E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.549
IJFAS 2018; 6(3): 168-172

www.fisheriesjournal.com
Received: 22-03-2018
Accepted: 23-04-2018

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Assessment of seasonal price fluctuations of marine fishes in Karnataka

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Abstract
The study was conducted to understand the seasonal price fluctuations for marine fish in Karnataka. The primary data was collected fortnightly by using pre-tested interview schedules and secondary data sourced from Karnataka Fisheries Development Corporation Limited (KFDC). The primary data analyzed using range and Coefficient of Variation (CV) and secondary data using price indices. The price instability was highest for high value fishes during June - July and less during October - November months. The price indices of medium value fish was maximum during June - July and minimum during September - October months. The monthly landing centre price indices for low value fishes highest during July-September. The highest CV was recorded in fish landing center, Mangaluru (144.24%) followed by Udupi (73.44%) and Karwar (74.07%). The highest CV was recorded in wholesale fish markets, Mangaluru (146.66%) followed by Udupi (70.94%), Karwar (73.13%) and Bengaluru (53.78%). The maximum CV was found in retail fish markets, Mangaluru (157.23%) followed by Karwar (70.06%), Udupi (68.15%) and Bengaluru (53.11%). The study recommends establishing price information system as well as cold chain infrastructure across the fish supply chain intermediaries to improve the efficiency of supply chain and stabilize the seasonal fish price fluctuations.

Keywords: Price fluctuations, index numbers, range, coefficient of variation

Introduction
The price of fish fluctuates far higher than any other agricultural commodity due to the changes in supply, prices of other marine fish varieties, uncertainty of fish production and perishability. The price of fish is determined by the interaction of demand and supply at both the producing centres and the consuming markets [6]. The price behaviour of fish is characterized by wide fluctuations at all the stages of transactions in the supply chain [7]. There is no proper grading, weighing, and quality control at any level of domestic fish marketing. Marine fish marketing in India is characterized by monopsony and oligopsony conditions and hence the fishermen are unable to get maximum advantage of high price prevalent in the consumer markets [8].

The seasonal price variations are regular and periodic lasting for a period of one year. Seasonal price variations of marine fishes originate due to their shorter shelf life. Fish price fluctuations are related to a series of seasonal variables such as fish landings and increased demand due to specific reasons [3]. The volatility in price and fish production within a year was caused by the external forces such as weather conditions, regulated fishing seasons, and fish consumption pattern [10]. Seasonal price variation for fish varieties occurs within a year due to fish production cycles, customs, climatic conditions etc [4]. The prices of marine fish varieties fluctuate very widely and they fluctuate across the seasons, within the season varies across the months, within the month across the days and within the days across the hours of business [9]. The availability of substitute products of fish like chicken, meat etc. is also responsible for the price fluctuation of fish. Many religious festivals decrease the demand for fish resulting in price fluctuation. The studies pertain to seasonal price fluctuations of marine fish are rare and scanty in India [5]. Thus, a study was designed with the objective of understanding seasonal price fluctuations for marine fish in Karnataka state.

Materials and Methods
The price fluctuations include price movements of marine fish at different points of transactions such as landing centre, wholesale markets, retail markets and terminal markets

(super market and vendors). The fortnightly data on 33 commercially important marine fish varieties was collected from the major fishing harbours in Mangaluru, Udupi, Karwar and Russell fish market in Bengaluru during August 2013 to July 2014. A sample size of 150 was selected comprising 41 fisherman, 16 auctioneers, 16 wholesalers, 19 retailers, 46 vendors, and 12 supermarkets from all the study areas. However, the prices of marine fish in the landing centre were considered only from the traditional crafts during the fishing ban. The simple random sampling and personal interview methods were used to collect the primary data from fisherman and the supply chain intermediaries. Secondary data on commercially important varieties of marine fish prices were collected from Karnataka Fisheries Development Corporation Limited (KFDC), Mangaluru. The secondary data were grouped into high value (above 400 ₹/kg), medium value (200-400 ₹/kg) and low value marine fishes (below 200 ₹/kg) for better understanding. The index numbers were constructed to the average monthly price of each marine fish. The primary data on marine fish prices were analyzed using Range and Coefficient of Variation (CV). As the range and CV increases, the prices of fish would be fluctuating more and vice-versa.

Coefficient of variation [5, 9]

The fluctuations of prices were estimated by measuring Coefficient of Variation (CV) of marine fish prices using the following formula.

$$CV = \frac{\text{Standard deviation}}{\text{Mean}} \text{ X } 100$$

Range [5]

Range is the difference between the highest and the lowest average monthly price index values of marine fish.

Results and Discussions

The monthly landing centre price indices of high value marine fish such as black pomfret, white pomfret and seer fish fluctuated more during June - July and less during October - November months. The monthly price index for white prawn was the highest in November and least in July months. The price index of lady fish swung up in January and recorded least in May with the maximum range noticed for white pomfret, lady fish and seer fish and minimum range was found for white prawns and black pomfret. The CV was found highest for white pomfret (22.51%) and lady fish (16.48%) and the least for white prawn (7.38%). The high price fluctuations lead to accruing more benefits to the supply chain intermediaries by depriving fair price for both the consumers and fishermen. The prices of black pomfret were highly volatile during June - July because of their irregular supply due to fishing ban and the subsequent excess demand was observed in the cities of Karnataka. Though, the price of white prawn was more, the CV was less because of regular uninterrupted supply in the market. The majority of medium value marine fish price indices were found to be at its peak during June - July and minimum during September - October. While, for pink perch and tuna, price index was found high in March and minimum for mackerel and lactarius in December. The maximum and minimum price index for soles was recorded in August and April respectively. The maximum range was observed for crocker (68) followed by lactarius (66) and pink perch (64). The minimum range was observed for soles (36) and crabs (42). The fishing ban was responsible for the major raise of price indices during June-July in Mangaluru. The highest CV was found for crocker (21.77%) followed by pink perch (20.75%), squid (19.97%), lactarius (18.76%), tuna (17.20%), barracuda (16.43%) and mackerel (15.80%). However, minimum CV was observed for soles (11.53%) and crabs (13.20%). The CV of medium value marine fish was higher in comparison to high value fishes revealing more price fluctuations which were attributed to instability and decreasing rate of harvest of medium value fish. The inverse relationship was found between the price indices and the quantity of marine fish traded through KFDC which was coinciding with the law of demand. The monthly landing centre price indices for low value fishes were recorded highest during July-September due to the inadequate supply of marine fish [1]. The least price indices for cat fish were recorded during December - February months. The maximum CV was found for cat fish (20.89%) followed by sardine (18.57%) and clams (12.06%). The quantity of clams and sardine traded was low during April – May (Table 1).

Table 1: Price fluctuations of marine fishes in the fishing harbor, Mangaluru

Sl No.	Months (April 2012- March 2013)	Highest Price Index	Lowest Price Index	Range	CV (%)
	High value marine fishes				
1	Black Pomfret	119 (1269)	76 (379)	43 (890)	14.64 (33.69)
2	White Pomfret	135 (1487)	67 (132)	68 (1355)	22.51 (87.02)
3	Seer Fish	130 (3458)	78 (869)	53 (2589)	15.65 (44)
4	White Prawn	117 (1179)	91 (454)	27 (725)	7.38 (25.71)
5	Lady Fish	138 (617)	77 (187)	61 (430)	16.48 (32.91)
	Medium value marine fishes				
1	Crab	118 (794)	76 (202)	42 (592)	13.20 (34.05)
2	Crocker	145 (1101)	77 (175)	68 (926)	21.77 (43.59)
3	Lactarius	146 (715)	79 (24)	66 (691)	18.76 (60.05)
4	Mackerel	138 (9369)	81 (2664)	57 (6705)	15.80 (29.70)
5	Pink Perch	130 (1096)	65 (228)	64 (868)	20.75 (44.85)
6	Barracuda	132 (838)	72 (80)	59 (758)	16.43 (48.05)
7	Soles	114 (993)	78 (45)	36 (948)	11.53 (84.62)
8	Squid	135 (157)	79 (10)	56 (147)	19.97 (41.96)
9	Tuna	129 (348)	71 (01)	58 (347)	17.20 (68.88)
	Low value marine fishes				
1	Cat Fish	134 (304)	56 (05)	78 (299)	20.89 (79.45)
2	Clam	113 (335)	76 (30)	37 (305)	12.06 (62.14)
3	Sardine	133 (5758)	74 (2315)	59 (3443)	18.57 (27.87)

Source: KFDC (2012) Note: NA-Not Available, Figures in the parentheses give the total quantity (in kg) of marine fishes traded through KFDC

Table 2: Price fluctuations of marine fishes in Karnataka

Marine fish (August 2013 to July 2014)		Mangaluru	Udupi	Karwar	Bengaluru
Landing center	CV (%)	144.24	73.44	74.070	N.A
	Range	433.96	396.33	353.08	N.A
Wholesale fish market	CV (%)	146.66	70.94	73.13	53.78
	Range	470.42	420.58	378	455.41
Retail fish market	CV (%)	157.23	68.15	70.06	53.11
	Range	526.04	475.33	430.25	567.41
Terminal fish market	CV (%)	152.13	70.63	70.96	N.A
	Range	518.63	518.50	426.33	N.A

Source: Primary data

The highest CV was recorded in fish landing center, Mangaluru (144.24%) followed by Udupi (73.44%) and Karwar (74.07%). The range of marine fish price was also highest in Mangaluru (433.96 ₹/kg) followed by Udupi (396.33 ₹/kg) and Karwar (353.08 ₹/kg). The highest CV was recorded in wholesale fish markets, Mangaluru (146.66%) followed by Udupi (70.94%), Karwar (73.13%) and Bengaluru (53.78%). The range of marine fish price in wholesale fish markets was also highest in Mangaluru (470.42 ₹/kg) followed by Bengaluru (455.41%), Udupi (420.58 ₹/kg) and Karwar (378 ₹/kg). The maximum CV was found in retail fish markets, Mangaluru (157.23%) followed by Karwar (70.06%), Udupi (68.15%) and Bengaluru (53.11%). The range of marine fish price in retail fish markets was highest in Bengaluru (567.41%) followed by Mangaluru (526.04 ₹/kg) Udupi (475.33 ₹/kg) and Karwar (430.25 ₹/kg) (Table 2).

Table 3: Price fluctuations in Mangaluru and Udupi fishing harbours

Months	Mangaluru								Udupi							
	LC		WC		RC		TM		LC		WC		RC		TM	
	CV	Range	CV	Range	CV	Range	CV	Range	CV	Range	CV	Range	CV	Range	CV	Range
Aug-13	128.82	305	130.33	335	139.83	347.5	139.83	347.5	70.29	273	69.64	295	64.52	320	68.87	353
Sep-13	147.19	320	150.87	335	156.21	390	148.83	400	72.1	325	69.61	365	65.14	395	68.41	373
Oct-13	129.28	422.5	134.67	437.5	136.03	555	125.88	595	73.6	383	71.72	398	66.56	415	67.46	420
Nov-13	141.67	370	144.8	395	149.36	460	142.47	438.5	76.06	333	71.83	348	67.79	405	67.17	505
Dec-13	159.75	385	161.28	432.5	170.1	485	168.26	460	69.36	383	58.81	305	64.99	450	67.46	420
Jan-14	156.43	505	160.84	535	178.97	550	162.07	550	69.49	405	69.48	450	66.3	493	67.17	505
Feb-14	144.39	497.5	146.35	547.5	163.04	575	161.48	550	72.15	430	70.29	470	64.61	500	65.83	505
Mar-14	158.21	455	150.38	497.5	160.48	565	158.79	520	78.3	428	73.52	453	70.2	498	68.99	475
Apr-14	127.56	410	132.13	422.5	157.16	580	151.78	570	75.5	478	73.93	523	69.2	558	69.34	545
May-14	140.51	565	149.43	587.5	165.84	625	162.2	612.5	77.87	460	75.81	500	74.38	565	71.1	518
Jun-14	159.8	482.5	158.96	525	160.58	605	164.01	585	69.9	393	70.33	435	69.14	520	88.22	978
Jul-14	137.24	490	139.91	595	149.15	575	139.91	595	76.66	465	76.32	505	74.91	585	77.58	625
Note: LC: Landing Centre, WC: Wholesale Centre, RC: Retail Centre, TM: Terminal Markets, CV is in%, Range is in ₹/kg																

The minimum CV was found in landing center, Mangaluru during August (128.82%) and October months (129.28%) in 2013. The highest price range was found in May, 2014 (₹ 565/kg) and least during August, 2013 (₹ 305/kg) in fish landing center, Mangaluru. However, the CV was high during December, 2013 (161.28%) to January 2014 (160.84%) and the maximum price range of ₹ 595/kg in July 2014 in the wholesale fish market, Mangaluru. The maximum CV was recorded during December, 2013 (170.10%) and January 2014 (178.97%) and the maximum price range of ₹ 625/kg and ₹ 605/kg in retail fish market, Mangaluru during May and June respectively in 2014. The maximum CV was recorded during December, 2013 (168.26%) and June 2014 (164.01%) and maximum range of ₹ 612.5/kg during May, 2014 in terminal fish market, Mangaluru. The price fluctuations were due to the uncertain nature of the fish harvest, perishable nature and variations in short run supply which is coincide with the present study [6].

The maximum CV was recorded in fish landing center, Malpe during March (78.30%) in 2014 and minimum CV of 69.36% in December, 2013. The minimum price range was found in August, 2013 (₹ 273/kg) and the maximum during April, 2014 (₹ 478/kg) in fish landing center, Malpe. However, the CV was more during July, 2014 (76.32%) and the minimum of 58.81% during December, 2013 with a maximum price range of ₹ 523/kg in April, 2014 in the wholesale fish market, Malpe. The maximum CV (74.91%) was recorded and a maximum price range of ₹ 585/kg during July, 2014 in retail fish market, Malpe. The highest CV was recorded during June, 2014 (88.22%) with a maximum price range of ₹ 978/kg during June, 2014 in terminal fish market, Udupi (Table 3). Each variety of marine fish showed a very high range of price fluctuations which was also observed in case of the present study [2].

Table 4: Price fluctuations in Karwar and Bengaluru fishing harbours

Months	Karwar								Bengaluru			
	LC		WC		RC		TM		WC		RC	
	CV	Range	CV	Range	CV	Range	CV	Range	CV	Range	CV	Range
Aug-13	82.57	300	80.02	320	75.96	340	75.92	343	46.17	375	45.37	493
Sep-13	73.82	275	72.66	295	67.69	315	70.99	335	48.22	405	47.12	475
Oct-13	85.69	360	83.6	400	78.12	443	79.05	440	51.9	385	55.33	405
Nov-13	73.79	280	74.57	320	67.48	350	69.48	350	52.28	375	49.67	473
Dec-13	69.51	278	69.34	310	65.36	355	66.58	360	48.84	398	47.14	515
Jan-14	70.57	283	70.57	283	66.33	355	67.61	355	46	528	45.09	685
Feb-14	70.08	350	68.56	375	65.85	405	65.34	415	50.61	425	50.84	543
Mar-14	75.83	350	72.9	390	69.13	445	71.5	430	61.34	448	59.94	577.5
Apr-14	60.9	315	60.9	315	63.31	450	61.09	390	46.69	513	47.8	667.5
May-14	73.95	445	72.33	485	72.76	565	73.83	605	69.82	523	67.15	685
Jun-14	76.41	463	76.49	505	73.51	580	74.43	555	58.35	520	57.63	640
Jul-14	75.73	538	75.73	538	75.26	560	75.73	538	65.23	570	64.26	650

Note: LC: Landing Centre, WC: Wholesale Centre, RC: Retail Centre, TM: Terminal Markets, CV is in%, Range is in ₹/kg

The maximum CV was recorded in fish landing center, Karwar during October (85.69%) during 2013 and the minimum CV of 60.90% in April 2013. The minimum price range was found during September, 2013 (₹ 275/kg) and the maximum during July, 2014 (₹ 538/kg) in fish landing center, Karwar. However, the CV was more during October, 2013 (83.60%) and the minimum of 60.90% during April, 2014 with a maximum price range of ₹ 538/kg in July, 2014 in the wholesale fish market, Karwar. The maximum CV (78.12%) was recorded in October, 2013 and a maximum price range of ₹ 580/kg during June, 2014 in retail fish market, Karwar. The highest CV was recorded during October, 2014 (79.05%) with a maximum price range of ₹ 605/kg during May, 2014 in terminal fish market Karwar. The maximum CV was recorded in wholesale fish market, Bengaluru during May (69.82%) in 2014 and the minimum CV was found during January 2104 (46.00%). The maximum price range was found July, 2014 (₹ 570/kg) and the least during August (₹375/kg) and November (₹ 375/kg) in 2013. However, the CV was high during May, 2014 (67.15%) and the minimum during January month, 2014 (45.09%) in the retail fish market, Bengaluru with a maximum price range of ₹ 685/kg during January and May months, 2014 in retail fish market (Table 4). The prices of high value marine fishes were fluctuated more in all the study areas due to fluctuations in their supply. However the low value fish had showed less price fluctuations since the regular supply as well as less consumption preferences. The medium value marine fish prices exhibited variability in all the months of the year since the increased demand.

Conclusion

The price fluctuations of marine fishes were commonly observed in all the study centres. The prices were highly volatile and varied between the landing centres, wholesale markets, retail markets and terminal fish markets in each month. It is also understood that, inverse relationship was found between quantity of fish traded and price fluctuations in the Mangalore fishing harbor. The price fluctuations were also linked to prices of other marine fishes, size, quality and quantity harvested. Further research need to carry out on variety-wise price fluctuations from all levels of fish supply chains. The study suggested to the concerned departments to establish online price information system for providing transparency among all the stakeholders of the fish supply chain systems. The fish landing centres have rigid structure and oligopoly nature of market competition prevailed. Hence, the price study needs to be recorded on hourly basis in order to understand clearly on daily price movements. Also, the concerned departments need to identify the attributes for distress sales by the fishermen among the landing centres and provide the remedies to combat their problems.

Acknowledgements

The study is drawn from the first author Ph.D. dissertation work entitled "Supply Chain Analysis of Marine Fishes in Karnataka, India" submitted to Tamil Nadu Fisheries University (TNFU), Nagapattinam, Tamil Nadu. The first author is thankful for Indian Council of Agricultural Research (ICAR), New Delhi for awarding Senior Research Fellowship (SRF) during 2012-2015.

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