very low.

5.2 MARINE FISH PRODUCTION OF MECHANIZED CRAFT SECTOR IN KANNIYKUMARI COAST

In order to find the trend of Kanniyakumari coast fish production using mechanized crafts a linear trend line is filled. The result of the trend analysis is given below Table 6

Table 6
MODEL SUMMARY FOR MECHANISED CRAFT'S FISH PRODUCTION – KANNIAYAKUMARI COAST

R	R2	ADJUSTED R2	Std.Error of the Estimate
0.200	0.040	-0.056	4889.17344

From the above model summary Table 6 the R^2 is 0.40. This indicates that the variability in production of mechanized craft sector is 4 percent, which is explained by the variable x.

Table 4.7
CO-EFFICIENTS TABLE FOR MECHANISED CRAFT'S FISH PRODUCTION KANNIYAKUMARI COAST

Model	Unstandardized Coefficients		Standardied Coefficients	t	Sig
	B	Std.Error	Beta		
Constant	40352.526	2701.460		14.937	.000
Year	262.304	406.491	.200	.645	.533

From the above coefficient Table 4.7 the trend as y=40352.526+262.304x. Here 262.304 are the annual increasing rate in fish production of mechanized craft sector in Kanniyakuamri coast. The co-efficient was non-significant.

In the case of non-mechanized craft sector, the regressing of marine production is calculated as.

5.3 NON MECHANIZED CRAFTS SECTOR IN KANNIYAKUMARI COAST

In order to find the trend of Kanniyakumari coast's fish production using non-mechanized craft, a linear trend line is fitted. The result of the trend analysis is given below.

Table 8
MODEL SUMMARY FOR NON-MECHANISED CRAFT'S FISH PRODUCTION-KANNIYAKUMARI COAST

R	R2	ADJUSTED R2	Std.Error of the Estimate
0.153	0.023	-0.740	5109.96788

From the above Model summary Table 8, the R^2 IS 0.023, which indicates that the variability in marine fish production of non-mechanized crafts sector is 2.3 percent, which is explained by the variable x.

Table 9
C0-EFFICIENT TABLE FOR NON-MECHANISED CRAFT'S FISH PRODUCTION KANNIYAKUMARI COAST

Model	Unstandardized Coefficients		Standardied Coefficients	t	Sig
	B	Std.Error	Beta		
Constant	23137.638	2823.457		8.195	.000
Year	-207.848	424.848	-153	-489	.635

From the above Co-efficient Table 9 the trend as y=23137.636-207.848x. Hence 207.848 are the annual decreasing rate of fish production of non-mechanized craft sector in Kanniyakuamri Coast; however, the co-efficient is not significant.

Fish production is decreased over the years in Kanniyakumari coast. But number of Crafts has increased from 5594 during 2000-2001 to 10114 during 2011-2012. Due to increasing the number of crafts, the fish production has declined. Large number of crafts led to over catching or exploitation, which is the prime cause for decrease in fish production.

5.4 GEAR WISE PRODUCTION

A Fishing gear is the tool with which aquatic resources are captured. The same fishing gear can be used in different ways. A common way to classify fishing gears and methods is based on the principles of how fish or other preys are captured and, to a lesser extent, on the gear construction. Gear wise marine fish production in Kanniyakumari coast is given in Table 10 and Figure 6.

Table 10
GEAR-WISE MARINE FISH PRODUCTION IN KANNIYAKUARI COAST 2011-2012

GEAR	PRODUCTION	PERCENTAGE
TRAWL NET	28342	64.67
SURROUNDING NETS	0	0
GILL NETS	11300	25.78
SEINE NETS	280	0.50
TANGLE NETS	382	0.87
LIFT NETS	1137	2.60
HOCK NETS	2100	4.79
BACK NETS	350	0.79
TOATAL	43819	100

GEAR-WISE MARINE FISH PRODUCTION IN KANNIYAKUARI COAST 2011-2012

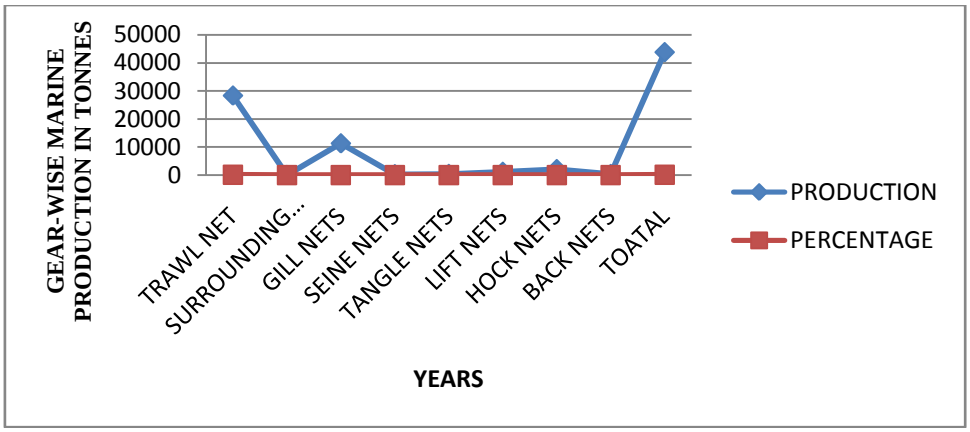

Fig 6

Trawl net is the major gear used by mechanized craft (64.67 percent). Gill nets are generally used by traditional crafts. However, they are also used by mechanized crafts. Gill nets contribution is 25.78 percent. As could be seen from data given in Table 10, trawl net, gill net seine nets, tangle nets, lift nets, back nets and hock net are the gears used in Kanniyakumari coast. Trawl net, gill net and block nets are the main gears taken together accounted for more than 96 percent of catch.

5.5 SEASONAL VARIATION OF FISH PRODUCTION IN KANNIYAKUMARI COASTS

The seasonal variation of fish production in Kanniyakumari coast is given in the table 4.11 and Figure 7,8.

Table 11
SEASONAL VARIATION IN FISH PRODUCTION OF KANNIYAKUAMRI COAST

YEAR	QUARTER I	QUARTER II	QUARTER III	QUARTER IV
2005-2006	18023	21471	12251	19425
2006-2007	17250	22170	12808	17984
2007-2008	17072	23212	13035	17965
2008-2009	18143	21145	11989	19145
2009-2010	16589	20563	11650	17200
2010-2011	16444	20725	12054	17025
2011-2012	10450	14523	8090	10911
TOTAL	113971	143809	81877	119655
AVERAGE	16281.57	20544.14	11696.71	17093.57
SEASONAL VARIATION	99.25	125.24	71.30	104.20

SEASONAL VARIATION IN FISH PRODUCTION OF KANNIYAKUAMRI COAST

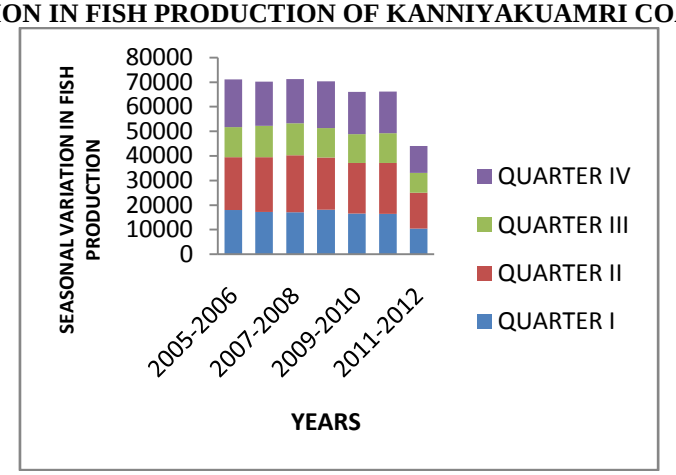

Fig 7

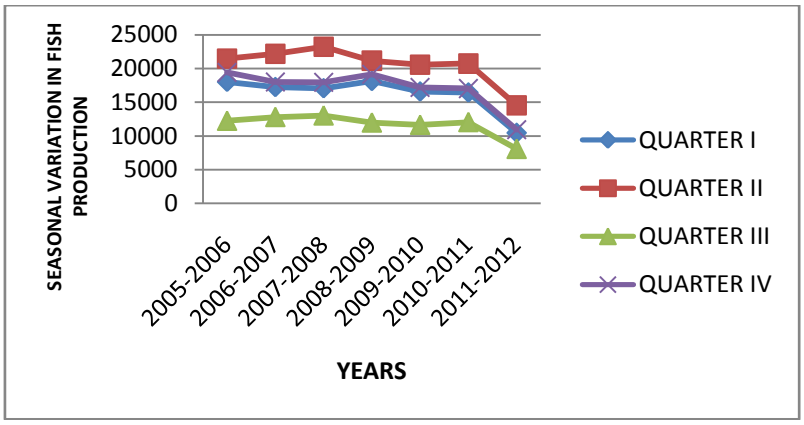

Fig 8

From the above Table 4.11 it is observed that in the first quarter the fish production is near normal i.e.99.25 percent, which is very close to 100 whereas in second quarter it is 25.24 percent more than normal i.e.125.24 percent. In the third quarter is 29 percent less production compared to the normal production i.e.71.30 percent. In the fourth quarter it is slightly more than normal production i.e.104.20. July – September is the peak time of fishing in Kanniyakumari coast, which is almost same as in the case of TamilNadu. In the third quarter i.e. October- December, low fish catch is due to heavy rainfall and cyclone over Bay of Bengal.

5.6 SPECIES WISE PRODUCTION IN KANNIYAKUMARI COAST

Trend analysis has been made to species wise production of Kanniyakumari coast. Following is the results of trend analysis.

5.6.1 DEMARSAL VARIETY OF FISH PRODUCTION IN KANNIYAKUMARI COAST

In order to find the significance of demarsal variety of fish production in Kanniyakumari coast following Model summary has been used.

Table 12
MODEL SUMMARY FOR DEMARSAL VARIETY OF FISH PRODUCTION- KANNIYAKUMARI COAST

R	R2	ADJUSTED R2	Std.Error of the Estimate
0.839	**0.704**	**0.556**	**4924.28445**

From the above Model summary Table 12, the R^2 is the variable x explains 0.704, which indicates that the variability in production of demarsal fish variety in Kanniyakumari coast is 70.4.

Table 13
C0-EFFICIENT TABLE FOR DEMARSAL VARIETY OF FISH PRODUCTION KANNIYAKUMARI COAST

Model	Unstandardized Coefficients		Standardied Coefficients	t	Sig
	B	Std.Error	Beta		
Constant	40391.500	6030.992		6.697	.022
Year	.4799.900	2202.207	.839	.1.96	.45

a. Dependent Variable: DEMER_NA

From the above Co-efficient Table 13 the trend line as y=40391.5-4799.9x. Here the co-efficient is 4799.9, which is significant at 5 percent level. The demarsal fish production decreases at the rate of 4799.9 tonnes annually in Kanniyakumari coast.

5.6.2 PELAGIC VARIETY OF FISH PRODUCTION IN KANNIYAKUMARI COAST

In order to find the significance of pelagic variety of fish production in Kanniyakumari coast following Model summary has been used.

Table 14
MODEL SUMMARY FOR PELAGIC VARIETY OF FISH PRODUCTION- KANNIYAKUMARI

R	R2	ADJUSTED R2	Std.Error of the Estimate
0.876	0.767	.650	2686.96276

From the above Model summary Table 14, the R^2 is 0.761, which indicates that the variability in pelagic fish production in Kanniyakumari is 76.1 percent, which is explained by the variable x.

Table 15
C0-EFFICIENT TABLE FOR PELAGIC VARIETY OF FISH PRODUCTION KANNIYAKUMARI COAST

Model	Unstandardized Coefficients		Standardied Coefficients	t	Sig
	B	Std.Error	Beta		
Constant	40745.500	3290.844		12.381	.006
Year	-3080.800	1201.646	.876	.2.564	.124

a Dependent Variable : PELAG_NA

From the above Co-efficient Table 15 the trend line as y=40745.50-3080.80x. Here 3080.80 are the annual decrement rate of pelagic fish in Kanniyakumari coast. The variable is not significant.

Comparatively, from the above analysis, the production rate decrease much for demarsal variety rather than pelagic fish variety.

5.7 COMPOSITION OF MARINE FISH PRODUCTION

The trawl net has been used by mechanized crafts. All types of demarsal varieties and few pelagic varieties are obtained with the help of trawl nets. Traditional crafts are using different gears for the catching of different varieties. For each species like prawn, crabs, lobsters, cuttle fish, skates and rays separate type of gears are used. The composition of the various species of fish caught in Kanniyakumari coast is given in Table 16 and Fig 9.

Table 16
COMPOSITION OF MARINE FISH PRODUCTION- KANNIAYAKUARI COAST SPECIES WISE

Species	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Fishes	**58345 (83.41)**	**62855 (88.55)**	**57182 (81.50)**	**52678 (80.11)**	**53915 (81.69)**	**35309 (80.58)**
Silver bellies	**4092 (5.85)**	**2228 (3.14)**	**4347 (6.20)**	**5263 (8.00)**	**4059 (6.15)**	**1492 (3.40)**
Perches	**3727 (5.30)**	**2879 (4.01)**	**4128 (5.90)**	**3564 (5.42)**	**4221 (6.40)**	**3523 (8.04)**
Crabs	**2300 (3.33)**	**2034 (2.9)**	**2831 (4.00)**	**2508 (3.82)**	**2245 (3.40)**	**1752 (4.00)**
Oil	**1478 (2.11)**	**985 (1.4)**	**1681 (2.40)**	**1742 (2.65)**	**1558 (2.36)**	**1743 (3.98)**
Total	**69942 (100)**	**70981 (100)**	**70169 (100)**	**65755 (100)**	**65998 (100)**	**43819 (100)**

COMPOSITION OF MARINE FISH PRODUCTION- KANNIAYAKUARI COAST SPECIES WISE

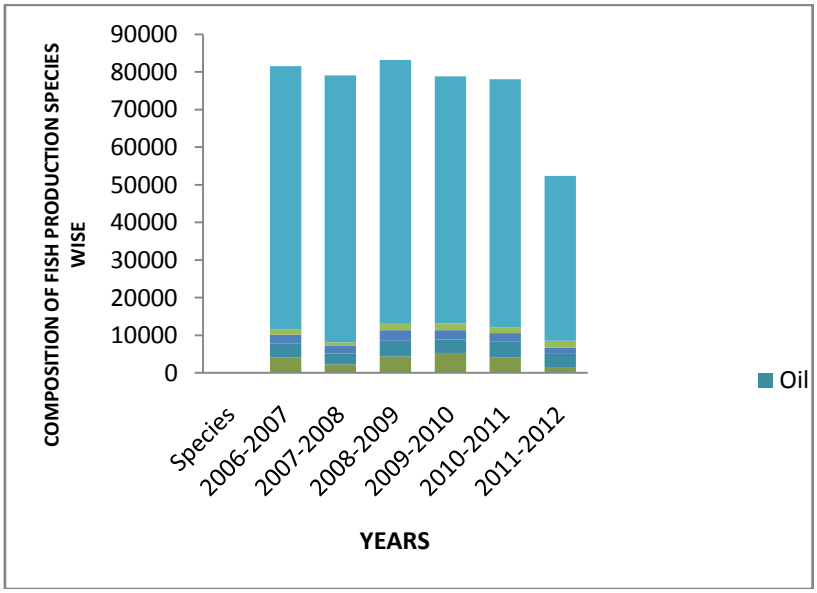

Fig 9

It is observed that the contribution on prawns and fishes are slowly coming down. The contribution of prawn had come down from eight percent in 2009-10 to 3.40 percent in 2011-12. The share of skates and rays has been increasing from 5.42 percent in 2009-10 to 8.04 percent in 2011-12. Similarly, the share of sharks has been increasing from 1.4 percent in 2007-2008 to 3.98 percent in 2011-2012. Contribution of fish has come down from 88.55 percent in 2007-2008 to 80.58 percent in 2011-2012; Generally, Marine fish production is getting down.

The following is the observation from the above analysis in respect of marine fish production in Kanniyakumari coast:

1. The Kanniyakumari coast is lowered down from second position to forth position in respect of production, among the TamilNadu coastal districts.
2. In the gear wise production, Trawl net is playing in vital role, followed by gill nets.
3. The marine fish production is decreasing.
4. The study area stands sixth place in terms of fish landings per km of coastline.
5. The share of mechanized sector in the total marine fish production of the district is high i.e. more than 60 percent.
6. The study area stands first to have much number of mechanized boats and catamarans.
7. The relative share of economically valuable species like prawns in composition of landing exhibited a decline trend.

5.8 DETERMINING FACTORS FOR FISH CATCH THROUGH FIELD SURVEY

A field survey was undertaken in selected coastal villages of the Kanniyakumari coast. The objective of the field study was to estimate the value of catch per unit effort for both mechanized crafts and non-mechanized crafts. The finding that emerged out of the analysis of the primary data collected in this regard is presented in the successive paragraphs.

Out of 42 villages, there are only 4 major landing centers and 42 minor landing centers. The total number of mechanized crafts and non-mechanized crafts was 1465 and 4,129 respectively in Kanniyakumari coast. This number increased to 2,419 and 7,695 respectively during 2011-2012.

5.9 CATCH PER UNIT EFFORT

Details of estimated annual production and their value for 60 mechanized crafts are given in Table 17. Catch per unit effort has been worked out with reference to quantity as well as value. On an average, a mechanized crafts has 120 fishing operations per annum. The catch per unit effort worked out to 450 kg and in terms of money value of it is reckoned at Rs 9,000%.

Table 17
ESTIMATED CATCH PER UNIT EFFORT FOR MECHANISED CRAFTS 2011-2012

Landing Centers	No. of Sample Crafts	Total Production per annum (in tones)	Value of Per catch per annum (in lakhs)	No.of Fishing trips per annum	Catch Per Unit effort	
					Quantity (kg)	value (Rs)
Colachal	**20**	**1100**	**235**	**2400**	**458**	**9160**
Cinnamuttom	**20**	**1074**	**220**	**2400**	**448**	**8960**
Cape Comerin	**20**	**1066**	**229**	**2400**	**444**	**8880**
Total	**60**	**3240**	**684**	**7200**	**450**	**27000**

Source: Primary data

The composition of catch per unit effort for mechanized crafts is presented in Table 18

Table 18
COMPOSITION OF CATCH PER UNIT EFFORT FOR MECHANIZED CRAFTS IS PRESENTED IN TABLE

Species	Catch per unit effort (Quntity)		Catch Per unit effort (Value)	
	Kilo grams	Percent	Rupee	Percent
Assorted Fishes	**290**	**64**	**5800**	**64**
Lobster	**17**	**4**	**680**	**8**
Crabs	**13**	**3**	**390**	**4**
Silver bellies	**60**	**13**	**1200**	**13**
Skates and Rays	**25**	**6**	**250**	**3**
Caranx	**45**	**10**	**680**	**8**
Total	**450**	**100**	**9000**	**100**

Source: Primary data

An analysis of the composition of catch per unit effort for mechanized crafts revealed that trash fishers accounted for the maximum in terms of both quantity and value. Though the prawn's accounts for just four percent of the total fish catch in terms of weight have contributed eight percent of the total fish catch in terms of weight have contributed eight percent of the total value.

Table 19
ESTIMATED CATCH PER UNIT EFFORT FOR NON-MECHANISED

Sample Landing Centers	No .of Sample Crafts	Total Production per annum (tones)	Value of catch per annum (in lakhs)	No.of fishing trips per annum	Catch per Unit effort	
					Quantity	Vale
Chinnamuttom	**10**	**57.20**	**11.44**	**2600**	**22.0**	**440**
Vaniakudi	**10**	**63.75**	**12.75**	**2550**	**25.0**	**500**
Seruthur	**10**	**67.86**	**13.57**	**2610**	**26.0**	**520**
Melamuttom	**10**	**51.84**	**10.37**	**2880**	**18.0**	**360**
Poothurai	**10**	**54.20**	**10.84**	**2930**	**18.5**	**370**
Neerodi	**10**	**41.12**	**8.22**	**2570**	**16.0**	**320**
Melamanakudi	**10**	**60.37**	**12.07**	**2625**	**23.0**	**460**
Periavilai	**10**	**62.50**	**12.50**	**2500**	**25**	**500**
Chinnavilai	**10**	**34.20**	**6.84**	**2850**	**12**	**240**
Colachal	**10**	**52.82**	**10.56**	**2780**	**19**	**380**
Total	**100**	**545.86**	**109.16**	**26895**	**20.30**	**406**

Source: Primary data

Ten landing centers are covered for the sample study. It is found that on an average a country craft can have 270 fishing trips per annum. The catch per unit effort for a country craft worked out to 20.30 kilograms and the money value is Rs.406. The differences in the catch per unit effort for the country crafts among the 10 landing centers are due to the go in the crafts and number of or more persons used to go in the craft. In Chinnamuttom, Vaniakudi, Seruthur on an average, three or more persons go in the craft for fishing. In three centers vi, Melamuttom, Poothurai and Neerodi two persons used to go in a crafts. In the remaining four centers, viz., Melamanakudi, Periavilai, Chinnavilai, and Colachal street, just one person ventured into the sea along with the country craft.

The composition of catch per unit effort for a country crafts is presented in Table 20. Fisherman operating country craft earned more from prawns than from various other species of fishes.

Table 20
Composition of Catch per Unit Effort for Non-Mechanized Crafts

Species	Catch Per Unit effort (Quantity)		Catch per Unit Effort (Value)	
	Kilo grams	Percent	Rupee	Percent
Trash Fishes	**11.30**	**55.67**	**226**	**55.66**
Squids	**6.00**	**29.55**	**60**	**14.78**
Lobster	**3.00**	**14.78**	**120**	**29.56**
Total	**20.30**	**100**	**406**	**100**

Source: Primary data

Catch per unit effort estimated on the basis of data collected for the empirical study could also be used for arriving at the total marine fish production for Kanniyakumari coast in the 2011-2012. In terms of quantity catch per unit effort for mechanized craft is 450 kilograms. There are 2,419 mechanized crafts made 120 fishing trips. Hence, total production worked out to 1, 30,626 tonnes.

Similarly, for a non-mechanized crafts, catch per unit effort is 20, 30 kilograms and average numbers of trips are 270 per year. For the 7,695 crafts, the production amounted to 42,176 tonnes. A comparison of estimated production aimed with that of figures obtained from secondary source given by the fisheries Department is an under estimation both for mechanized sector and traditional sector. According to secondary source, the production in mechanized sector is 33,882 tonnes source, the production in mechanized sector is 33,882 tonnes during 2011-2012 comapred to 1, 30,696 tonnes worked out from primary survey and it was about 74 percent less.In respect of traditional sector, the Fisheries Department's figure is 9,937 tonnes against 42,176 tonnes from empirical study, the under estimation being 76 percent.

VI. ANALYSIS BY FITTING FUNCTION

The main objectives of this analysis to study the impact of various input factors on total marine fish production. The analysis has been attempted for mechanized crafts only. The analysis has been attempted for mechanized crafts only. Production function expresses the functional relationship between input and output (Gupta, 1973). Cobb-Douglas function is widely used in empirical analysis (Earl, 1969) and it has been chosen for the present analysis.

Marine fish production depends on a number of factors. However, labour charges paid, capital invested and the depth of the sea up to which the crafts used to make their trips are considered as the principal factors. In the case of non-mechanized crafts, the expenditure on maintenance and repairs constituted only a small amount. But, with regard to mechanized crafts the proportion of working capital is large compared to fixed capital.

For the purpose of the analysis, working capital is taken into account for mechanized crafts and working capital includes expenditure on repairs, fuel, replacement, license fee, insurance premium etc. Data collected in respect of 60 samples – mechanized crafts are utilized for the analysis and the reference year is 2011-2012.

The Cobb-Douglas production function used for the present analysis in specified as:

$Y = ax1\ \beta1\ x2\ \ \beta2\ x3\ \beta3\ \ u$ …….. (1)

Where, y - Value of output per mechanized crafts per year expressed in terms of money value;

x1 – Working capital per craft per annum

x2 - Labour charges per craft per annum

x3 – Depth of the sea (fathoms)

and β1,β2, and β3 are unknown parameters, u is an error term which is assumed to be normally distributed with N (o,o2) $\sigma e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} \pm \frac{x^3}{3!} + \cdots\ ,\ -\infty < x < \infty$ and is the intercept.

The equation (1) may be rewritten as

$\text{Log } Y = \text{Log } a + \beta1 \text{Log} x1 + \beta2\ \text{Log} x2 + \beta3\ \text{Log}\ x3 + \text{Log}\ u$

That is,

$Y = a1 + \beta1x1 + \beta2x2 + \beta3x3 + u1$ …….. (2)

The values of regression co-efficient of input factors are estimated by using the least square method and they are presented in Table 4.41

Table 21
Estimated Values Of Regression Co-efficient of Input Factors- Mechanized Crafts

Co-efficient of Production			Sum of the Co-efficient β1+β2+β3	R2	F Value for D.O.F (3,56)
β1	β2	β3			
-0.467 (.233)	1.157 (.370)	-5.79 (.177)	0.68	.561	5.956

Figure in parameters denote standard error of the respective estimates

The following inferences can be drawn from the Table 21.

1. Among the variable considered working capital and labour should have a significant effect on total fish production i.e. value of fish production. While a labour show a positive significant effect, and working capital shows a negative significant effect on the fish production. The value of the regression co-efficient β1 is negative and significant at five percent level, which implies that for one percent increasing labour, keeping others factors constant, the value of output would decrease by 0.467 percent. Similarly the value of output of β2 is positive significant at five percent level means that for one percent increase in the labour, keeping other factor constant, the value of production would increase by 1.157 percent. The regression co-efficient β3 is found to be insignificant. Therefore, the working capital and the labour are found to be the main input factors influence in the total fish production.
2. The sum of the co-efficient β1, β2, and β3 is 0.68. It implies that if specified input factors are increased by one percent, the output could be increased by 68 percent. This means that the mechanized crafts are operating under diminishing returns to scale.
3. The co-efficient of determination, R^2 Worked to be 0.561. This implies that the three input factors taken together explained for 56 percent variation in the total fish production.
4. The calculated value of F was 5.956 for (3.56) degrees of freedom, whereas the table value of F (3, 56) at 5 percent level is 2.78. It is therefore concluded that F is significant.

VII. CONCLUSION

Kanniyakumari coast has 71,5km of coastline, Due to the longest coast, the fishing villages concentrated along the coast. There are 42 fishing villages found in the Kanniyakumari coast. Those fishing villages have facilities such as wharf or T' Jetty, auction hall, net mending, shed, water supply arrangement, toilet block, sanitation, approach road, sodium vapour lamp and fish dying platform, called as fish landing centers. In Kanniyakumari coast 42 fish landing centers are located.

To find out the reason for the declining trend of fishing, rainfall has considered as the natural factor that might be controlled fish population. It needs to understand the relationship between fisheries and the environmental and between fisheries management and development. Owing to the understanding that fishing over capacity and the districts reach of fishing operations continue to have deleterious effects on fish stocks, it is becoming more widely recognized that long-term fisheries management and investment need to take into account the environment and natural long-term climate fluctuations. There is a relationship between rainfall and fish production in Kanniyakumari coast.

Fishing crafts are classified into mechanized and non-mechanized Crafts without motor considered as non-mechanized. Both types of crafts are used in Kanniyakumari coast. In order to find the trend of Tamil Nadu fish production using mechanized crafts increases.

The fish production varies from season to season due to climatic factors. In the northeast monsoon season and south west monsoon season in Kanniyakumari coast has been experiencing the rainy and stormy events. In those days fishing is almost absence. Fishing year begins in the month of April and ends in March.

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