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Cultural communication and diversity along the Grand Canal of China: a case study of folk songs in intangible cultural heritage

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Abstract

As a UNESCO World Heritage Site, the Grand Canal of China has a rich intangible cultural heritage along its route. The intangible cultural heritage of folk songs is an important representative. The study of its distribution characteristics and influencing factors is of practical and social significance for promoting the protection and development of intangible cultural heritage in relevant areas and the construction of the Grand Canal Cultural Belt. This paper uses the theories of musicology, geography, sociology, data statistical analysis and spatial analysis to analyze the distribution pattern of intangible cultural heritage items in the Grand Canal basin from the dimensions of geographical space and folk song genre, and from the perspective of natural and social conditions. The results show that the spatial distribution of folk songs in the Grand Canal basin shows a trend of "distribution along the river, two cores and two belts". Water system, landform and regional culture are the main influencing factors for the formation and dissemination of intangible cultural heritage of folk songs. At the same time, compared with the mountainous areas in western China, the economic and social development and frequent population flow in the Grand Canal basin lead to the diversified and unified musical culture characteristics of folk songs. Finally, this paper proposes the suggestions that the folk songs should be integrated into the local social and economic activities.

Keywords The Grand Canal of China, Folk songs, Intangible cultural heritage, Spatial characteristics, Causes analysis

Introduction

Intangible cultural heritage (ICH) is the accumulation of human culture and the witness of history [1]. Since the *Project of Rescue and Protection for the Oral and Intangible Heritage* was launched in 2002, after 20 years of continuous exploration and efforts, intangible cultural heritage protection work has formed a rich series of items, including national, provincial, municipal and county-level, which has achieved fruitful results [2]. Folk song is one of the artistic forms characterized by folk oral creation, oral performance and oral transmission. Its

musical, artistic, literary, social and other characteristics have a long history of influence on the development of folk culture and art [3].

The Grand Canal of China (GCC) is a great project created by working people in Chinese history, and it was recognized as a World Heritage site in 2014 [4]. For the first time in history, the GCC connected the north and south regions, promoted in-depth exchanges and integration in different regions in the fields of ideology, value forms, social concepts, production mode, culture, art, customs and customs, and promoted the comprehensive development of society, economy, science and technology and culture in the GCC basin [5–10]. Recently, there are a lot of research on the spatial distribution and influencing factors of intangible cultural heritage from the perspective of geography, including municipal [11, 12], provincial [13, 14], trans-provincial

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regions [15, 16] and even the whole country [17–19]. Compared with the valuable research on the ICH in China's natural river basins, such as the Yangtze River [20], Yellow River [21], Pearl River [22] and so on, there are few studies about ICH in the GCC basin, which is an urgent need for in-depth research and excavation [23].

In addition, from the perspective of genre based on the characteristics of music [24–26], Chinese folk songs can be divided into four genres, namely, *Haozi*(号子), *Shan'ge*(山歌), *Xiaodiao*(小调) and comprehensive. For the intangible cultural heritage of folk songs, the spatial analysis and research based on genre are extremely rare.

In view of this, this paper takes the GCC basin as the research area, and focuses on intangible items as the research object, spatial distribution law and influencing factors as the research content, and synthesizes musicology, geography, sociology and other theories and methods to excavate the GCC as the core of historical and cultural materials. Then, the deep connotation of folk-song ICH items in the GCC basin is brought to explain the relationship between folk culture and the human culture of GCC to provide a useful reference for the protection and development of the region.

Research methods

Study area

The GCC basin is an important area connecting northern and southern China. It consists of three parts: the Beijing-Hangzhou Canal, the Sui-Tang Canal and the East Zhejiang Canal. Eight provinces, such as Hebei, Shandong, Jiangsu, Zhejiang, Henan, and other provinces, are called the Canal Provinces of GCC in this paper. Therefore, the cities along the route are called as the Canal Cities, such as Beijing City, Tianjin City, Langfang City in Hebei Province, Cangzhou City in Hebei Province, Hengshui City in Hebei Province, Xingtai City in Hebei Province, Handan City in Hebei Province, Dezhou City in Shandong Province, Liaocheng City in Shandong Province, Tai'an City in Shandong Province, Jining City in Shandong Province, Zaozhuang City in Shandong Province, Xuzhou City in Jiangsu Province, Suqian City in Jiangsu Province, Huai'an City in Jiangsu Province, Yangzhou City in Jiangsu Province, Zhenjiang City in Jiangsu Province, Changzhou City in Jiangsu Province, Wuxi City in Jiangsu Province, Suzhou City in Jiangsu Province, Huzhou City in Zhejiang Province, Jiaxing City in Zhejiang Province, Hangzhou City in Zhejiang Province, Shaoxing City in Zhejiang Province, Ningbo City in Zhejiang Province, Puyang City in Henan Province, Anyang City in Henan Province, Hebi City in Henan Province, Xinxiang City in Henan Province,

Jiaozuo City in Henan Province, Luoyang City in Henan Province, Zhengzhou City in Henan Province, Kaifeng City in Henan Province, Shangqiu City in Henan Province, Huaibei City in Anhui Province and Suzhou City in Anhui Province. All 36 cities are in the core of the GCC Basin, which is also the regional scope in this paper.

Data sources

ICH items of folk songs are divided into national, provincial and municipal levels according to their grades, mainly concentrated in the categories of TRADITIONAL MUSIC in the ICH list. The statistical time is until September 2022. In the national-level of folk-song ICH items, there are six items in the GCC basin, according to the list of national ICH items published by the State Council of China before [27]. In the provincial-level, there are 27 items, according to the lists of ICH items published by the Canal Provinces. In the municipal-level level, there are 109 items, according to the lists published by the Canal Cities.

To improve the accuracy of the data, in this paper, the statistical data are processed as follows:

- (i) If there are several items appearing in multilevel lists, only count once at the highest level.
- (ii) If the national or provincial item is jointly organized by multiple cities as applicants, split it by municipal cities.
- (iii) If the national item is directly declared by one province without the municipal declaration organization, take the people's government of the related provincial capital city as the applicant.
- (iv) Obtain the geographic location coordinate information of the ICH items from the online map (such as map.google.com), according to the names of applicants. If the name of the applicant is not detailed, take the address of the people's government instead.

After the raw data were processed, the valid data were as follows: 6 items in national-level folk-song ICH, 21 items in provincial level and 83 items in municipal level. These 110 items were used as the basic data of this paper, as shown in Table 1.

Research technique

This study analyzes the level and type structure of folk-song ICH items in the GCC basin through statistical and spatial analysis, including the kNN (k-Nearest Neighbor) calculation method and the KDE (Kernel Density

Table 1 Statistics of folk-song ICH items of the Canal Provinces

	Beijing	Tianjin	Hebei	Shandong	Jiangsu	Zhejiang	Henan	Anhui	Subtotal
National-level	–	–	–	–	4	1	1	–	6
Provincial-level	1	1	1	6	4	6	2	–	21
Municipal-level	–	–	12	13	23	22	13	–	83
Total	1	1	13	19	31	29	16	–	110

Estimation) method to analyze the nuclear density and the multidisciplinary analysis method to analyze the causes of natural geography, human environment and economic level.

kNN algorithm

The geographic coordinates of intangible cultural heritage are taken as point data. There are three types of spatial distribution of point data: uniform, random and condensed, which can be distinguished by nearest neighbor distance and nearest neighbor index [28].

Nearest distance is a geographical indicator that indicates the degree of mutual proximity of point objects in geographical space, which can be expressed by the following formula:

$$\bar{r}_E = \frac{1}{2\sqrt{n/A}} = \frac{1}{2\sqrt{D}}$$

$$R = \frac{\bar{r}_1}{\bar{r}_E} = 2\sqrt{r_1 D}$$

where \bar{r}_E is the theoretical nearest distance, r_1 is the distance between each point and its nearest neighbor, A is the area, n is a number of the point data, D is the point density and R is the nearest point index.

When the index $R < 1$, the distribution of the point data is cohesive. When the index $R > 1$, the distribution is homogeneous. When the index $R = 1$, the distribution is random.

KDE method

Kernel density estimation is used to calculate the density of point data in its surrounding neighborhood. It uses the kernel function to calculate the quantity value per unit area based on point or polyline elements. The estimation of kernel density can directly reflect the specific gathering place and degree of intangible cultural heritage [29].

The expression of kernel density estimation is following:

$$f(x) = \frac{1}{nh} \sum_{i=1}^n K\left(\frac{x - X_i}{h}\right)$$

where $K()$ is the kernel function, n is the total number of ICH items, h is the bandwidth, and $x - X_i$ is the distance from estimated point x to ICH point X_i .

Spatial characteristics

Provincial distribution

Data statistics

Statistics are conducted according to the four dimensions of provincial administrative region, level, and publication year. The statistical results of the folk song ICH items are obtained, as shown in Table 1. In this table, the following conclusions are drawn:

- (i) From the perspective of provincial administrative regions, the items in Jiangsu Province and Zhejiang Province are the highest, with a total of 60 items, accounting for approximately half of the total.
- (ii) From the perspective of level, national-level, provincial-level and municipal-level items account for approximately 5%, 20% and 75% of the total, respectively, shown as a pyramid structure.
- (iii) From the perspective of time, 7 items were announced in the period from 2005 to 2006 (when the first list of national-level ICH was published), 32 items in the period from 2007 to 2008 (the second list), 32 items in the period from 2009 to 2011 (the third list), 11 items in the period from 2012 to 2014 (the fourth list), and 14 items from 2015 to the present (the fifth list in 2021). See Fig. 1 for the annual distribution.

Comprehensive analysis shows that the folk-song ICH items in the Grand Canal basin are mainly concentrated in Jiangsu and Zhejiang Provinces; on the other hand, it also reflects the unbalanced distribution among regions; most of the items have great historical value and social influence, and a quarter of the items are also national or provincial. In addition, the declaration and announcement of ICH items are mainly concentrated before 2011, and since then, Henan, Jiangsu, Shandong, Hebei and other places still have a growth trend.

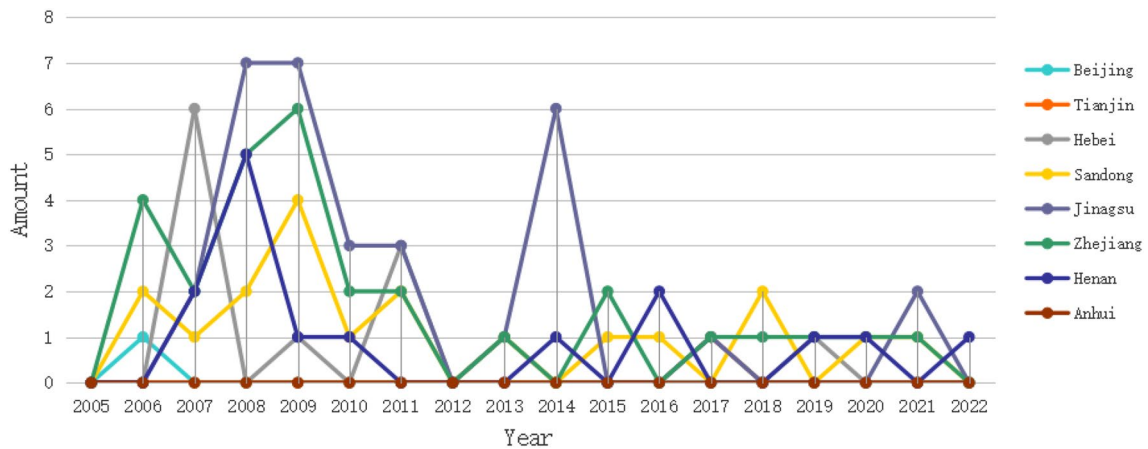


Fig. 1 Annual distribution of Folk-song ICH items in the Canal Provinces

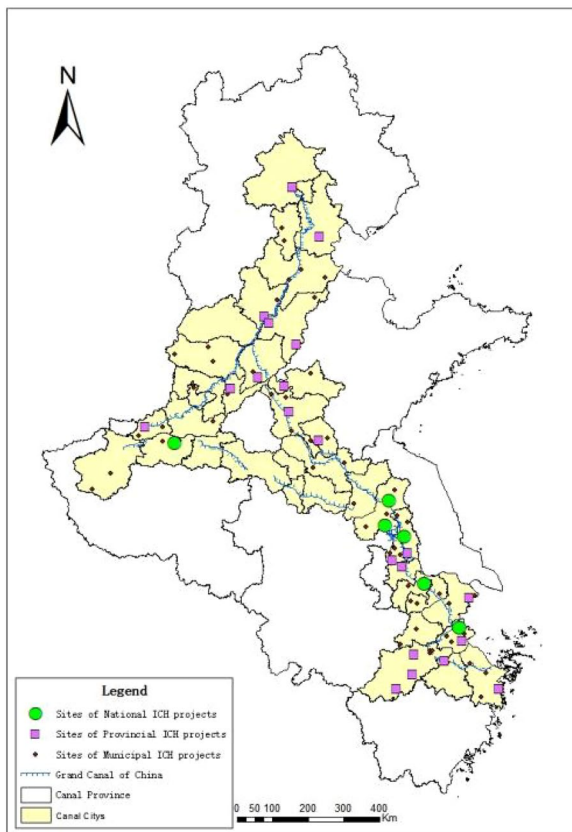


Fig. 2 Geographical distribution of folk song ICH items

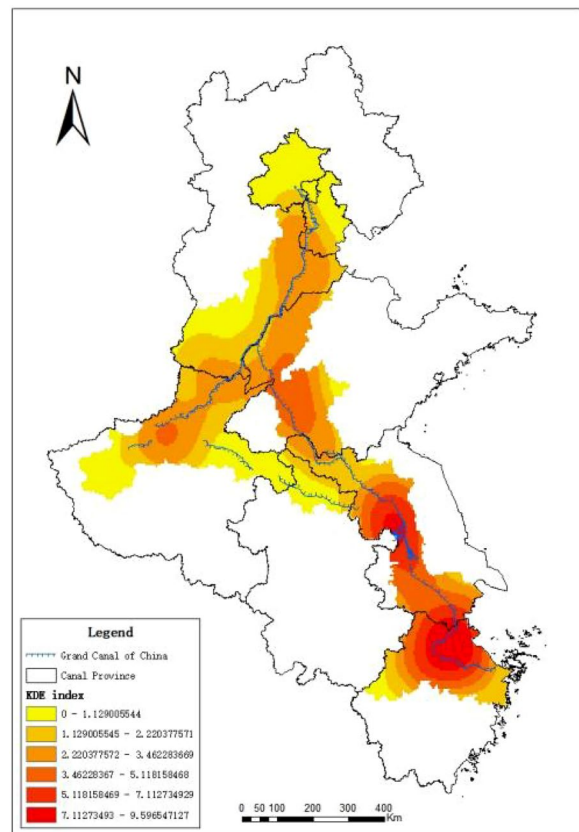


Fig. 3 Density distribution of ICH items in provinces

Geographical distribution

According to the geographic coordinate information of the applicants of the ICH item, the geographical distribution map of the folk-song ICH items in the GCC is generated by GIS software, as shown in Fig. 2. Through the distribution map, it can be intuitively concluded

that the ICH items form a more obvious aggregation and distribution along the canal. Subsequently, the spatial analysis tool of GIS can calculate the index of the nearest neighbors of the ICH items as $R=0.38$, far less than 1, and $Z=-17.43$, $P=0$, which indicates that the

spatial agglomeration of the folk-song ICH items is strong [30].

Through the density analysis tool of GIS, the nuclear density distribution map of the folk song ICH items in the GCC can be obtained, as shown in Fig. 3. As seen by the density distribution map, the distribution characteristics of folk-song ICH items can be described as "two cores and multiple zones along the canal". Specifically:

- (i) One core area is the central part of Jiangsu Province. Here, it can be called **Core#1**, including Huai'an and Yangzhou. Many well-known national-level ICH items are located in the Core #1 region, such as *Jinhu Yangko*(金湖秧歌), *Gaoyou folk songs*(高邮民歌), *Nanzha folk songs*(南闸民歌), etc. Provincial-level items, such as *NanxiangTiange*(南乡田歌), Shao boyang Song(邵伯秧号子), and *Yangzhou folk songs*(扬州民歌).
- (ii) Another core area is the southern part of Jiangsu Province and the urban agglomeration around Hangzhou Bay in Zhejiang Province. Here, it can be called **Core #2**. This area is rich in many kinds of field songs, chanting tunes, fishing songs, *Haozi*(号子) songs, *Xiaodiao*(小调) songs and so on.
- (iii) South of Hebei Province, northeast of Henan Province and west of Shandong Province have formed a belt-shaped dense area, called **Belt #1**. As the region is located at the border of the above provinces, it is rich in *Haozi*(号子) songs and *Xiaodiao*(小调) songs.
- (iv) Beijing, Tianjin, southern Hebei Province and northwest Shandong Province are in another belt-shaped dense area, called **Belt#2**, with many *Haozi*(号子) songs from the boatman in the canal.

Municipal distribution

Data statistics

According to the database of 36 cities, the statistical results of the number of folk song ICH items in each city are shown in Table 2, with the following conclusion:

- (i) There are 110 items for folk-song ICH in 36 cities, with an average of approximately three items per city.
- (ii) The top 6 cities are Huai'an, Jiaxing, Yangzhou, Jining, Shaoxing, Dezhou, Hangzhou and Ningbo, with 57 items as the subtotal amount, more than one-half of the total number.
- (iii) There are 5 cities with national-level ICH items, which is one-seventh of the total number of cities.
- (iv) Seventeen cities have provincial-level ICH items, which is one-half of the total number of cities.

Geographical distribution

GIS software was used to further generate the municipal distribution map of the folk-song ICH items in the GCC, as shown in Fig. 4. Similar to the provincial distribution map, the municipal distribution map shows the geographical aggregation characteristics of folk song and the differences between cities more accurately in terms of granularity. It is worth noting that according to the law of gradient distribution from the center to the periphery in the cluster area, in the case of the Core #2 area, it radiates to Suzhou, Huzhou, Hangzhou, Shaoxing and Ningbo, with Jiaxing as the center. However, in the case of Core #1, it did not spread to the north from the center of this area, namely, Huai'an, that is, the amount of folk-song ICH items in Suqian declines drastically in Table 2, and the reason needs further study.

The structural distribution of different levels of items in each Canal City is shown in Fig. 5. Similar to the data statistics above, Huai'an, Jiaxing and Yangzhou not only have a large number of folk-song ICH items but also have

Table 2 Statistics of folk song ICH items of the Canal Cities

City	Amount	City	Amount	City	Amount	City	Amount
Huai'an	10	Cangzhou	4	Liaocheng	2	Tianjin	1
Jiaxing	10	Jiaozuo	4	Zaozhuang	2	Suqian	1
Yangzhou	9	Handan	3	Xuzhou	2	Xinxiang	1
Jining	7	Tai'an	3	Zhenjiang	2	Kaifeng	1
Shaoshing	6	Wuxi	3	Changzhou	2	Xingtai	0
Dezhou	5	Suzhou*	3	Puyang	2	Anyang	0
Hangzhou	5	Huzhou	3	Hebi	2	Shangqiu	0
Ningbo	5	Zhengzhou	3	Luoyang	2	Huaipei	0
Langfang	4	Hengshui	2	Beijing	1	Suzhou2**	0

* Stands for Suzhou(苏州) in Jiangsu Province, while ** is Suzhou2(宿州) in Anhui Province

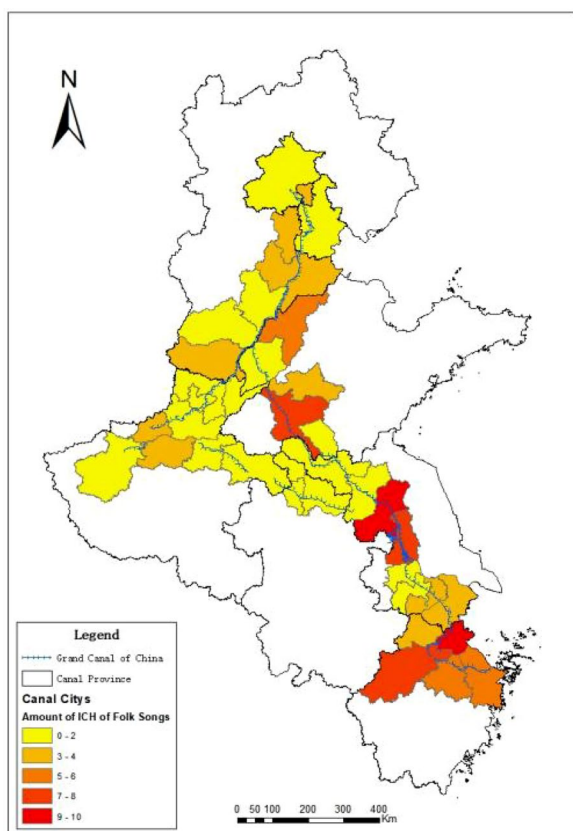


Fig. 4 Spatial distribution of folk song ICH items in terms of cities

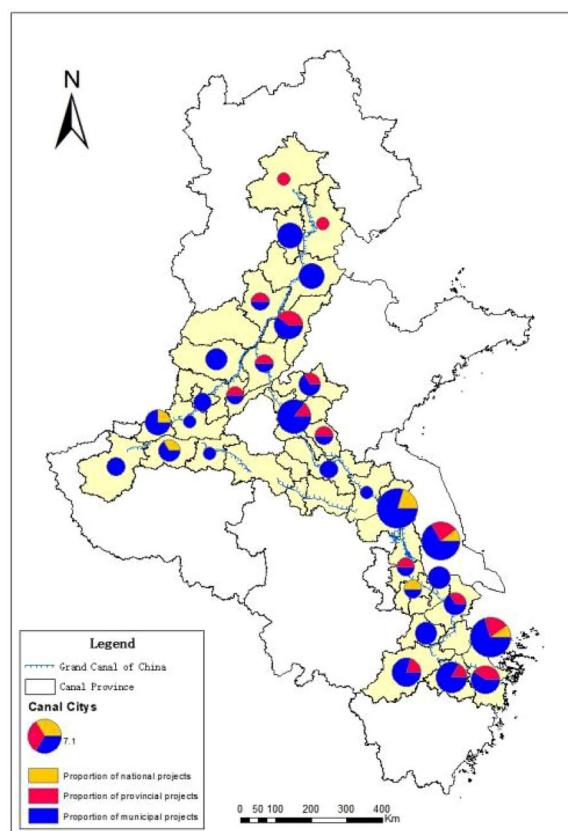


Fig. 5 Level structure distribution of folk-song ICH items in cities

a relatively balanced distribution of national, provincial and municipal tertiary structures.

Genre distribution

Data statistics

Among the 110 items for folk-song ICH in this paper, 47 items are classified as *Haozi*(号子)-genre, 16 as *Shan’ge*(山歌)-genre, 32 as *Xiaodiao*(小调)-genre and 15 as comprehensive.

Geographical distribution

According to the geographic coordinate information of each item applicant, the genre distribution map based on GIS is obtained, as shown in Figs. 6, 7, 8 and 9.

Figure 6 shows that the *Haozi*(号子)-genre ICH items are mainly concentrated in Shandong, Jiangsu, and Zhejiang. There are 7 items, named *GCC-Haozi*(运河号子) songs, which means these items are the unique folk songs in China. In Fig. 6, these *GCC-Haozi*(运河号子) songs are represented by orange dots and are mainly concentrated in the northern part of the GCC.

As shown in Fig. 7, the *Shan’ge*(山歌)-genre ICH items are mainly concentrated in Jiangsu and Zhejiang Provinces, and the distribution characteristics are also related to the local natural geography and cultural environment, such as *Jinhu Yangko*(金湖秧歌), *Jiashan TianGe*(嘉善田歌), and *Nanxiang TianGe*(南乡田歌) [31].

Figure 8 shows that the distribution of *Xiaodiao*(小调)-genre ICH items is relatively balanced, among which the local *Xiaodiao*(小调) items, such as *Suzhou Xiaodiao*(苏州小调), *Hangzhou Xiaodiao*(杭州小调) and *Huaiyin Xiaodiao*(淮阴小调), are full of their unique musical style and profound cultural deposits. In addition, as a form of reciting classical poetry and prose in the form of music, intonation is concentrated in areas where poetry culture is more prevalent, such as *Changzhou Intonation*(常州吟诵), *Suzhou Intonation*(苏州吟诵), *Wuxi Tang Intonation*(无锡唐调), etc.

Figure 9 shows that the comprehensive genre ICH items are mainly concentrated in Huai’an and Yangzhou in central Jiangsu Province, which have rich music cultural heritage and diverse genres. Therefore, these items are often named by region, such as *Gaoyou Folk*

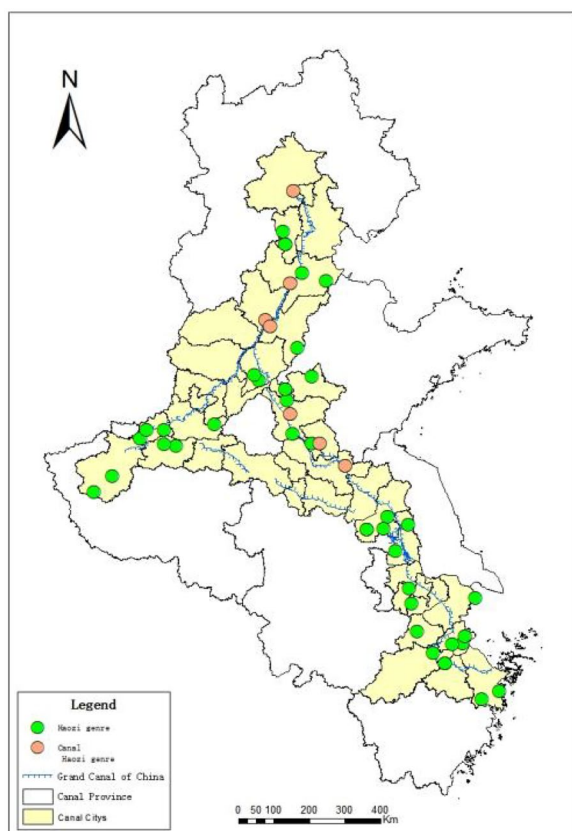


Fig. 6 Haozi-genre distribution of ICH items

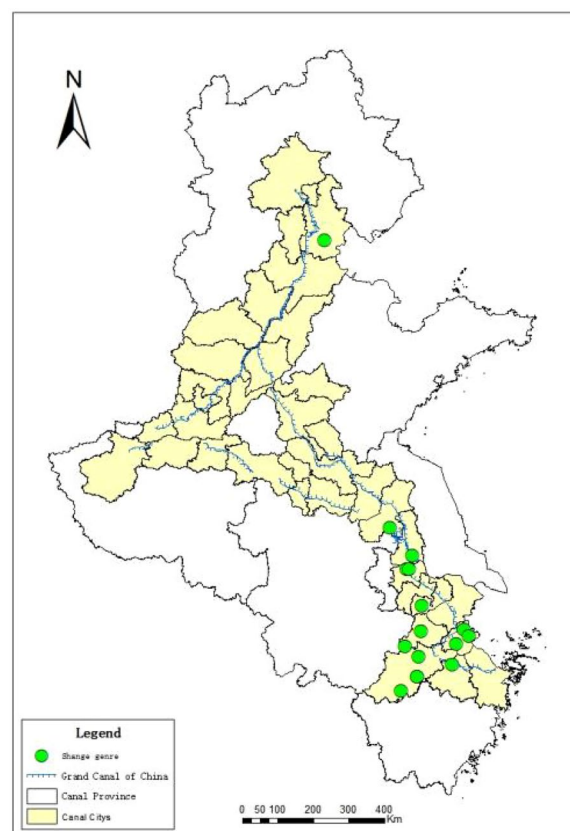


Fig. 7 Shan'ge-genre distribution of ICH items

Songs(高邮民歌), *Nanzha Folk Songs*(南闸民歌), *Yangzhou Folk Songs*(扬州民歌), etc.

Causes analysis

The formation and spatial distribution of folk song ICH items in the GCC basin are comprehensively influenced by a variety of factors. Based on the research literature on ICH items and the actual situation of the GCC basin, this paper will analyze the spatial distribution of folk song ICH items in the GCC Basin from the perspective of natural conditions and social conditions.

Natural conditions

Rivers

Water resources have been the primary factor for people to choose to live together since ancient times, and human civilization is often based on rivers. Although the direct purpose of the GCC is transportation, it brings about the gathering of population and the emergence and dissemination of culture, thus forming rich material and spiritual civilization. The role of the water system in the promotion of cultural

communication has formed a consensus. The GCC connects the Haihe River, Yellow River, Huaihe River, Yangtze River and Qiantang River in the order of north to south. The accumulation and precipitation of culture and wisdom in the nearly 2000 years in the GCC basin not only promotes the formation of the intangible culture of folk songs but also realizes the mutual absorption and integration of different regions in the dissemination and circulation. According to the above spatial distribution characteristics, on the one hand, the distribution of folk song ICH items along the canal is obvious. On the other hand, the high-density cluster areas are related to the natural water system.

For example, the Core#1 and Core#2 areas are located in the lower reaches of the Huaihe River and the lower Yangtze River, respectively. Belt#1 and Belt#2 are located in the lower reaches of the Yellow River and Haihe River. There are large lakes in each core area, such as Taihu Lake in Core#2 area, Hongze Lake, and Gaoyou Lake in Core#1 area. Therefore, it can be said that rivers are one of the important factors affecting the spatial distribution of ICH items of folk songs.

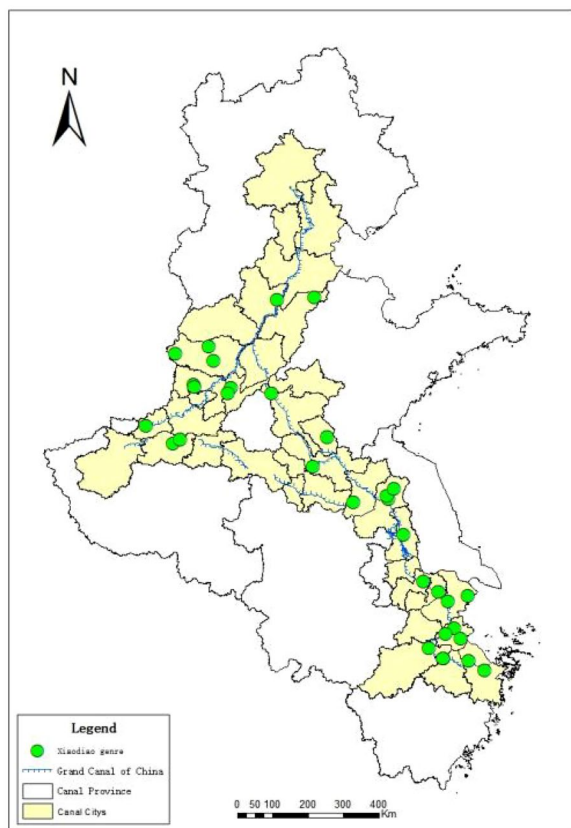


Fig. 8 Xiaodiao-genre distribution of ICH items

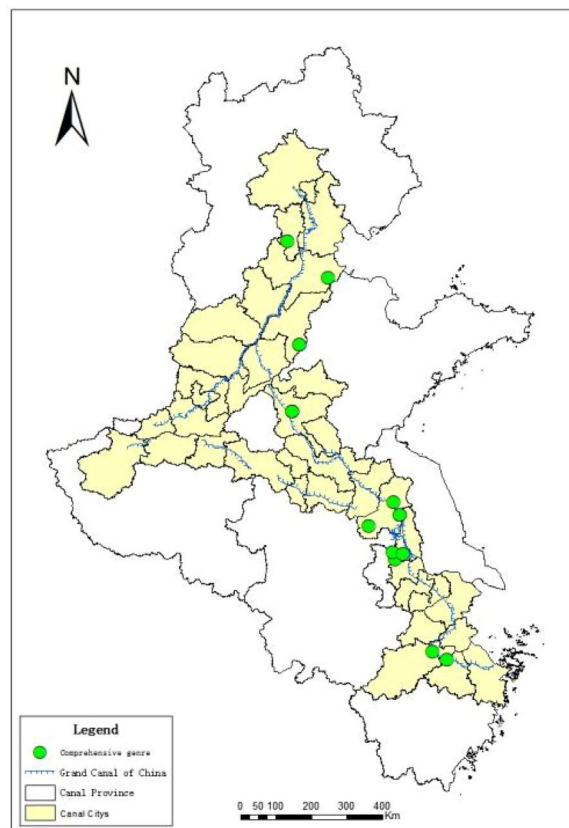


Fig. 9 Comprehensive-genre distribution of ICH items

Landform

The GCC is located in the east of the alluvial plain of China, by the Yellow River, Huai River, Haihe River and the Yangtze River, through the terrain of the North China Plain, Shandong Hills, Jianghuai Plain, Zhejiang-Fujian Hills. Based on the topographic distribution of China and related canal mapping data [32], this paper has produced a schematic coupling diagram between the distribution and topography of folk-song ICH items in the GCC Basin, as shown in Fig. 10. According to the topographic map and the longitudinal section along the GCC, the following can be seen:

- (i) In the northern section of the GCC, such as the Beijing-Tianjin section, Tianjin-Linqing section, and Linqing-Xuzhou section, as the fluctuation difference increased, the *Haozi* (号子) songs needed manpower to participate in shipping, which helped humans work together. It can be said that the boatman songs in the folk song ICH items are concentrated in this area, which has a great influence on the landform of the area.
- (ii) The south section of the GCC is relatively flat and crisscrossed with lakes, known as the "land of

plenty of fish and rice". In particular, the Jianghuai Plain area was an important grain-producing area in the *Ming-Qing* (明清) dynasties and is known as the "granary of China". Therefore, the plant-product industry in this area has been developed. The *Jinhu Yangko* (金湖秧歌), *Gaoyou Folk Songs* (高邮民歌), *Nanzha Folk Songs* (南闸民歌), *Xupu Agricultural Songs* (胥浦农歌), *Shaoboyang Haozi* (邵伯秧号子), *NanxiangTianGe* (南乡田歌) and other folk-song ICH items all come from here.

- (iii) The hilly areas where the GCC passes, such as Jinjing in Shandong Province and Huzhou and Jiaying in Zhejiang Province, are characterized by mountains and rivers. Therefore, it has also created a variety of folk song ICH items, such as *Jining Folk Songs* (济宁民歌), *Hangzhou Xiaodiao* (杭州小调), *Huzhou Folk Songs* (湖州民歌), and *Changhua Folk Songs* (昌化民歌).

Compared with other regions in China, the GCC basin is located in the third step of China (the part extending from the mainland to the sea naturally), with an elevation below 500 m. The overall terrain is flat, and people have

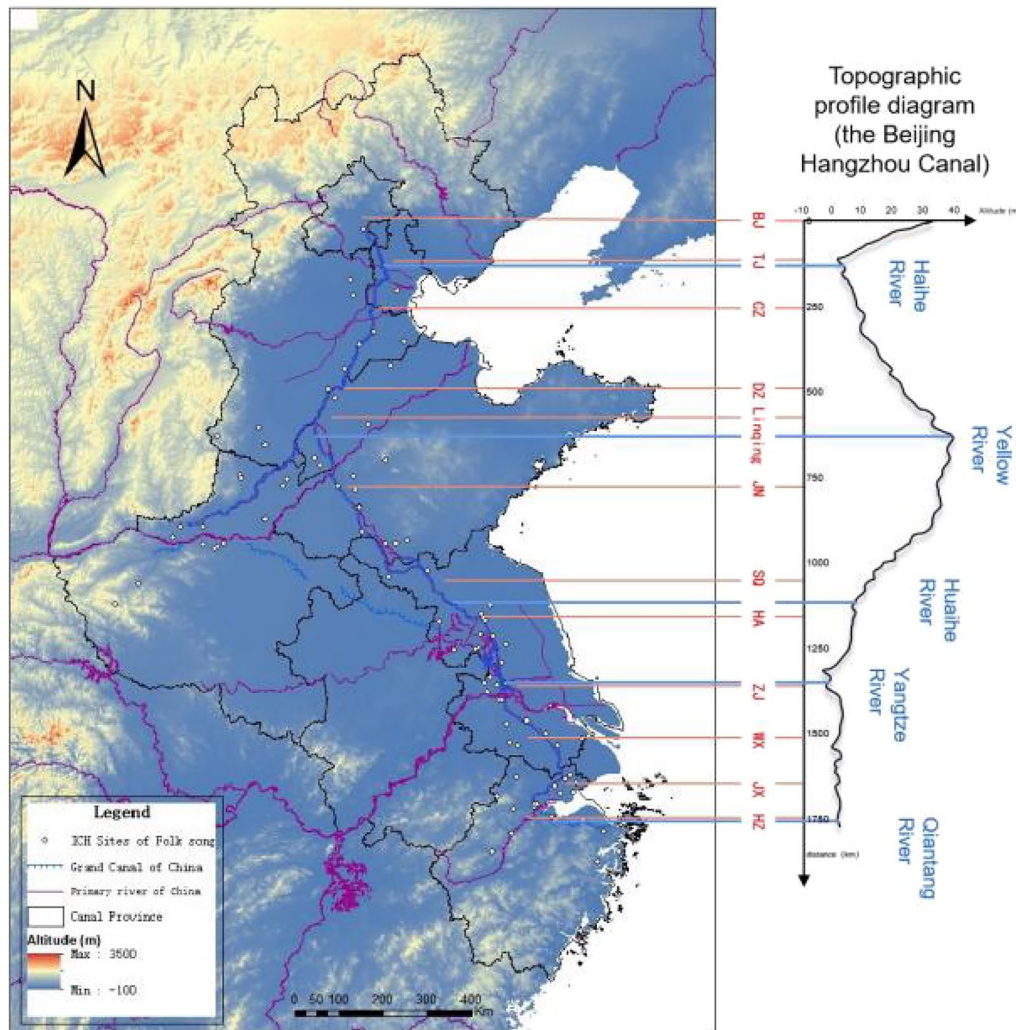


Fig. 10 Relationship between the spatial distribution and landform

a broad vision. The folk song style is typical of the subtle and euphemistic minor genre with a stable rhythm, which reflects the balanced spatial distribution of ICH items in *Xiaodiao*(小调) and comprehensive genres.

Climate

The impact of climate on the distribution of folk song ICH items in the GCC basin is mainly reflected in the differences between the north and the south of the GCC basin on the style of folk songs; that is, the north section of the GCC is in the Southern Temperate Monsoon Climate zone, whose climate is characterized by drought, less rain and distinct seasons. Therefore, the characteristics of northern folk songs are bold and unrestrained, with a lively rhythm, and the interval is dominated by jump forward. Meanwhile, the southern

section of the GCC is in the Northern and Middle Subtropical Monsoon Climate zone, with moist, mild and evergreen climate characteristics. Therefore, the lyrics of the southern folk songs are implicit, the style is beautiful, and the melody is mainly tortuous and progressive.

In addition, the cultural differences between the north and the south and the laws of social migration under the influence of climate also affect the spatial distribution of folk song ICH items in the GCC basin.

Social conditions

Regional culture

Different geographical environments, living environments and historical development backgrounds have formed a variety of cultural areas for a long time. The folk-song ICH items in the Grand Canal basin have

typical regional characteristics, which are not only the direct reflection of regional culture, but also the epitome of the geographical distribution and style characteristics of regional culture. The lyric content, tunes and singing methods all have regional labels:

- (i) According to the division of traditional culture in China [33], the folk song ICH items in the GCC basin are highly concentrated in the subregions of *Wuyue Culture* (吴越文化), *Jianghuai Culture* (江淮文化), *Central Plains Culture* (中原文化), *Qilu Culture* (齐鲁文化), *Yanzhao Culture* (燕赵文化). The quantity and variety of folk-song ICH in the subregion of Wuyue culture is both high, which reflects people's extensive pursuit of art, because of ample food and clothing in this area. The folk songs in subregion of Jianghuai culture has a mixed style of southern and northern songs due to its geographical position. The ICH items in the Central Plains subregion highlight the agricultural color and historical tradition, such as labor chant, poetry chanting. In the subregion of Qilu culture, the lyrics content of the intangible cultural heritage of folk songs shows the Confucian culture. The intangible cultural heritage of folk songs in the subregion of Yanzhao culture reflects the integration characteristics of opera style, which is because of its long history and culture.
- (ii) In terms of song materials and style, The folk-song ICH in the southern section of the canal are mainly lyrical, and the expression methods of lyric and pun homophonic cases are widely used, represented by men–women duets and songs of the four seasons, which is famous for its fresh and lively style. In contrast, the folk-song ICH in the north section of the canal have a wide range of themes, not only in the circle of family life, but also in many ways reflect social life. The content of songs is sharp and fierce, and conveys the aspirations of the people, described in a rough and vigorous style.
- (iii) As an important symbol of regional culture, dialect also have a significant impact on folk-song ICH. According to the division of the Chinese dialect areas in China [34], the GCC basin involves several dialect areas, namely, *Northern Mandarin* (北方官话), *Zhongyuan Mandarin* (中原官话), *Jianghuai Mandarin* (江淮官话) and the *Wu dialect* (吴语) region. The characteristics of different dialects in terms of pronunciation, tone, local embedding, appellation and exclamation language, naturally come to the folk songs, thus forming the regional differences of folk-song ICH. For example, there are a lot of interlocutors and mood words in folk-song ICH in the northern, but not in the south. In

addition, dialect directly affects the time and space range of the spread of folk song ICH items in the GCC basin.

Social migration

From a historical perspective, the opening of the Grand Canal has broken the confrontation between the North and the South in China since ancient times, provided favorable transportation conditions for cultural communication between the North and the South, promoted the formation of the pattern of cultural pluralism and integration of the Chinese nation, and shortened the distance between people's social activities. Compared with other regions, the north–south two-way population migration in the flow region is more frequent and has obvious characteristics, and the urbanization process in the GCC basin is faster. The canal has brought about a great convergence of the population, and an emerging canal city is the convergence point [35].

In this context, the changes and development of the urban population objectively also play a role in promoting the spread of ICH items such as folk songs, which are typical representatives of living culture. For example, in the history of the GCC basin, many waves of immigrants brought about by wars, dynastic changes and natural disasters have had a profound impact on the folk songs in the places they pass by, realizing the transformation and integration of the "Southern and Northern Mixed Tune", bringing about the mutual penetration of the modes and melodies of northern folk songs and southern folk songs. For another example, thanks to the flourishing status of Linqing in Shandong Province in the prosperous period of the GCC, as an art genre with both folk songs and folk operas, *LinqingShidiao* (临清时调), one of the ICH items, has been influenced northward by many folk artists, especially in Beijing and Tianjin.

Economic development

Due to historical reasons, the urban pattern along the GCC is often referred to as "politics in the north and economy in the south". The original intention of the GCC is naturally inseparable from the economic foundation of the places it passes through. The cities along the GCC are rich in people's livelihood, such as grain, salt, wood, and building materials, which is objectively the recognition of the industrialization and agricultural development level of the cities along the GCC throughout history. With the prosperity of water transport by the canal, in turn, it has brought vitality to the commodity trade and economic development of the cities along the canal. Many cities

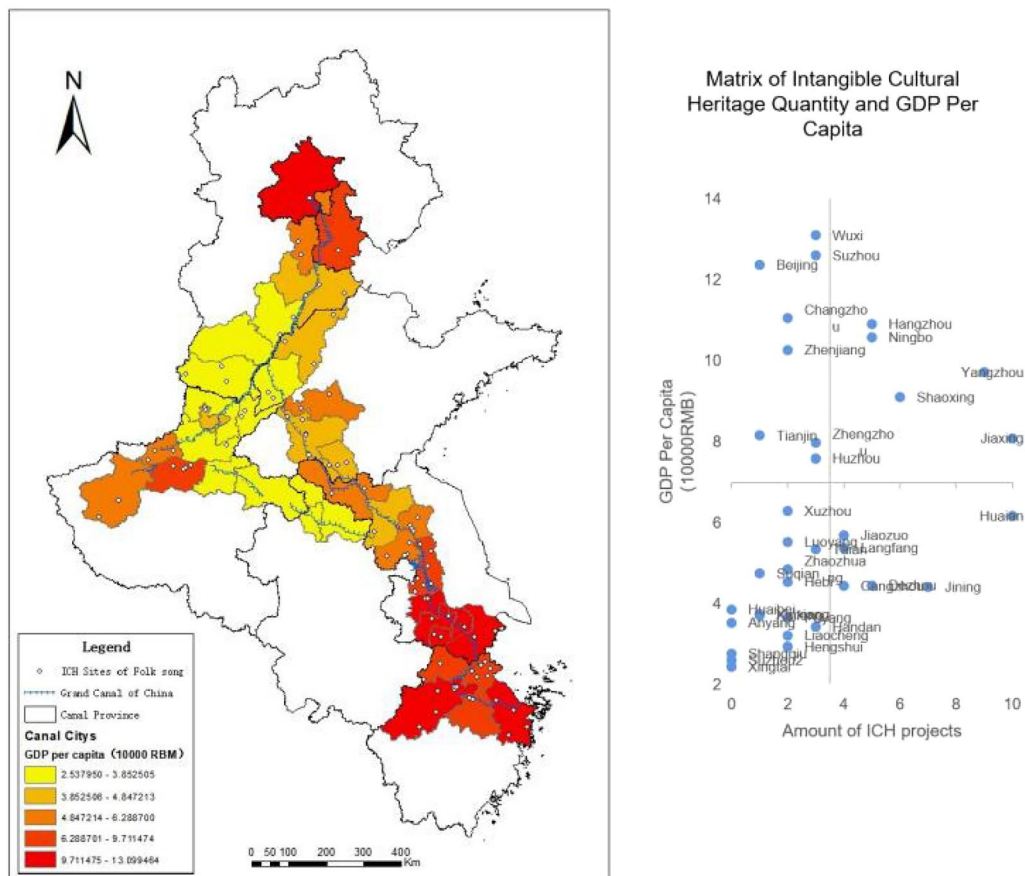


Fig. 11 Relationship between the spatial distribution and the economic level

were built and prospered because of the canal, and even in the late period of canal transport, some cities declined because of the canal. The prosperity of commerce and trade also stimulated the spread of art, including folk songs. Many merchants who went north and south along the canal also brought the folk music of their hometown to various places. The theater built along the canal also became a place for business banquets, rest and entertainment.

According to the GDP per capita data of Canal Cities, which are obtained from the China Statistical Yearbook website [36], the relationship between folk-song ICH items and local economic development can be better presented, as shown in Fig. 11. It can be seen from the figure that:

- (i) In the first quadrant, the number of ICHs in Hangzhou, Ningbo, Yangzhou, Shaoxing and Jiaxing are positively correlated with the economic level.
- (ii) In the second quadrant, the number of ICHs in Beijing, Changzhou, Zhenjiang, Tianjin and other

cities is negatively correlated with their economic level. This shows that although these cities have developed rapidly in economy, the cultural heritage of folk songs is relatively weak.

- (iii) In the third quadrant, most cities fall into this category. Both the number of ICHs and the economic level are lower than the average. Relatively speaking, these cities have no obvious regional advantages, single economic means, relatively inactive population flow, and insufficient cultural relics of original folk songs.
- (iv) In the fourth quadrant, there is a negative correlation between the number of ICHs and the economic level. The main reason is that these regions have much cultural precipitation throughout history, but the contemporary process of economic development is relatively slow due to location and other reasons. However, in history, these cities prospered due to the canal transport. In the Yuan, Ming and Qing Dynasties, these areas'

commerce and economy were prosperous, and the cultural resources of folk songs were abundant, which verified the promoting role of economic development on the folk-song ICH from the historical perspective.

In summary, it can be concluded that the economic level has a positive role in promoting the formation of folk song ICH items. In economically developed areas, people have greater spiritual and cultural needs, the tertiary industry develops rapidly, and the financial funds of local government are sufficient, so more attention is given to the excavation, protection and inheritance of ICH items.

Discussion

Nothing can ignore its internal and external links. Folk-song ICH items do not change the attributes of cultural exchange. Since its birth, folk songs have the affinity of grassroots culture and market culture. Only in the process of transformation and integration can the social functions and values of folk songs be released. As the object of intangible cultural heritage protection, they can also have a wider inheritance space with a broader perspective, which is just the embodiment of the open and inclusive characteristics of the GCC culture. ICH items, including folk songs, can be effectively integrated into the local culture, tourism and other economic and social industries to better and more sustainably realize the win–win of economic development, social progress and the protection and inheritance of folk-song ICH items. In this regard, the development experience of some cities in the southern section of the GCC that integrate canal culture into the tertiary industry is worthy of in-depth study and reference.

The spread and integration of folk songs along the GCC

According to the published folk songs [37], there are more than 7600 folk songs in the Canal Provinces and more than 1800 folk songs located in the Canal Cities of China. These rich and valuable folk song resources are one of the important carriers of GCC culture and the corpus for the study of GCC folk song culture.

The folk songs in the GCC basin reflect the cultural life, local customs, spiritual temperament and aesthetic psychology of the working people, which closely link the culture along the canal and are an organic part of the GCC culture.

Compared with the traditional folk songs divided by the natural geography of the *Yangtze River* (长江), *Yellow River* (黄河), *Dabie Mountains* (大别山), etc., the research on folk songs in the canal basin has some problems, such

as incomplete system, insufficient height, regional imbalance, etc. Promoting the cultural construction of the GCC has important theoretical and social significance.

If natural conditions such as topography and landform affect the formation of the original ecological ecology of regional folk songs, transportation is an important channel to spread them. It provides acquired conditions for the influx of external culture and the prosperity of local culture. The GCC is the main artery of transportation between the north and the south in modern China. It not only plays an important role in supporting the logistics and economic development of the north and the south but also brings convenient conditions for the cultural exchange of folk songs.

Compared with the Yangtze River, Yellow River and Pearl River with similar lengths and magnitudes, the folk-song ICH items in the GCC basin are distributed more evenly by province. On the one hand, people from different regions spread the folk songs of their hometowns vertically along the north and south of the canal, and the evolution of the cognate songs is especially common in the GCC basin. On the other hand, with the horizontal expansion of people along the production and living areas, the north–south folk songs spread horizontally from east to the west with the GCC as the axis, further affecting the formation, reference and evolution of folk song culture in a larger region.

In addition, the rapid development of modern opera is inseparable from the promotion of the GCC. For example, *Changsheng WEI* (魏长生), a famous artist in the history of China, forced his troupe to go south along the canal, absorbing local art forms, including folk songs wherever he went, which in turn promoted the exchange and reference of various local operas. At the same time, Hui opera, which was integrated from Huizhou folk songs, was transported to Beijing along the GCC during the reign of Emperor *Qianlong* (乾隆皇帝) of the Qing Dynasty, and a number of operas were developed where it passed.

Folk-song culture enriched the cultural connotation of GCC

The GCC culture is a regional culture of the Chinese nation, which has a wide range of regions from north to south, long-term accumulation, and rich and colorful contents. The GCC culture is a cross-regional and cross-era cultural product. It mixes several cultures of the regions it flows through, forming a whole cultural system characterized by inclusiveness, openness and unity with water, banks and cities as its spatial forms. Rich religious beliefs, local customs, traditional customs, academic thoughts, literature and art are also the core of the intangible culture of the GCC.

With the rapid development of urbanization in China in recent years, the original geographical space of ICH has changed, and young people tend to flow to cities. The inheritors of ICH are also facing the shortage, and the ICH items of folk songs rely on oral transmission. Especially in municipal-level items, there is too much pressure for inheritance. However, in some economically underdeveloped areas with inconvenient transportation, although economic and social development is limited, the original authenticity of ICH items has been well preserved due to infrequent population mobility and less impact of commercialization on local culture. On the other hand, society is also full of excessive packaging and excessive commercialization of ICH products. These are easy to make people misunderstand the ICH items of folk songs; that is, they should be protected in a closed way to retain their original flavor and avoid external impact and influence. There are several suggestions proposed in this paper:

- (i) For cities where folk-song ICH is relatively poor, fieldwork should be invested more deeply and widely, to extensively collect and sort out relevant historical materials, and actively apply for ICH items.
- (ii) More training of inheritors of folk-song ICH is needed, as well as the digital protection of folk-song ICH. In particular, music colleges should shoulder the responsibility of inheritance of folk-song ICH, so as to ensure that their original authenticity is retained under the impact of pop music and western music.
- (iii) In an appropriate combination with market operation, the folk-song ICH items will be effectively integrated into the local performing arts and tourism activities, such as the concert named by folk-song ICH theme, the tourist route along the canal with the video and audio of folk-song ICH item, to realize the mutual promotion of economic development, social progress and the protection and inheritance of the intangible cultural heritage of folk songs.

Future research

The conclusion of this study depends on data samples. The folk-song ICH items discussed in this paper are extracted from the categories of TRADITIONAL MUSIC in the official published list of ICH. However, there also are similar folk songs collected in other categories, such as *WuGe*(吴歌), traditional children's songs and canal boat songs, which were collected in the category of

FOLK LITERATURE, *the Old Beijing hawking*(老北京叫卖) collected in the category of FOLKLORE. According to the relevant requirements of intangible protection in China, an application item needs to be submitted in a specific category. Improper category declaration caused by the applicant will affect the integrity of the folk-song ICH. In addition, according to the current standards of intangible cultural heritage identification, the ICH items should be inherited for more than 100 years, with the regional uniqueness and inheritance subjects. Under these requirements, it is difficult for the application of folk songs in GCC.

To some extent, the above problems affect the comprehensiveness of folk-song ICH in GCC. Therefore, this paper only analyzes the spatial distribution law from an empirical perspective, and it is urgent to conduct in-depth research from the perspective of declaration and evaluation in the future to make up for the deficiencies of the above studies.

Conclusions

In this paper, the folk-song ICH items in the GCC basin reflect the obvious rheology, diffusion and integration, which is the concrete embodiment of the GCC culture at the artistic level. For example, compared with the items in the Yellow River and Yangtze river, the folk songs in GCC generally show the common characteristics of sometimes sonorous and sometimes soft and are accompanied by narrative lyric elements, while these songs in various regions show a different style due to the influence of regional culture and canal topography. Another example is the different versions of song "*Jasmine Flower*" in the GCC basin, which has many similarities and differences in terms of melody, tone, style, lyrics, pronunciation, rhyme and other. This variation is all related to the absorption of local folk songs. This feature of pluralism and unity has well confirmed the essence of the GCC culture and makes people intuitively feel the richness of the canal culture.

According to this research, the distribution of folk-song ICH in the GCC basin is influenced by not only rivers and land forms in natural conditions but also human history, social development and economic level. Folk song culture, as a kind of sketch of intangible culture, cannot be separated from the ecological environment needed for its generation and development. More importantly, as a living culture, its formation and dissemination cannot be separated from human social and economic activities. From this point of view, the different natural environments have formed different cultural forms, thus affecting different music cultures in the GCC basin and

ultimately creating a diversified and unified folk song culture.

Due to the limitations of the article space and research field, this paper takes the folk songs in the GCC basin as the research object. However, the research method based on GIS and the innovative idea of analyzing the causes from the natural and social conditions in this paper, is expected to be used as a reference for the study of intangible cultural heritage in other countries and regions.

Abbreviations

ICH	Intangible cultural heritage
GCC	The Grand Canal of China
GIS	Geographic information system
kNN	K-nearest neighbor
KDE	Kernel density estimation

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Author contributions

LL performed the data analysis and wrote the manuscript. The author read and approved the final manuscript.

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Declarations

Competing interests

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