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Spatial distribution and tourism competition of intangible cultural heritage: take Guizhou, China as an example

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Abstract

As a province inhabited by ethnic minorities in southwest China, Guizhou is rich in tourism and ICH (intangible cultural heritage) resources. The spatial distribution of ICH and the utilization of tourism and ICH resources in Guizhou worth studying, which is better for understanding the tourism competition situation and the tourism utilization of ICH. This research uses GIS tools for spatial analysis, mathematical formulas for calculating the abundance of ICH and tourism resources, as well as the matrix analysis for ICH and tourism competition, to identify the spatial distribution and tourism competition situation of ICH in Guizhou Province in 2019. The results show that: (1) in terms of the structural characteristics of the number and types of ICH in Guizhou Province, folk custom, traditional craftsmanship and traditional music have the highest number and proportion, while Quyi has the lowest. (2) Grade A scenic spots are mainly located in Zunyi City, while ICH scenic spots are mainly in Southeast Guizhou, Zunyi City, South Guizhou and Southwest Guizhou. Zunyi City ranks first in the abundance of tourism resources, and Liupanshui City ranks last. Southeast Guizhou has the highest ICH resources abundance, while Liupanshui City has the lowest. (3) Both the distribution of national-level and provincial-level ICH in Guizhou are aggregated. The national-level ICH are clustered in a large core area in geographical space, which is located in the southeast of Guizhou. The provincial-level ICH sites form a belt extending from southwest to southeast of the province, which is distributed at the junction of southeast of Guizhou, Guiyang and Anshun. (4) The provincial-level ICH in Guizhou has formed a belt-like high-density zone extending from southwest to southeast and three high-density core areas. (5) Through the analysis of a tourism competition matrix, we found that there are three types of development in nine cities in Guizhou Province. Zunyi City and Southeast Guizhou show the development characteristics of "tourism prosperity-ICH tourism prosperity". Guiyang, Bijie, Anshun, Southwest Guizhou, Liupanshui and Tongren City show the development characteristics of "tourism depression-ICH tourism depression". South Guizhou shows "tourism depression-ICH tourism prosperity". These findings and methods will help cities determine their own strengths and weaknesses according to their resources, and narrow the regional development gap through formulating cultural and tourism development plans.

Keywords Guizhou, China, Intangible cultural heritage, Spatial distribution, Tourism competition

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Introduction

Intangible cultural heritage (ICH) includes not only the annual activities, festival celebrations and handicraft skills related to production and life inherited by ordinary people from generation to generation in the era of agricultural civilization, marine civilization, nomadic civilization, and business civilization, but also the folk knowledge and natural practice related to people's understanding of nature and the universe. The distribution of ICH in different countries and regions vividly reflects the diversity of human civilization, and fully demonstrates the richness of human wisdom. Since the adoption of the resolution on the establishment the Representation of the Oral and Intangible Heritage of Human Beings by United Nations Education Scientific and Cultural Organization (UNESCO) in 1997 and the deliberation and adoption of the Regulations on the Declaration of Representation of the Oral and Intangible Heritage of Human Beings in 1998, the protection, development and utilization of ICH have received more and more attention from countries.

Nowadays, in many countries and regions, ICH is regarded as the main carrier to display their own history, culture and social lifestyle, and an important tourism resources to promote regional development. For example, in Greece, the Cretan Diet Festival is used in the marketing and publicity of local tourism destinations to explore the mutually beneficial cooperation between ICH and tourism [1]. In Italy, the traditional Christian festival, Easter in Sardinia, is regarded as an important resources to enrich tourism activities and increase the attraction of tourist destinations in the off-season, driving the sustainable development of tourism on the island [2]. In Vietnam, ICH has become the key to the creation and development of creative places in rural area, helping to promote its tourism attractions [3].

Generally, the current research on ICH mainly focuses on the following aspects. First of all, some researchers regard ICH as a historical urban landscape, and call on governments, non-governmental organizations, communities and other stakeholders to actively participate in the planning, management, development, utilization and practice of intangible culture [4]. Second, some researchers focuses on the digital protection of ICH [5] and its digital use in the development and planning of scenic spots [6]. Third, some scholars began to pay attention to the conclusion of the Convention on the Protection of Intellectual Property Rights and Geographical Indications of ICH, so as to avoid transnational misappropriation of ICH. Fourth, ICH will be taken as an important resources or cultural landscape and incorporated into the process of urban renewal and social innovation planning, to create a smart, sustainable and inclusive city [7–9]. The fifth is to pay attention to the relationship between tourism and rural heritage, highlighting the importance of diverse groups of tourism communities participating in the development and utilization of regional economy, society, tourism and architecture [10].

In China, current research on ICH is conducted in the micro, medium [11] and macro levels [12]. On the macro level, the research focuses on the spatial distribution characteristics of ICH on a national scale. On the medium level, there are studies on the spatial distribution characteristics of ICH across cultural areas [13], economic belts and at the scale of provinces, cities, counties [14] and villages [15]. Most of them combined the method of tourism and geography to explore the type characteristics of ICH in a specific economic belt [16, 17], province [18] and place [19, 20], analyzed the distribution and concentration of ICH resources along mountains, rivers and traffic lines [21], and summarized the development characteristics and future development direction of ICH tourism in the region [13]. On the micro level, the research objects are mostly specific ICH sites or original villages [22, 23] and communities where ICH exists [24]. It mainly focus on the authenticity, political nature [25], staging and commercialization of ICH tourism [26], and pays attention to the participation and identity of community members in the context of ICH [27]. It also seeks to study the local expression of ICH, the revitalization of rural areas by ICH [28, 29], cultural acculturation and power allocation [30]. In terms of research methods, correlation analysis [31], kernel density analysis [32], location order method and location entropy are often used to study the spatial pattern [33]; In terms of problem presentation, researches focus on the modernity, urbanization, localization, mobility, homogeneity and diversity of ICH [34].

In Guizhou, China, the typical karst landform and various ethnic minorities have created rich and diverse ICH. The prevalence of ICH also provides a rich resources base for the development of local tourism. Since the State Council of the People's Republic of China (PRC) announced the first batch of representative projects of national-level ICH in 2006 (https://www.ihchina.cn/#page5), several intangible cultural heritages of Guizhou has been selected for the projects, including traditional music represented by Dong's big song, Dong's pipa song, folk festivals represented by Miao's Kuzang Festival, Miao's Sister Festival, and traditional craftsmanship such as silver decoration, Miao embroidery, batik, and Lusheng production. All those projects show extensive cultural and economic influence. Due to its history, geography, ethnic migration and other reasons, Guizhou is not only a region with a large number of ethnic minorities, but also a culturally diverse province. Therefore, characteristics of ICH,

such as authenticity [25], nationality [35], regionality, diversity [36], can be preserved and inherited more completely. Several ICH-themed cultural performance activity and product promotion activity have been carried out, such as "ICH party in weekend" (A type of ICH exhibition activities held on weekends in Guiyang City), the "ICH shopping festival", and the building of Danzhai Wanda "ICH tourism town", which gradually created a "ICH tourism card" with rich connotation and obvious regional characteristics, attracting a large number of tourists. In order to meet the needs of times, the combination of ICH and tourism development will produce economic, cultural and social effects, which is not only a field of concern for the government, but also a focus of academic research.

On the whole, the existing research has deeply analyzed the opportunities and problems brought by the tourism utilization of ICH from different themes and spatial scales. However, most of these studies are empirical analysis of cases, and few studies focus on the relationship between ICH resources and tourism resources from a mathematical and statistical level. As for Guizhou, although they are rich ICH resources and booming tourism, few studies have combined the abundance of ICH resources with tourism resources to interpret the correlation between them, and few studies have explored the impact of ICH resources endowment on the development of tourism.

Therefore, it is necessarry to further figure out the abundance and spatial distribution characteristics of ICH, clarify the relationship between ICH resources and tourism resources, identfy the competitive situation of tourism and ICH resources in nine cities in Guizhou Province, and scientifically guide the development of ICH tourism. This paper takes the national-level ICH project (including expansion items) and provincial-level ICH project (including expansion items) of Guizhou Province as the research object, using ArcGIS to analyze the spatial distribution characteristics of ICH, and employs mathematical statistics analysis to establish a series of formulas to measure the abundance of tourism and ICH resources. Meanwhile, the method of tourism competition state is introduced, and the matrix of tourism and ICH resources abundance is established. Based on these work, this paper analyzes the market competition of ICH and tourism in nine cities in Guizhou Province, identifies the advantages and disadvantages of various cities in the utilization of ICH and tourism resources, which makes up for the lack of research on the relationship between ICH and tourism resources from a mathematical and statistical level.

Research methods and data sources

Data source and processing

By the end of 2019, State Council of the PRC had announced four batches of national-level ICH representative projects, including 140 projects of Guizhou Province (including expansion items) (https://www.ihchina.cn/). Since 2005, Guizhou Province has announced five batches of provincial-level ICH representative projects (including expansion items) in 2007, 2012, 2015 and 2019, totaling 780 projects (http://www.gzfwz.org.cn/). The list of national-level ICH projects of Guizhou Province in this article were obtained from the China ICH Network, and the provincial-level ICH project directory was obtained from the website of Guizhou Provincial Government. The geographic location of ICH projects is derived from Baidu Picking Coordinate System, and the list of A-grade scenic spots in Guizhou Province is obtained from the website of Guizhou Provincial Department of Culture and Tourism (https://whhly.guizhou.gov.cn/). The number of ICH scenic spots is determined by experts based on the develpoment of A-grade scenic spots in Guizhou and their experience in the utilization of ICH in A-grade scenic spots.

Research methods

Analysis of spatial distribution pattern

The nearest neighbor index (*NNI*) can be used to determine the distribution type of ICH points in the geographical space, and the class point elements are generally divided into cluster type, uniform type and random type [37]. The nearest neighbor index represents the ratio between the average observation distance and the expected average distance. The *NNI* formula is [38, 39]

$$f(x) = \frac{1}{nh_i}\sum_{i=1}^{n} k\left\{\frac{x - x_i}{h}\right\} \tag{1}$$

In the formula, $mind_{ij}$ is the distance between any ICH item and its nearest neighbor; N is the total number of ICH; A is the area of the study case.

Kernel density estimation

The kernel density estimation can reflect the influence intensity around a kernel [37]. It is a tool for identifying and analyzing ICH hotspots and cold spots. The formula is [40]

$$f(x) = \frac{1}{nh_i}\sum\nolimits_{i=1}^{n} k\left\{\frac{x - x_i}{h}\right\} \tag{2}$$

In the formula, $k\left\{\frac{x-x_i}{h}\right\}$ is the kernel function, $h>0$ is the broadband, and $(x-x_i)$ represents the distance from the valuation point x to x_i. The larger the $f(x)$ value, the denser the points are.

The correlation measure between ICH and tourism

In this paper, the abundance of tourism resources emphasized are mainly represented by the value of tourism resources. According to 《GB/T 18972-2017 Classification, Investigation and Evaluation of Tourism Resources》 of China, the definition of tourism resources is " all kinds of things and phenomena in nature and human society that can attract tourists, be developed and utilized for tourism industry, and produce economic, social and environmental benefits". In China, as the most important indicator of regional tourism resources, A-grade scenic spots can represent the richness of regional tourism resources to a certain extent. A-grade scenic spots are divided into five grades in China, namely 5A, 4A, 3A, 2A and 1A scenic spots. Among them, 5A scenic spots are the best, with the most abundant tourism resources. In China, the most famous 5A scenic spots include the Forbidden City in Beijing, Terra Cotta Warriors in Xi'an, Huangguoshu Waterfall in Guizhou, etc. They are the most prominent representatives of tourism resources. Therefore, in this study, A-grade scenic spots are mainly used to calculate the abundance of tourism resources.

Then, the research uses the concept of resource first concentration [41] to construct the abundance ratio of tourism resources and the abundance ratio of ICH tourism resources, as the data basis for the analysis of ICH and tourism competition. The formulas are (3)–(9):

Abundance value of tourism resources [42, 43]:

$$RD_i = 5.0X_{5A} + 2.5X_{4A} + 1.75X_{3A} + 0.5X_{2A} + 0.25X_A \tag{3}$$

In the formula, RD_i is the abundance value of tourism resources of the i city, X_{iA} is the number of scenic spots of the iA level, and the coefficients are the weights of scenic spots of different levels.

Tourism resources abundance ratio [44, 45]:

$$T_i = \frac{RD_i}{\sum_{i=1}^{n} RD_i} \tag{4}$$

In the formula, T_i is the tourism resources abundance ratio, and RD_i is the tourism resources abundance value of the i city, $i=1, 2, 3, \ldots, n$.

The abundance value of ICH tourism resources is one of the measuring standards to judge the transformation of ICH into tourism resources. At present, there is no research on the abundance of ICH tourism resources, and there are few calculating methods for the transformation rate of ICH tourism resources. In order to solve the measurement of ICH tourism resources and the calculation of tourism transformation rate of intangible culture, Delphi method is used in this research. The details are as follows:

First of all, 10 experts in ICH and tourism research in Guizhou Province were invited to select ICH tourism resources from A-grade scenic spots, then the number of ICH scenic spots at each level was determined. Secondly, according to the principle of weight assignment of tourism resources (Formula 3), 10 experts assigned 0.1–5 points to different levels of ICH scenic spots. Finally, we used weighted average of the weights assigned by the experts to different levels of ICH scenic spots, then got the weights of ICH scenic spots of different levels. That is, the weight of 5A ICH scenic spots is 4, the weight of 4A ICH scenic spots is 3, the weight of 3A ICH scenic spots is 2.5, the weight of 2A ICH scenic spots is 0.3, and the weight of 1A ICH scenic spots is 0.2, which finally forms Formula 5. The Formula 5 is used to calculate the abundance of ICH tourism resources.

Abundance value of ICH tourism resources:

$$B_i = 4D_{5A} + 3D_{4A} + 2.5D_{3A} + 0.3D_{2A} + 0.2D_A \tag{5}$$

In the formula, B_i is the abundance value of ICH tourism resources of the i city, D_{iA} is the number of ICH tourism resources of the iA level, and the coefficients are the weights of ICH tourism resources of different levels.

Abundance ratio of ICH tourism resources:

$$I_i = \frac{B_i}{\sum_{i=1}^{n} B_i} \tag{6}$$

In the formula, I_i is the abundance ratio of ICH tourism resources in the i city, B_i is the abundance value of ICH tourism resources in the i city, $i=1, 2, 3, \ldots, n$.

Construction of ICH and tourism competitive state matrix

In the study, the tourism competitive state model is built on the improved Boston Consulting Group (BCG) [46]. This paper comprehensively draws on the theoretical principles and ideas of the Rank-Size rule and the Boston matrix, and takes the rank and scale of the ratios of ICH coefficients to tourism coefficients of cities as a reference. Then we analyzed the reasons why different cities fall in different quadrants, and put forward different development suggestions according to their existing problems. On the basis of revising and improving the original competition state formula of tourism market, we proposed Formulas (3)–(6), the abundance ratio of tourism resources and the abundance ratio of ICH tourism resources are obtained, and the matrix model of ICH and tourism competition state is established. Combined with

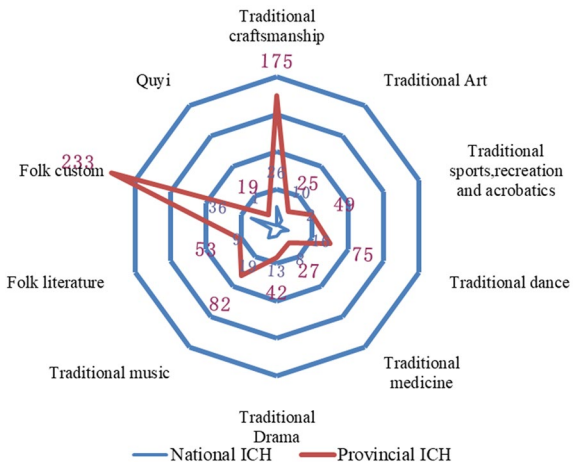

Fig. 1 Structure chart of national and provincial ICH types in Guizhou Province in 2019

current situation of urban development in Guizhou Province, the transformation and utilization of ICH tourism resources are analyzed.

Spatial distribution of tourism resources and ICH resources in Guizhou Province

The quantity and type structure characteristics of ICH in Guizhou Province

The premise of analyzing the transformation and utilization of ICH tourism resources is to understand the tourism development and distribution of ICH resources. According to the classification of ICH by UNESCO, the national-level and provincial-level ICH of Guizhou in 2019 will be divided into ten categories, namely traditional craftsmanship, traditional art, traditional sports recreation and acrobatics, traditional dance, traditional medicine, traditional music, folk literature, folk custom and Quyi. In order to visually present the position of different types of national and provincial ICH, the paper uses radar chart as shown in Fig. 1. On the basis of summarizing the number of different types of national and provincial ICH, it provides an analysis basis for subsequent research.

This paper also obtains the number of each type of national and provincial ICH in Guizhou Province, as shown in Table 1. Among them, National ICH data is from the official website of China ICH (https://www.ihchina.cn/).The provincial ICH data of Guizhou is from the official website of Protection Center of ICH in Guizhou Province. Then the proportion of National and Provincial ICH in Guizhou Province is calculated, as shown in Fig. 2.

It can be seen from Table 1 and Fig. 2 that among the national and provincial ICH in Guizhou Province, folk custom accounts for large quantity and proportion, 25.71% and 29.88% respectively; The second is traditional craftsmanship, 18.57% and 22.44% respectively; The third is traditional music, which is 13.57% and 10.51% respectively; Quyi accounted for the least, 0.71% and 2.44% respectively.

The reason for the above distribution is closely related to the fact that Guizhou has typical karst landform and being a minority-inhabited region. In the past, due to the original geographical barriers and traffic conditions, the cities in Guizhou Province were separated from each other. ICH resources were relatively independent and well preserved, and it was easy to form a production and lifestyle with regional and ethnic characteristics. When sorting out the list of ICH resources, it is not difficult to see that the ICH projects are mainly related to primitive religion, sacrifice, marriage and production, such as the Kuzang Festival, Sister Festival, Sama Festival of Dong, Chabai Festival of Buyi, Duan Festival of Shui, and Maolong Festival of Gelao, most of which are derived from the important traditional customs of various ethnic minorities; Traditional craftsmanship such as batik, printing and dyeing, silver forging, Dong wooden architecture, Miaozhai stilts, pottery firing, etc., are closely related to the original production and lifestyles of various ethnic minorities, and most of them have distinctive regional characteristics; In the same way, the traditional music and dance nurtured in the history of ethnic minorities are also various, so Guizhou is also known as the "paradise of singing and dancing" of ethnic minorities. The number of Quyi ICH projects is small, the reason is that some projects related to Quyi were declared as traditional music, such as Dong's big song and Miao's flying song, which results in a small proportion of national Quyi ICH projects.

It can also be seen from the box marks in Fig. 2 that the proportion of folk customs, traditional crafts and traditional music exceeds the average, which roughly coincides with China's most popular ICH, such as social customs, ceremonies and festivals, performing arts and traditional handicrafts. Therefore, it is obvious that most of them are part of Guizhou's intangible cultural resources, which is a good basis for promoting the rapid and high-quality development of Guizhou's tourism.

Spatial distribution of A-grade scenic spots and ICH scenic spots

In order to better understand the current situation of tourism utilization of intangible cultural resources,

Table 1 Quantity statistics of national and provincial ICH types in Guizhou Province in 2019

Category	Traditional craftsmanship	Traditional Art	Traditional sports, recreation and acrobatics	Traditional dance	Traditional medicine	Traditional Drama	Traditional music	Folk literature	Folk custom	Quyi	Total
National level	26	10	2	16	8	13	19	9	36	1	140
Proportion at national level%	18.57	7.14	1.43	11.43	5.71	9.29	13.57	6.43	25.71	0.71	100
Provincial level	175	25	49	75	27	42	82	53	233	19	780
Provincial percentage%	22.44	3.20	6.28	9.61	3.46	5.39	10.51	6.8	29.88	2.44	100

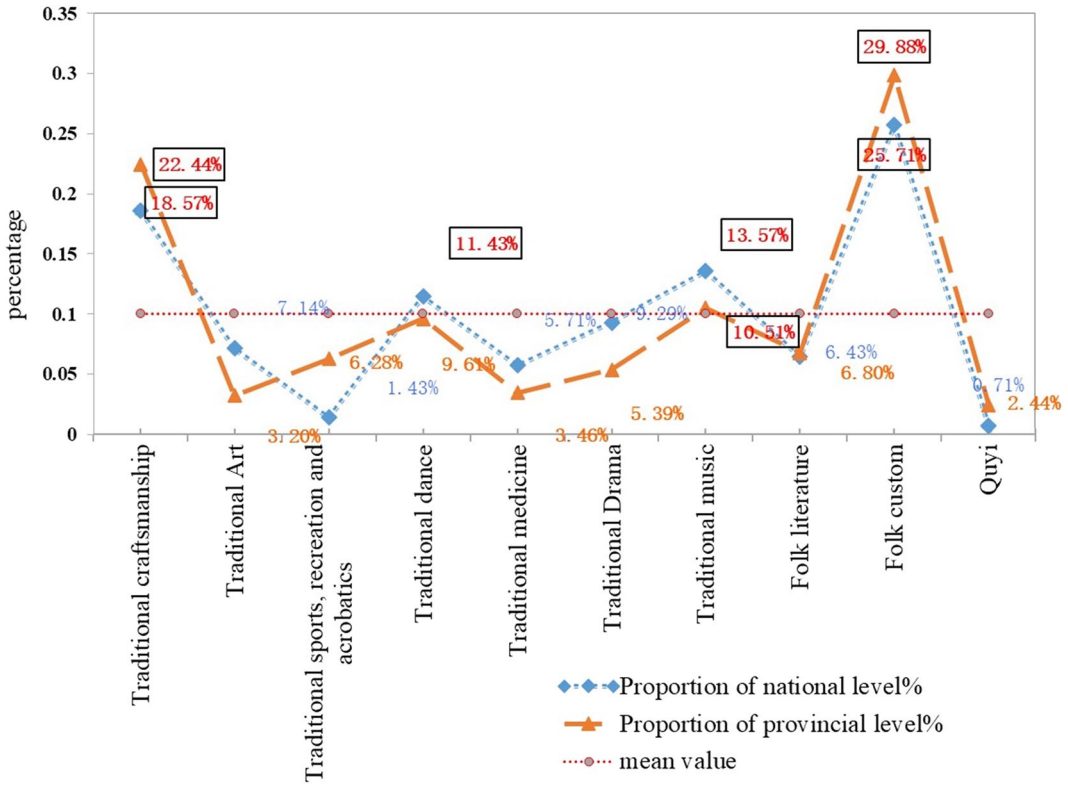

Fig. 2 The proportion of national and provincial ICH in Guizhou Province

identify the characteristics of different cities using intangible cultural resources to develop tourism, analyze the specific problems faced by various regions, and propose targeted development paths, this study conducts geographic visualization of tourist and ICH resources for detailed analysis based on analysis of the quantitative structure and spatial distribution characteristics of ICH.

The specific steps are as follows: First of all, we collected and summarized the list of A-grade scenic spots of cities in Guizhou Province in 2019. Secondly, 10 experts in ICH and tourism research were invited to select scenic spots with the characteristics of ICH attractions from the 2019 A-grade scenic spots as ICH Scenic Spots, which can be seen in Table 2. Third, we used ArcGIS to conduct spatial visualization analysis for A-grade Scenic Spots and ICH Scenic Spots, and then analyzed the spatial distribution characteristics of tourism and ICH resources in different region, which can be seen from Fig. 3.

According to (Fig. 3a–c), Grade A scenic spots are mainly located in Zunyi City, followed by Southeast Guizhou, and sparsely distributed with the least quantity in Tongren; ICH tourist attractions are mainly concentrated in Southeast Guizhou, Zunyi City, South Guizhou and Southwest Guizhou, which are inhabited by several ethnic minorities. Guiyang, the provincial capital, has the least number of ICH tourist attractions and the most sparse distribution.

Spatial distribution of tourism resources abundance and ICH tourism resources abundance

In this study, the tourism and ICH resources abundance value of nine cities in Guizhou Province are calculated by Formula (3) and Formula (5), and imported into ArcGIS10.2 to generate the spatial distribution map of tourism resources and ICH resources to get Fig. 4. Figure 4 is used to observe the spatial distribution of tourism resources and ICH resources. According to Formula (3), it can be seen from (Fig. 4a) that the abundance of tourism resources is in the order: Zunyi City > Southeast Guizhou > South Guizhou > Bijie City > Guiyang City > Anshun City > Southwest Guizhou > Tongren City > Liupanshui City. According to Formula (6), it can be seen from (Fig. 4b) that the abundance of ICH resources is in the order: Southeast Guizhou > Zunyi City > South Guizhou > Southwest Guizhou > Anshun City > Bijie City > Tongren City > Guiyang City > Liupanshui City.

Table 2 ICH and tourism related data of Guizhou Province in 2019

Region	5A scenic area	ICH scenic spots in 5A	4A scenic area	ICH scenic spots in 4A	3A scenic area	ICH scenic spots in 3A	2A scenic area	ICH scenic spots in 2A	1A scenic area	ICH scenic spots in 1A
Guiyang City	1	0	21	2	9	2	0	0	0	0
Zunyi City	0	0	28	8	88	16	3	0	0	0
Liupanshui city	0	0	11	1	11	2	5	2	0	0
Anshun City	2	0	10	3	19	11	0	0	0	0
Bijie City	1	0	7	2	33	11	0	0	0	0
Tongren City	1	0	11	5	11	6	0	0	0	0
Southeast Guizhou	1	0	14	9	51	39	0	0	0	0
South Guizhou	1	1	8	3	36	15	3	0	0	0
Southwest Guizhou	0	0	10	5	24	10	0	1	0	0
Guizhou Province	7	0	120	28	282	112	11	0	0	0

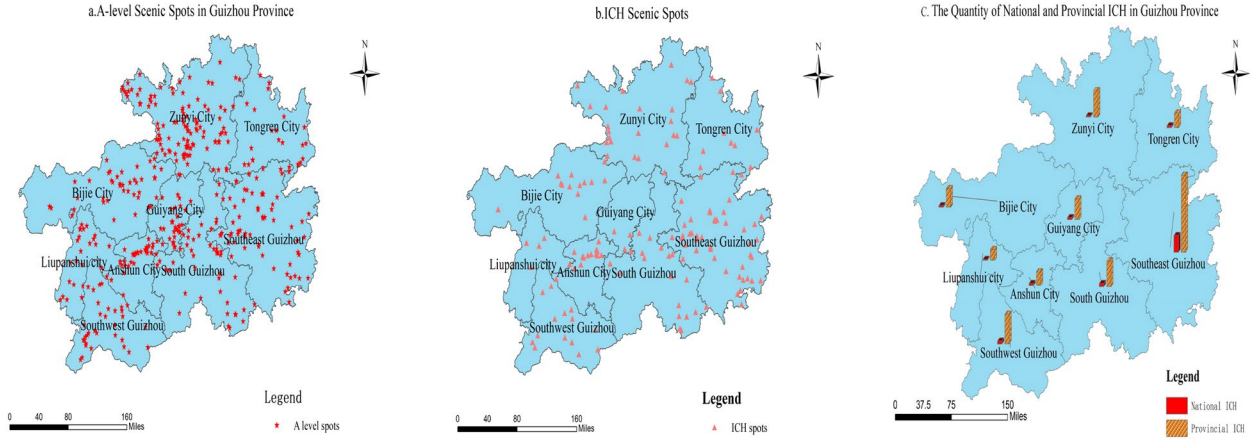

Fig. 3 Spatial distribution of A level scenic spots and ICH scenic spots

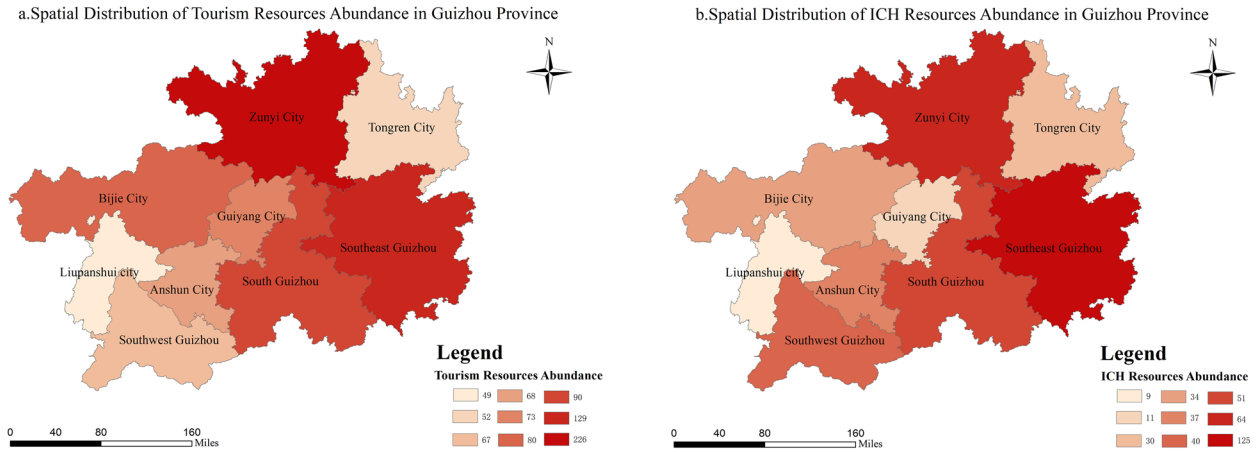

Fig. 4 Spatial distribution of tourism resources and ICH resources abundance in Guizhou Province

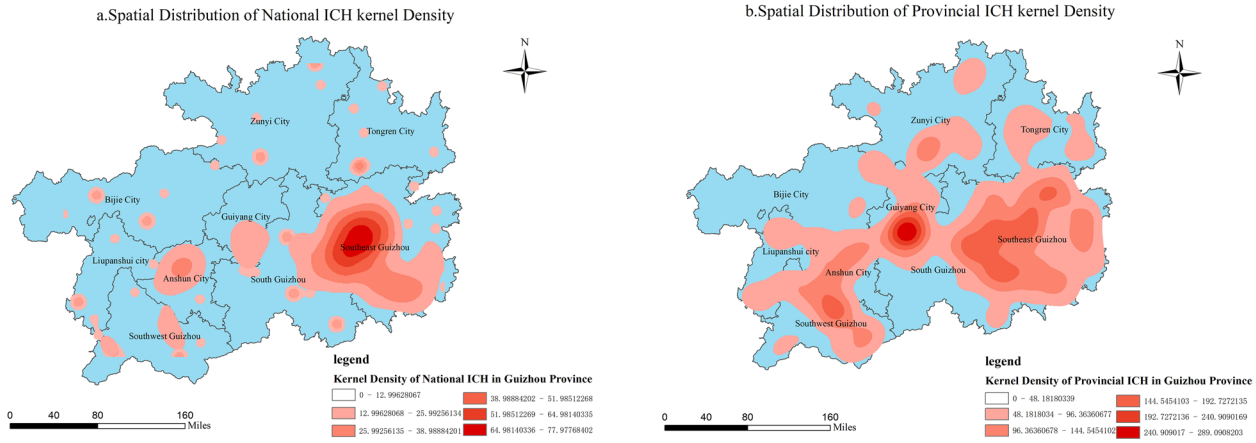

Fig. 5 Spatial distribution of national and provincial ICH kernel density

Table 3 ICH and tourism related data of Guizhou Province in 2019

Region	National ICH	Provincial ICH	5A scenic area	ICH scenic spots in 5A	4A scenic area	ICH scenic spots in 4A	3A scenic area	ICH scenic spots in 3A	2A scenic area	ICH scenic spots in 2A	1A scenic area	ICH scenic spots in 1A
Guiyang City	8	89	1	0	21	2	9	2	0	0	0	0
Zunyi City	5	113	0	0	28	8	88	16	3	0	0	0
Liupanshui city	4	47	0	0	11	1	11	2	5	2	0	0
Anshun City	10	60	2	0	10	3	19	11	0	0	0	0
Bijie City	7	81	1	0	7	2	33	11	0	0	0	0
Tongren City	8	63	1	0	11	5	11	6	0	0	0	0
Southeast Guizhou	72	331	1	0	14	9	51	39	0	0	0	0
South Guizhou	14	112	1	1	8	3	36	15	3	0	0	0
Southwest Guizhou	12	128	0	0	10	5	24	10	0	1	0	0
Guizhou Province	140	1024	7	0	120	28	282	112	11	0	0	0

Kernel density distribution of national and provincial ICH resources

The research uses the kernel density analysis tool in ArcGIS10.2, employing Formula (2) to analyze the data of national and provincial ICH projects (including expansion items) in Guizhou Province, and finally generates Fig. 5, the kernel density distribution map of national and provincial ICH. It can be seen from (Fig. 5a) that national ICH in Guizhou Province are distributed in one big core area and multiple secondary core areas. The big core area is located in Southeast Guizhou, and the secondary core areas are mainly in Guiyang City, Anshun City and Southwest Guizhou. It can be seen from (Fig. 5b) that the provincial ICH forms a belt extending from southwest to southeast, which is distributed at the junction of Southeast Guizhou, Guiyang City, and Anshun City.

It can be seen that the national and provincial ICH in Guizhou Province are mainly concentrated in cities with large minority populations. For example, Miao, Buyi and Dong are ethnic groups with the largest minority population, while Southeast Guizhou is dominated by Miao and Dong, and Southwest Guizhou is dominated by Buyi and Miao, so there is a spatial echo relationship between the concentration of ethnic minorities and the density and distribution of ICH. In particular, Southeast Guizhou has always been in the high-density core area of national and provincial ICH, from which we can see that the distribution of ICH is closely related to the settlement of ethnic minorities and minority culture.

Spatial nearest neighbor characteristics of national and provincial ICH resources

The average nearest neighbor ratio of national ICH can be calculated by the spatial statistical tool in ArcGIS10.2 software through Formula (1). The calculated *NNI* value is 0.330946, *Z* value is −15.144541, *P* value is 0.000, and *NNI* value is ≤ 0.5. Therefore, the national ICH in Guizhou Province is clustered. The nearest neighbor index of provincial ICH is calculated. The results show that the *NNI* value is 0.016044, the *Z* value is −60.08881, the *P* value is 0.000, and the *NNI* value is ≤ 0.5. Therefore, the provincial ICH in Guizhou Province is also clustered on the whole.

Competitive situation of ICH and tourism

Establish the competition matrix of ICH and tourism

In order to more clearly understand the current situation of tourism utilization of ICH, clarify the characteristics of different cities in using ICH resources to develop tourism, analyze the specific problems faced by various regions, and propose targeted development paths, the ICH and tourism competition matrix is specially established.

The specific steps are as follows: we summarize the collected data of all cities in Guizhou Province in 2019 into Table 3, and use Formula (3)–(6) to obtain Table 4, ICH and tourism related ratio values of all cities.

According to the ratio values of ICH and tourism in Table 4, the competitive matrix of ICH and tourism are established. The solid line in the matrix represents the division boundary. The mean value of the horizontal solid line and the vertical solid line is 0.11. See Fig. 6 for the results.

Characteristics and development reasons of ICH tourism in 9 cities under the jurisdiction of Guizhou Province

Figure 6 can be used to reflect the characteristics of ICH tourism resources and tourism resources in various cities and can be used to analyze the development reasons of ICH tourism. According to the four quadrants of the matrix, nine cities are divided into three types, "tourism prosperity-ICH tourism prosperity", "tourism depression-ICH tourism depression", and "tourism depression-ICH tourism prosperity".

Development characteristics and causes of "tourism prosperity-ICH tourism prosperity" cities

It can be seen from Fig. 6 that Zunyi City and Southeast Guizhou are in the first quadrant of the matrix. Among them, Zunyi City has the highest proportion of tourism resources, and Southeast Guizhou has the highest proportion of ICH tourism resources. Both are "tourism prosperity-ICH prosperity" cities, that is, "double high" cities. Zunyi city is endowed with abundant tourism resources, and Southeast Guizhou is rich in ICH resources. The reasons for the result are closely related to the regional resources endowment, diversity of ethnic cultural, and the economic and social development of the two cities.

Zunyi City is a tourism-resources-driven city. It is a well-known historical and cultural city in China, and an old revolutionary base area. It is a place inhabited by mixed nationalities of Han and minority, famous for its wine culture, and being titled with National Forest City. There are rich resources in red culture, wine culture, ecological culture, national culture, etc., providing a good resources base for the development of tourism.

For such city, efforts should be made to further explore the advantages and highlights of resources, and continue to play the role of tourism resources in driving the development of ICH tourism. It is necessary not only to "build a brand" in tourist attractions and tourism products, but also to strengthen the further integration of tourism and ICH tourism products by optimizing the design of

Table 4 ICH and tourism related values and ratios by city in Guizhou Province in 2019

Region	Tourism resources abundance	Tourism resources abundance ratio	Rank of tourism resources abundance	ICH tourism resources abundance	ICH tourism resources abundance ratio	Rank of ICH tourism resources abundance
Guiyang City	73	0.09	5	11	0.03	8
Zunyi City	226	0.27	1	64	0.18	2
Liupanshui City	49	0.06	9	9	0.02	9
Anshun City	68	0.08	6	37	0.10	5
Bijie City	80	0.10	4	34	0.09	6
Tongren City	52	0.06	8	30	0.08	7
Southeast Guizhou	129	0.15	2	125	0.34	1
South Guizhou	90	0.11	3	51	0.14	3
Southwest Guizhou	67	0.08	7	40	0.11	4

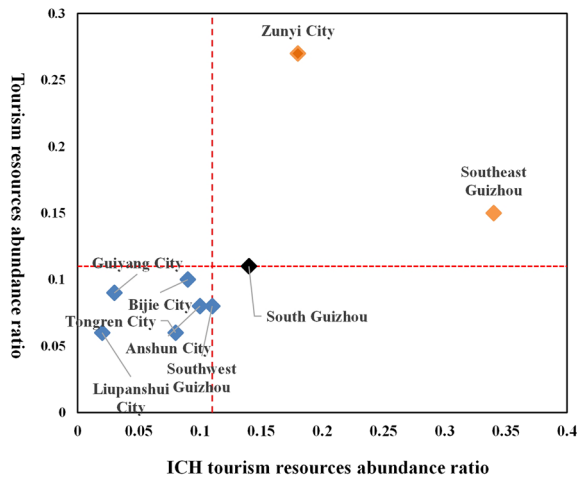

Fig. 6 Competitive matrix about tourism resources abundance ratio and ICH tourism resources abundance ratio

tourism routes and improving the quality of ICH tourism products.

Southeast Guizhou is a ICH-tourism-driven city, which is related to the gathering of ethnic minorities, the diversity of ethnic cultures, and the dominant policies of the tourism industry. On the one hand, Southeast Guizhou has a large minority population with 46 ethnic groups such as Miao, Dong, Buyi, etc., and the minority population accounts for 81.5% of the total population. The region is crisscrossed with continuous mountains and ravines, and has developed water systems, giving birth to rich ICH resources. On the other hand, in recent years, Southeast Guizhou has continuously constructed representative scenic spots with ICH and national folk culture as the core attraction. The number of ICH tourism landscapes is large and the quality is high. For example, Xijiang Qianhu Miao Village, Zhaoxing Dong Village, Danzhai Wanda Town, etc., which mainly focus on the authentic ethnic cultural tourism products. Meanwhile, various ICH tourism routes have been designed to promote the rapid development of ICH tourism.

Therefore, the region should focus on promoting the industrial value of ICH tourism resources, and use the advantages of ICH to boost the tourism industry. While shaping the destination image of ICH tourism and building original ethnic cultural scenic spots, the region should give full play to the advantages of ICH resources, expand the integration of ICH and tourism commodities, strengthen the integration of ICH with tourism experience products, performing arts products and theme scenic spots. In this case, ICH's driving effect on tourism will be achieved.

Development characteristics and causes of "tourism depression—ICH tourism depression" cities

It can be seen from Fig. 6 that Guiyang City, Anshun City, Tongren City, Bijie City, Southwest Guizhou and Liupanshui City are in the third quadrant of the competitive matrix, whose ratio of tourism resources and ratio of ICH tourism resources are lower than the average, which means they are "tourism depression-ICH tourism depression" cities, that is "double low" cities.

Among them, Liupanshui City and Tongren City rank last in terms of tourism resources abundance ratio and ICH tourism resources abundance ratio, which is related to the urban development process of the two cities. As far as Liupanshui is concerned, it used to be an energy-driven city. Liupanshui is China's "third front" construction city (the "third front"construction refers to a large-scale construction of national defense, science and technology, industry and transportation infrastructure in 13 provinces and autonomous regions in central and western China under the guidance of war preparedness since 1964.). The city got great development by virtue of its energy and raw

materials industry during the period. It is rich in mineral resources, including more than 30 kinds of coal, iron, manganese, zinc, basalt and other mineral resources, known as the "Southwest Coal Capital", so its development is still dominated by modern industry such as coal, electricity, metallurgy, building materials and new coal chemistry, while tourism only plays a supplementary role. Therefore, the focus of the city's economic development is in favor of modern chemical industry and energy, while the tourism industry development is relatively ignored.

Such a city can use its relatively perfect industrial system and modern industrial city planning to develop industrial tourism, and use the diverse and inclusive "three front" culture to improve the tourism industry chain; It also can take advantage of the Yi Torch Festival, Miao Flower Dance Festival, Hui Eid, Gelao New Eating Festival and other minority festival customs to develop ICH tourism and help tourism become a new growth pole for the city's diversified development.

Tongren City, located in Wuling Mountain Area, is one of the 14 contiguous poor areas in China in the past. Although the city has achieved full poverty alleviation now, the overall population quality is lower than other cities, the infrastructure construction still needs to be improved, the connection with the central city is not close, and the radiation driving effect is limited. Accordingly, the backwardness of the overall economic and social development level leads to the depression of its tourism development, because rich resources could not guarantee good development, perfect infrastructure and relatively mature population quality are also indispensable.

Therefore, for Tongren City, on the one hand, the state and local governments need to give continuous support of policy and funding. On the other hand, the city needs to take the national policy as an opportunity to fully tap its own advantages in tourism resources and ICH resources, cultivate internal development potential, and turn itself into an internally driven city.

Guiyang is the capital of Guizhou Province. Although it is not a resources driven city with a small number of scenic spots and rich ICH resources, it can rely on the primacy effect and industrial agglomeration effect of the capital city, and has industrial advantages that other cities cannot match, such as big data, trade exhibitions, financial services, technology and education, and medical services. The outstanding advantages of diversified industries have overshadowed the quality of scenic resources. On the other hand, as Guiyang City focuses on developing tourism products and routes about leisure, vacation, ecology, health, exhibition, trade and other themes, it is relatively easy to ignore the tourism development, transformation and utilization of ICH resources. As a result, the city has no obvious advantages in terms of tourism resources abundance ratio or ICH tourism resources abundance ratio, becoming a "double low" city.

Anshun is not a city driven by tourism resources either. Compared with Southeast Guizhou, Anshun is less rich in ICH resources, because it pays more attention to building its brand of "Chinese Waterfall Village", and promotes its tourism products and routes with natural resources as the main attraction. Meanwhile, it also neglects the development and utilization of local ICH resources, not adequately putting them into tourism. At the same time, Anshun City, relying on the popularity of the 5A scenic spots (Huangguoshu and Dragon Palace), has relatively ignored the construction of scenic spots below 5A.

Therefore, for Guiyang City and Anshun City, while vigorously developing tourism, efforts should be made to enrich the types of tourism products, create diversified tourism routes, give full play to the radiation and driving role of tourism in the development and transformation of ICH resources, promoting the mutually beneficial trend of ICH and tourism.

Bijie City is the only pilot area in China with the theme of "poverty alleviation through development and ecological construction". It was also a city "famous" for poverty in the past. Although the city has invested a lot in the construction and planning of scenic spots in recent years, due to the weak base compared with other cities, it still needs to further accelerate the construction.

Southwest Guizhou has typical karst landform, and it is a well-known city for mountain tourism. The reason why the ratio of tourism resources and ICH tourism resources are in the third matrix is as follows. Although Southwest Guizhou has developed rapidly by virtue of its mountain tourism in recent years, the local land has suffered from serious rocky desertification, and the collection of local tourism resources and the brand building of tourist attractions have been seriously affected by the environment due to rocky desertification. In recent years, rocky desertification prevention has brought about positive effects of social development, promoting the gradual formation of brand effect of local mountain tourism. However, compared with other cities, the city needs to further refine its resources advantages, speed up infrastructure construction, and strive to catch up with other cities.

Development characteristics and causes of cities characterized by "tourism depression—ICH tourism prosperity"

It can be seen from Fig. 6 that Southwest Guizhou is in the fourth quadrant, its tourism resources ratio is lower than the average, while the ratio of ICH tourism resources is higher than the average, which means that its

tourism resources are weak, ICH tourism resources are prosperous, and it is a "low–high" city.

The reason lies in the city's natural and cultural resources and geographical location. On the one hand, South Guizhou is a place with diverse culture and multiple ethnic groups lived together. There are 43 ethnic groups living here, including Buyi, Miao, and Shui, so the place integrates the inclusiveness of Buyi, the diversity of Miao, the uniqueness of Shui, the mystery of Yao, and the peculiarity of Maonan. Therefore, the diversity of ethnic culture has created the richness of ICH tourism resources. On the other hand, one of the important reasons why the abundance value of tourism resources in South Guizhou is lower than the average is not that its resources background is weak, but that Zunyi City and Southeast Guizhou had huge advantages in the early stage of creating A-grade scenic spots, which highlights the disadvantages of South Guizhou in the creation of A-grade scenic spots.

Therefore, South Guizhou should further utilize its resources, dig its own unique advantages, actively participate in the creation of A-grade scenic spots, and make good use of its advantages in ICH resources in the creating process, continuously promoting the development of ICH tourism.

Conclusion and discussion

Discussion

The living habits, weddings and funerals, and festivals of ethnic minorities in Guizhou Province are not only urban marks and rural relics with regional and ethnic characteristics, but also regarded as rich cultural and tourism resources. This paper takes Guizhou Province, inhabited by ethnic minorities in Southwest China, as the research object. Considering the distribution of ICH and A-grade scenic spots in Guizhou, this paper used relevant data of ICH and tourism development to analyze the competitive situation of ICH and tourism in different cities.

Theoretical contributions and practical implications

The contribution of this study is to establish a series of mathematical calculating methods related to ICH and tourism resources. Firstly, through developing formulas that are mostly used to quantify and measure the abundance value of tourism and ICH resources, this study provides a quantitative analysis basis for analyzing the correlation between ICH and tourism resources. Secondly, the study created the matrix of ICH and tourism resources, which can be used to analyze the market competition of ICH and tourism. Furthermore, it can be used to identify the advantages and disadvantages of different countries and cities in utilizing ICH and tourism resources. Thirdly, the spatial distribution of ICH and tourism resources can be achieved through ArcGIS tools, which can provide reference for countries and cities to formulate development planning for cultural and tourism industry.

Although this study has explored the competition of ICH and tourism market in Guizhou Province from an empirical perspective through mathematical statistics analysis and spatial visualization analysis, there are also limitations in this study. On the one hand, as for the measurement of the abundance value and abundance ratio of tourism resources and ICH tourism resources, the method of using experts to determine the weight still has strong subjectivity. On the other hand, there is insufficiency in the depth of research, and the analysis on the impact of 10 different types of ICH on the tourism development is not enough. Finally, due to the epidemic, the data on the tourism development in Guizhou Province from 2020 to now are not complete, which is not conducive to the analysis of ICH and tourism competition in recent years. Therefore, the paper takes 2019 to study the spatial distribution and competition of ICH and tourism, and the selection of time is outdated to a certain degree.

Future research

ICH is not only the essence of regional culture, but also the core of promoting regional industry and city image. In the future research, on the one hand, poverty alleviation through ICH tourism and the spatial imbalance of ICH are two topics worth studying; On the other hand, more attention should be paid to the role of different types ICH in discovering urban connotation and shaping urban image.

Conclusion

The study analyzed the spatial distribution of ICH and tourism resources in Guizhou Province in 2019, as well as the competition of ICH and tourism. Research findings are as followed:

In terms of the structural characteristics of ICH in Guizhou Province, folk custom, traditional craftsmanship and traditional music have the highest number and proportion, while quyi has the lowest number and proportion. The reason is that Guizhou has typical karst landform and minority inhabited here.

As far as the spatial distribution of Grade A scenic spots and ICH scenic spots is concerned, Grade A scenic spots are mainly located in Zunyi City, while Tongren is the most sparsely distributed city and ranks last

in number; ICH tourism resources are mainly concentrated in Southeast Guizhou, Zunyi City, South Guizhou and Southwest Guizhou, which are inhabited by several ethnic minorities. Guiyang, the provincial capital, has the least number of ICH tourism attractions and the most sparse distribution. This is closely related to the regional economic and social development of each city, the focus of industrial development, and the concentration of ethnic minorities.

In terms of abundance values of Guizhou's tourism resources and ICH tourism resources, the abundance values of tourism resources are in the order of Zunyi City > Southeast Guizhou > South Guizhou > Bijie City > Southwest Guizhou > Guiyang City > Anshun City > Tongren City > Liupanshui City. The abundance values of ICH resources are as follows: Southeast Guizhou > Zunyi City > South Guizhou > Southwest Guizhou > Anshun City > Bijie City > Tongren City > Guiyang City > Liupanshui City.

As far as the spatial distribution of kernel nuclear density of national and provincial ICH in Guizhou Province are concerned, there is a large core area and multiple sub core areas in the geographical space of national ICH. The core area is located in the southeast of Guizhou. The secondary core areas are mainly in Guiyang City, Anshun City and southwest Guizhou. The provincial ICH sites forms a belt extending from southwest to southeast, which is distributed at the junction of southeast of Guizhou, Guiyang and Anshun.

As far as the spatial nearest neighbor of ICH resources are concerned, both the distribution of national-level and provincial-level ICH resources in Guizhou Province are generally aggregated.

In terms of competition between tourism and ICH development in Guizhou Province, Zunyi City and Southeast Guizhou show the development characteristics of "tourism prosperity-ICH tourism prosperity". Guiyang, Bijie, Anshun, Southwest Guizhou, Liupanshui and Tongren cities have shown the development characteristics of "tourism dedpression-ICH tourism dedpression". South Guizhou has shown the development characteristics of "tourism dedpression-ICH tourism prosperity".

Abbreviation

ICH Intangible cultural heritage

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Author contributions

BLD was responsible for conceptualization, data collection and quality, and formal analysis; KB was responsible for interpretation, visualization and methods. XLS was responsible for editing the manuscript. MTW was responsible for translation. YLcollected relevant data and made tables for explanation. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and analyzed during the current study are available from the author upon reasonable request.

Declarations

Competing interests

The authors of this article declare no potential competing interest.

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