Advances in Social Science, Education and Humanities Research, volume 72
International Conference on Management, Education and Social Science (ICMESS 2017)

Studies on Spatial Structure of Tourist Attractions in Edge-Typed Tourism City

-A Case Study of Ankang

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***Abstract*—Taking Ankang as a typical case of edge-typed tourism city, we analyze the compactness, agglomeration, differentiation characteristics of its class-A tourist attractions spatial structures and explore the spatial path out of the edge of the plight for edge-typed tourism city, basing on the spatial statistical and mathematical methods such as compactness index, coefficient of variation, scale index, unevenness index and superiority index. The results indicated that: ①The degree of compactness and unevenness of Ankang class-A tourist attractions spatial distribution are high. Spatial clustering is significant. ②Differentiation characteristics in number, size, quality and influence of the Ankang class-A tourist attractions are different, but Hanbin District and Shiquan County have shown a clear advantage in all aspects. ③Formation of tourism center system which based on high-grade core tourist attractions may be the key for edge-typed tourism city to become an emerging core tourist destination.**

Keywords—edge-typed tourism city; class-A tourist attractions; spatial structure; Ankang

I. INTRODUCTION

The spatial structure of tourist attractions is not only the key object of tourism spatial structure and tourist attractions research, but also a hot content in tourism geography and tourism planning research [1]. Compared with foreign countries [2], domestic research on spatial structure of tourist attractions started late, the achieved results is abundant. But what we need to note is that the analysis always focus on the economic zone [3], industrial belt [4] ,city circle [5] and other tourist hotspots, or concentrates in large-scale areas such as national[6], provincial[1], regional[7]. City-wide comprehensive research with spatial statistical and mathematical methods is rarely few [8].It's very urgent to carry out the research on cold temperature travel area especially the edge-typed tourism city [9].

Ankang is located in the hinterland of China, southeastern part of Shaanxi Province, between the Qinling Mountains and Bashan. Sichuan, Shaanxi, Hubei provinces and Chongqing municipality are converged in here. The transition of natural condition, marginality of administrative location, non-superiority of tourism resources, marginalization of economic status, homogeneity of tourism products and the ambiguity of tourism image shows that it's a typical edge-typed tourism city. However, it should be noted that the "edge" of Ankang is more due to the comparison to its corresponding strong core tourist city—Xi'an, its tourist location, resources, market isn't absolutely "non-superiority". Especially with the building of large Qinling Mountain humanistic eco-tourism holiday circle, Ankang tourism development has entered to the new stage of core tourist attractions construction drive and global tourism pattern conformation, it is possible to grow into a new core tourist destination.

Based on that, this paper takes the Ankang class-A tourist attractions as research object, using compactness index, coefficient of variation and unevenness index to identify the compactness and agglomeration of spatial distribution, using scale and superiority index, Lorenz curve to analyze its spatial differentiation characteristics so as to provide ideas for the study of tourist attractions spatial structure in city especially the edge-typed tourism city.

II. DATA AND METHODOLOGY

A. Data

The sample data are obtained from Shaanxi Tourism Administration (http://www.sxta.gov.cn), Ankang Tourism (http://www.ankangtour.gov.cn). By the end of 2016, there're 25 national classA tourist attractions in Ankang, of which the number of class-4A is 9, class-3A is 10, and class-2A is 6. With the help of Baidu map coordinate picker, we obtain the geographical coordinates of the tourist attractions and approve it by xGeocoding software. Abstract the tourist attraction as dot-like element and use ArcGIS10.2 to map the spatial distribution of class-A tourist attractions in the vector map (Fig.1).

B. Methodology

1) Compactness index. It can represent the compactness of the region form and reflect the development foundation of tourism traffic from the side. In the case of the other conditions were same, the more compact the region form is, and the easier to organize tourism flow. It is defined as follows [10]:

$$C = T / D \tag{1}$$

Sponsor: National Natural Science Foundation of China (No.41601174), Social Science Foundation of Shanxi Prince, China (No.2015D055), The Science Foundation of Northwest University (No.14NW03).
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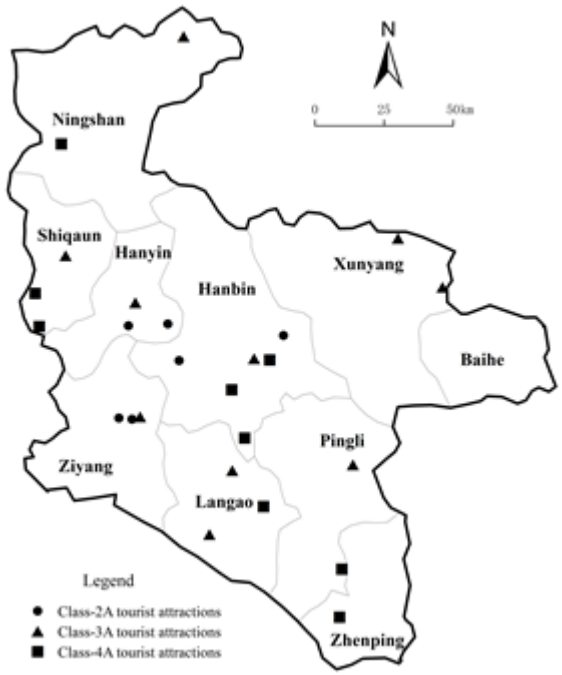

Fig. 1. Spatial distribution of Ankang class-A tourist attractions

Where T is the circle's diameter which has the same acreage with study area, *D* is the distance between two farthest tourist attractions in the study area. Value of *C* among in 0 and 1, when the shape of the study area is a straight line, *C*=0; when it's a circle, *C*=1.The larger the C value is, the more compact the study are and the better the internal accessibility will be Vice versa.

2) Coefficient of variation. It can measure the relative change degree of point-feature in space and determine the distribution tape of tourist attractions[8]. It is defined as follows:

$$CV = \sqrt{\sum_{i=1}^{n}(S_i - \bar{S})\Big/ n\bar{S}^2} \times 100\% \quad (2)$$

Where Si is the acreage of No.*i* Voronoi polygon, n is the number of Voronoi polygons; $\sqrt{\sum_{i=1}^{n}(S_i-\bar{S})^2/n}$ is the standard deviation, $\bar{S}$ is the average.

3) Unevenness index. It can reflect distribution equilibrium level of tourist attractions in different counties [6]. It is defined as follows:

$$S = \frac{\sum_{i=1}^{n} Y_i - 50(n+1)}{100n - 50(n+1)} \quad (3)$$

Where n is the number of counties; Yi is the cumulative percentage of No.i county which calculated the proportion of country's tourist attractions accounted for Ankang's and ranked from large to small. Value of S varies in 0 and 1, when the tourist attractions is evenly distributed in each county, *S*=0; when they are concentrated in one county, *S*=1.The greater the value of *S* is, the more imbalance the tourist attractions distribution is. Vice versa.

III. RESULTS AND ANALYSIS

A. Compactness of tourist attractions spatial distribution

Link 9 tourist attractions which located at the edge of Ankang in ArcGIS platform. Regard Qinling-Canyon-Drifting in Ningshan County as vertex, calculate the acreage of small triangle surrounded by other tourist attractions and that tourist attractions. The diameter of the circle with same acreage is 148.66 km, the farthest distance of this two tourist attractions (Qinling-Canyon-Drift in Ningshan County, Feiduxia -Huanganba in Zhenping County) is 218km. So the C value (compactness index) of Ankang class-A tourist attractions is 0.68, which indicate the distribution is compact and is conducive to the connection of tourist attractions and tourism flow.

B. *Agglomeration of the spatial distribution*

Fig. 2. Voronoi diagram of Ankang class-A tourist attractions

To identify the spatial distribution type of Ankang class-A tourist attractions, we measure the coefficient of variation (CV) of Voronoi polygon. Use ArcGIS10.2 to draw the Voronoi image of tourist attractions distribution (Fig.2). The average acreage of 25 polygons is 898.63km2, standard deviation is 561.93, so the CV value is 159.92% which is much larger than the critical value (64%) raised by Duyckaerts[8]. It shows that Ankang class-A tourist attractions are clustered in space.

The CV results reflect the spatial structure agglomeration characteristics. It's necessary to grasp unevenness degree of the tourist attractions with mathematical statistics method. Unevenness index S of Ankang class-A tourist attractions is 0.37, indicating that the distribution is relatively unbalance in 10 counties.

C. Spatial Differentiation of Tourist attractions

Based on the unbalanced spatial distribution, we use Lorenz curve, scale index and superiority index to explore the

spatial differentiation in number, size, quality and influence of Ankang class-A tourist attractions further.

1) Spatial differentiation in quantity

From Fig.3, we can see that Ankang class-A tourist attractions are mainly distributed in Hanbin, Ziyang, Shiquan, Langao, the number of this four accounted for 64% of total city.

2) Spatial differentiation in scale

The scale index represented by the density of the tourist attractions in the area[1] is used to measure the size of a particular tourist group. The higher the index is, the better the tourist attractions development degree will be and may produce scale benefit, vice versa. Scale index of Ankang class-A tourist area is 11.13 per million km2, Scale index of Shiquan, Ziyang, Hanbin, Langao and Hanyin is higher than the average value and other 5 districts' (Tab. 1). Specifically, because of its advantages in the number the scale benefits of Hanbin County is obvious; the number of other four counties isn't as big as the former, but the county acreage is small, so the scale index is also high.

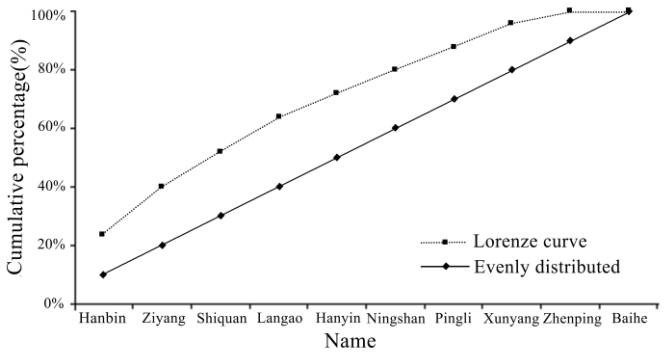

Fig. 3. Lorenz curve of Ankang class-A tourist attractions spatial distribution

TABLE I SCALE INDEX OF ANKANG CLASS-A TOURIST ATTRACTIONS

Name	Number of tourism attraction	Acreage (million km^2)	Scale index (per million km^2)	Rank
Shiquan	3	0.1352	19.67	1
Ziyang	4	0.2106	18.15	2
Hanbin	6	0.3605	16.43	3
Langao	3	0.1923	15.34	4
Hanyin	2	0.132	14.65	5
Pingli	2	0.2493	7.61	6
Zhenping	1	0.1407	6.67	7
Ningshan	2	0.355	5.44	8
Xunyang	2	0.3377	5.63	9
Baihe	0	0.1333	0	10
Total	25	2.2466	11.13	—

3) Spatial differentiation in quality

From Fig.3, Tab.2, we know the total number, number of class-4A and above tourist attractions in Shiquan, Hanbin is big, both the quality and quantity are good; Although the total number is big, but the quality is low in Ziyang; Zhenping, Pingli and Ningshan are just as the opposite, the number is small but value is high.

TABLE II SUPERIORITY INDEX OF ANKANG CLASS-A TOURIST ATTRACTIONS

Name	Number of high-level tourism attractions	Total number of tourism attraction	Proportion	Superiority index	Rank
Hanbin	3	6	50%	0.12	1
Shiquan	2	3	66.67%	0.08	2
Ningshan	1	2	50%	0.04	3
Langao	1	3	33.33%	0.04	3
Zhenping	1	1	100%	0.04	3
Pingli	1	2	50%	0.04	3
Hanyin	0	2	0%	0	7
Ziyang	0	4	0%	0	7
Xunyang	0	2	0%	0	7
Baihe	0	0	0%	0	7
Total	9	25	36%	0.03	—

4) Spatial differentiation in influences

Superiority index is a measure of the status and influence of high-grade tourist attractions in the scenic group of upper-level area in specific area. We use the proportion of class-4A and above tourist attractions in the total area of upper-level area to measure [1]. The higher the index is, the higher the tourist attractions grade is, the greater the impact in the upper and higher regions will be; vice versa. Superiority index in Han Bin, Shiquan, Ningshan, Langao, Zhenping, and Pingli is higher than the average (about 0.03).

Based on the above analysis, Hanbin and Shiquan have obvious advantages regardless of the number, size, quality or impact of tourist attractions.

IV. CONCLUSION AND DISCUSSION

The main conclusions of this paper are as follows:

- The distribution compactness degree of Ankang class-A tourist attractions is high and it's convenient to the interconnection between tourist attractions and organization for regional tourism flow.
- Agglomeration characteristics of Ankang class-A tourist attractions is significant and the distribution among counties are unbalanced.
- The spatial differentiation characteristics in number, size, quality and influence of the Ankang class-A tourist attractions are different, But Hanbin Distict and Shiquan County have shown a clear advantage in all aspects.

Based on the empirical research of Ankang, we will further explore the path of the edge-typed tourism city to get out of edge dilemma in theoretical level, which may lie in the following: First, relying on the existing high-level core tourist attractions to form 1-2 tourist centers with strong attraction and influence and then accelerate the construction of numbers of key tourist attractions which can become the tourism centers

gradually. Then as the time goes, it becomes a tourism hotspot with different types of tourist centers and places which is structural integrity and closely tied; Further, through the strengthening of regional cooperation and product innovation, it may develop into a new core tourist city.

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