

A Geographical Study Of Rank Size Relationship Of Rural Settlements In Kolhapur District Of Maharashtra

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Rank size rule is the one of the applied aspect in the disciple of settlement geography. Present paper aims to study the chi-square test and rank size relation on the basis of data mainly compiled from Census of India, 2001 by applying to methodologies viz. Chi-square test and G.K. Zipf's (1949) rank size rule. Kolhapur district of Maharashtra state has been selected as a study area. The study reveals that, the less number of observed rural settlements than the expected rural settlements in Hatkangale, Shirol, Radhanagari, Bavda and Shahuwadi tahsils. The study of rank size relationship indicates that, large settlements have less population than the expected so far their rank is concern and to this gap filled by the middle-sized settlements.

1. Introduction

Distribution reflects how settlers select some sites, avoid others, spread and saturate (Singh, 1994). Size, spacing, density of settlement and dispersion are significant measures in distributional analysis (Pore and Lokhande, 2011a). Great importance to human existence is the spatial relationships between settlements of different sizes: their spacing, their arrangement, their functional differences and their economic specialties (Sarkar, 2010). The study of relationship between size and rank of settlement is significant to know how the size of settlements affects on their own distributional pattern. Distributional analysis is also helpful for the identification of validity of central place theory, rank size rule, and to prepare plan of regional development. In this context, present paper studies chi-square test and rank size relationship for rural settlements.

2. Objectives

Present paper intends to test chi-square test and rank size rule in terms of rural settlements of Kolhapur district.

3. Study Area

The Kolhapur district of Maharashtra situated in the extreme southern part of Maharashtra State. It lies between 15° 43' north to 17° 17' north latitude and 73° 40' east to 74° 42' east longitude (Fig. 1). It is surrounded by Sangli district to the north, Belgaum district of Karnataka state to the east and south, and Ratnagiri and Sindhudurga districts to the west. The Kolhapur district comprises 7685 sq.

km. area and administratively divided into 12 tahsils supporting 35, 23,162 population. In general the physiography of the district may be grouped in three parts i.e.: (1) The Sahyadri hills in a north-south direction (2) The Plateau area situated to the east of the Sahyadri hills and (3) The eastern plain area. The climate of Kolhapur is generally temperate. The average annual rainfall varies widely from about 600 mm in Shirol tahsil in the east to 6000 mm in Bavada tahsil in the west. The temperature ranges between 14° c to 38° c. The decadal growth rate (1991-2001) of population is 17.85 per cent. About 70.19 per cent of total population lives in rural area.

4. Database And Methodology

Present chapter is based on secondary source of data mainly collected from District Census Handbook, Kolhapur District, 2001, Socio-economic Review and District Statistical Abstract of Kolhapur District, 2010 and Ground Water Survey and Development Agency, Government of Maharashtra. Various statistical techniques have been employed to analysis the compiled data. Chi-square test has been used to compare the actual and expected rural settlements in terms of area of tahsil. To understand the existence of distortions in the hierarchical structure within the system of settlements, G.K. Zipf's (1949) rank size rule has been applied. The rank size rule establishes a relationship such that, the population of the nth settlement is 1/nth of the size of the largest settlements population i.e. p₁. That's why

a set of settlements arranged in descending order of population according to its rank has been computed by using following formula:

$$P1 = \frac{\sum P}{\sum 1/R}$$

Where, P1 =Expected population,

$\sum P$ = Total population .

1/R = Reciprocal rank.

according to their population size. The expected

The difference between expected population and actual population of each rural settlement has been computed and these two populations are depicted through logarithmic graph.

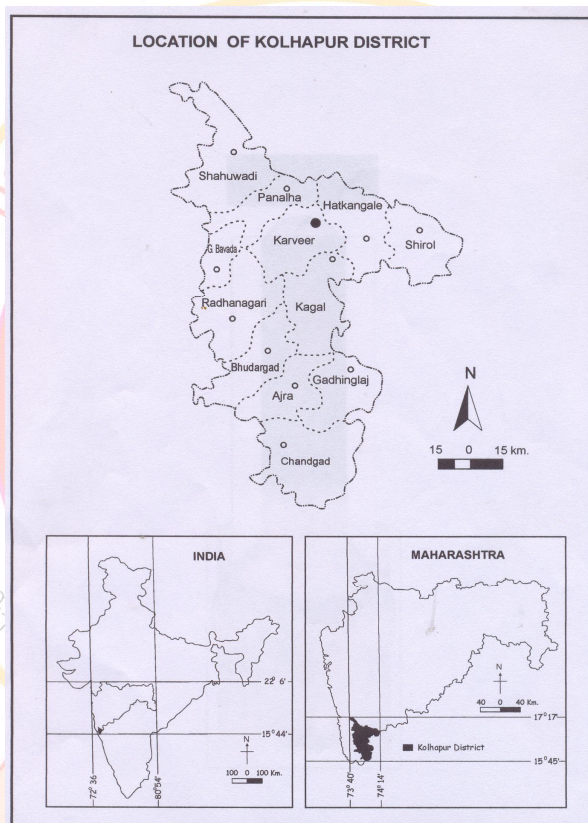


Fig. 1

5. Chi-Square Test

The distribution and evolution of the settlements bring out clearly the interaction between people on space in a particular environment (Desai, 1984). In these aspects, 'the settlement and area relationship' is important to study. The density of rural settlements is uneven in the study area (Pore and Lokhande, 2011b). The expected rural settlements shown in table 1 is the ideally even distribution according the area of concern talasil. However, the observed rural settlements are either

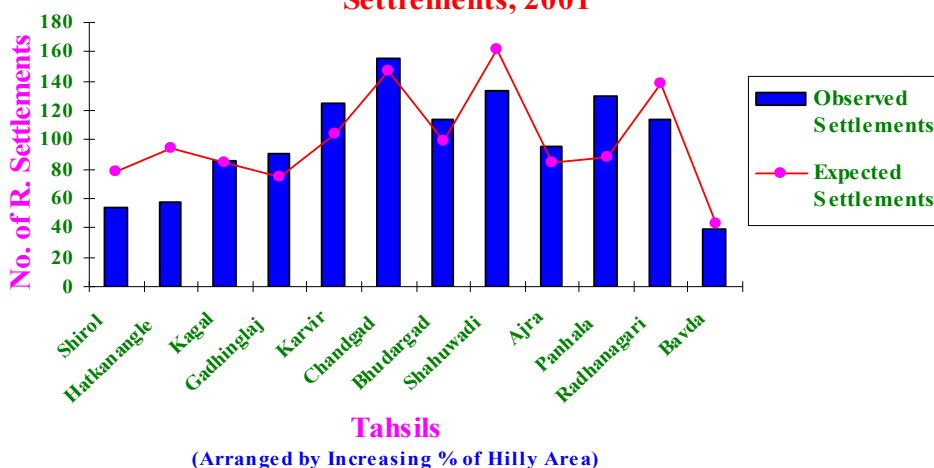
more or less than the expected number of settlements. In Hatkangale, Shirol, Radhanagari, Bavda and Shahuwadi talasils less number of observed rural settlements than the expected. The remaining seven talasils have more number of observed rural settlements than the expected (Fig. 2) in which Panhala talasil ranks first in more number of rural settlements (42) than the expected figure, while on the other hand Hatkangale talasil ranks first in less number of rural settlements (36) than the expected figure (Fig. 2).

Table 1
Kolhapur District: Chi-square Test on the Distribution of Rural Settlement, 2001

Sr. No.	Name	Area (Sq. Km)	% of Area	Observed Settlements	% of Observed Settlements	Expected Settlements	% of Expected Settlements	Difference (Observed - Expected)
1.	Shirol	507.9	6.56	54	4.52	78	6.56	-24
2.	Hatkanangle	609.4	7.87	58	4.85	94	7.87	-36
3.	Kagal	547.5	7.07	86	7.19	85	7.07	1
4.	Gadhinglaj	481.2	6.21	91	7.61	74	6.21	17
5.	Karvir	671.1	8.66	125	10.45	104	8.66	21
6.	Chandgad	952.2	12.29	156	13.04	147	12.29	9
7.	Bhudargad	644.4	8.32	114	9.53	99	8.32	15
8.	Shahuwadi	1043.5	13.47	133	11.12	161	13.47	-28
9.	Ajra	548.8	7.08	96	8.03	85	7.08	11
10.	Panhala	568.8	7.34	130	10.87	88	7.34	42
11.	Radhanagari	892.3	11.52	114	9.53	138	11.52	-24
12.	Bavda	279.3	3.61	39	3.26	43	3.61	-4
Study Area		7746.4	100	1196	100	1196	100.00	0

Source: Based on District Census Handbook, Kolhapur District, 2001.

Kolhapur District: Observed and Expected Settlements, 2001



6. Rank Size Relationship

6.1. About Rank Size Rule

In the rank size rule, number of settlements should continue to increase as their size decreases. It is quite interesting to note the relationship between size and their rank in the settlement system of the region. Hagget (1972) stated that, this relationship might not hold true universally, because isolated farmstead is not everywhere more than the hamlets.

It is also interesting to study, what is the actual rank size relationship existing in the study area and how it deviated from the ideal rank size relationship. Hence, Desai (1984) rightly stated that, the stability or changes in the settlement system in terms of rank and size are useful aspects of study.

6.2. Application Of Rank Size Rule

In the study area, results of rank and size relation have been computed both as a whole and at

tahsil level. In the study area as a whole the result of this relationship clearly indicates that, among 1196 from first ranked rural settlement, firstly the higher sized villages (above 7500 village population) remain below the expected line and then the actual line gradually tend to go above the ideal line with decreasing settlement size (village population from 7500 to 3500). After reaching highest positive difference between actual and expected line this difference decreases with decreasing settlement size from 3500 to 300. The actual line again cross the ideal line at 280 settlements size and then it suddenly drop below the expected line with decreasing settlement size. In other words, high size settlements

rural settlements of the study area there is distortion in the actual line than the ideal line (Fig. 3). Starting have less population than the expected as far as rank size rule is concern. This gap filled by the middle sized rural settlements that have more population than the expected population and finally few smaller rural settlements have again less population than the expected population of theoretical rank size rule. The study area experiences notable classwise changes in rural settlements (Pore and Lokhande, 2011c) and this affects on the rank size relationship

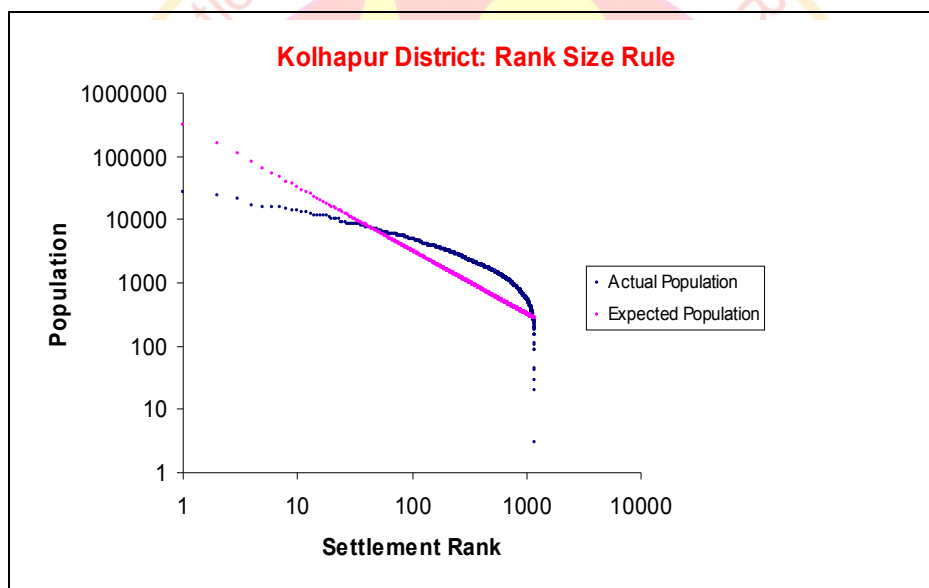


Fig. 3

6.3. Tahsil Level Observation

The general picture of all tahsils is nearly same that, the large rural settlements have less population and medium rural settlements have more population than the expected population according to rank size rule, but in particular the little variations observed in the difference between the actual line and expected line. In Hatkangale, Shirol, Kagal, Ajara and Gadhinglaj tahsils, the difference between ideal line and the expected line is small at both large and medium sized settlements. Although the common phenomenon is that, the actual line is below from the ideal line at large settlements and above in case of medium settlements in all tahsils of the study area. The Karvir, Chandgad, Radhanagari, Panhala

and Shahuwadi tahsils have more difference in ideal and actual line both at large and medium settlements. The values of highest positive and negative difference and ideal settlement to rank size rule is useful to clear the above stated picture (Table 2).

Table 2
Kolhapur District: Disruption from Ideal Rank Size Rule, 2001

Sr. No.	Tahsil		Maximum		Minimum
			Negative	Positive	
1.	Shahuwadi	Villag	Sarud	Malew	Palasav
		Differ	24595	822	4
2.	Panhala	Villag	Kodoli	Kekhal	Danewa
		Differ	15333	916	13
3.	Hatkanangle	Villag	Shirol	Alte	Ambew
		Differ	54654	4427	137

4.	Shirol	Villag	Shirol	Terwad	Kurund
		Differ	39916	2451	4
5.	Karvir	Villag	Mudshin	Hasur	Arewad
		Differ	53429	1959	5
6.	Bavda	Villag	Tisangi	Sakhari	Narvelli
		Differ	5421	443	-2
7.	Kagal	Villag	Sagaon	Ekondi	Balikre
		Differ	38705	1159	-6
8.	Bhudar gad	Villag	Gargoti	Khana	Palewa
		Differ	13476	628	28
9.	Ajra	Villag	Uttur	Saroli	Parewa
		Differ	12994	636	-6
10.	Gadhinglaj	Villag	Gadhingl	Dunda	Tupurw
		Differ	29204	1204	16
11.	Chandgad	Villag	Chandga	Majare	Kitvadi
		Differ	22981	608	-2
12.	Radhanagari	Villag	Rashiwa	Kapiles	Lingach
		Differ	26838	1154	-31

Source: Based on District Census Handbook, Kolhapur District, 2001.

7. Conclusion

The analysis of Chi-square test reveals that, the less number of observed rural settlements than the expected rural settlements in Hatkangale, Shirol, Radhanagari, Bavda and Shahuwadi tahsils and more number of observed rural settlements than the expected rural settlement in remaining seven tahsils. In an average 15.56 rural settlements per 100 sq. km. which has spatial variations due to uneven topography and resultant variations in density of road, agricultural development etc. The study of rank size relationship indicates that, large settlements have less population than the expected so far their rank is concern and to this gap filled by the middle-sized settlements have more population than the expected population and few smaller settlements have again less population than the expected population. This phenomenon has tahsil level variation affected by topographical difference and resultant socio-economic variation. The study of chi-square test and rank size rule is necessarily useful for planning purpose.

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