

Knowledge Mapping of Genglubu Research: Bibliometric Analysis

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Abstract:

This study aims to construct the knowledge map of the current academic research of Genglubu. We use the Citespace to conduct bibliometric analysis of 211 documents in China National Knowledge Infrastructure, covering annual publications, author cooperation network, institutional cooperation network and keyword clustering analysis, co-occurrence and emergent analysis map, highlighting the research dynamics and trends in the field. The results show that the number of publications in the field reached its peak in 2017, and Zhang Zhengsheng, Li Wenhua, Chen Hong and other authors formed a stable research group around "Genglubu" and "GengluCulture". The Social Science Research Center of Hainan University and other institutions play a key role in promoting related research. Five main clusters (Genglubu, Nanhai, Hainan fishermen, place names, digital humanities) have been formed, among which the cluster keywords "Genglubu" and "South China Sea" show research hotspots, digital humanities and other keywords provide a new direction for future research. Through the analysis of key highlighted reveal the evolution of industry technology application.

Keywords: Genglubu, cross-cultural communication, knowledge graph, bibliometric analysis, intangible cultural heritage, intangible cultural heritage

1.Introduction

Genglubu is a maritime record and oral historical document passed down for generations among fishermen in Hainan, China, serving as an important intangible cultural heritage that meticulously documents navigation routes in the South China Sea (Liang et al., 2023). These records contain extensive information on maritime routes, reefs, fishing grounds, meteorological conditions, and

navigational markers, playing a crucial role in guiding Hainan fishermen in offshore fishing and navigation (Wu & Young, 2023; Liu & Zhang, 2015). The richness and longevity of Genglubu have been preserved through continuous transmission across generations, highlighting its historical significance. Research on Genglubu is of great importance for cultural heritage preservation, the protection of maritime rights, and the development of modern navigation technology. The study and preservation of Genglubu and its cultural heritage align with the national strategic goals proposed in the 20th National Congress of the Communist Party of China, which emphasize strengthening cultural confidence, enhancing the global influence of Chinese culture, and protecting and inheriting intangible cultural heritage. These efforts not only contribute to the inheritance and promotion of outstanding traditional Chinese culture but also provide a crucial cultural and historical foundation for safeguarding national maritime rights (Chow-Bing, 2024; Liang et al., 2023; Zhang, 2020).

Bibliometric analysis plays a significant role in Genglubu research by systematically and normatively organizing existing literature, which facilitates the preservation and protection of this valuable intangible cultural heritage while enhancing its accessibility for research and utilization. Additionally, bibliometric analysis aids in uncovering the historical value of Genglubu while ensuring its long-term documentation and transmission, thereby providing researchers with a clear and systematic knowledge base that promotes cultural dissemination and education. Within academic disciplines, bibliometric analysis serves as a crucial tool for evaluating research progress by quantitatively analyzing literature to reveal the development trajectory of Genglubu studies, identifying research hotspots and emerging fields, exploring interdisciplinary integrations, recognizing influential scholars, and optimizing the allocation of research resources. The application of bibliometric analysis offers fundamental data support for scientific research, further driving the sustained advancement of the discipline (Chen et al., 2022; Chen et al., 2024; Ju, 2024; Mody et al., 2021; Wang & Zhang, 2022; Xie et al., 2020).

Current research on Genglubu primarily focuses on its historical origins and development. The historical background and evolutionary trajectory of Genglubu as a navigational record and oral historical document among Hainan fishermen have been thoroughly examined (Liang et al., 2023; Wei et al., 2023; Wu, 2023). The maritime techniques and experiences embedded within Genglubu have also been explored, with analyses detailing the recorded navigation routes, reef locations, fishing grounds, meteorological conditions, and navigational markers of the South China Sea, along with discussions on the applicability of traditional navigation knowledge in modern maritime contexts (Wu & Young, 2023). Furthermore, the relationship between Genglubu and maritime rights protection has been studied, with research focusing on the historical foundation provided by its documentation of traditional Chinese fishing activities and navigation routes in the South China Sea, as well as its significance in safeguarding national maritime rights (Yuan & Yan, 2021). While previous studies have primarily adopted theoretical discussions and archival research, the application

of bibliometric methods remains limited. Through bibliometric analysis, this study aims to systematically present key research themes, author networks, major research directions, and trending topics in Genglubu studies, offering insights into future research trends and serving as a reference for subsequent studies.

Therefore, this study seeks to construct a knowledge map of Genglubu research through bibliometric analysis. By developing multiple knowledge maps—including keyword co-occurrence networks, author collaboration networks, institutional cooperation networks, and key node emergence analysis—this study will provide an in-depth examination of collaboration patterns and the evolution of research hotspots within the field. Based on a review of existing studies, this research will also propose forward-looking recommendations regarding potential future research directions and methodological advancements in Genglubu studies.

2. Literature Review

2.1 Genglubu

The conceptual understanding of Genglubu has been explored in various studies. It has been noted that the term “Geng” represents the time required for fishermen to travel from the departure port or an intermediate waypoint to the next destination, as well as the approximate distance covered, while “Lu” refers to the direction measured using a compass with the bow of the ship as the reference point. Further research has been conducted by digitizing the Genglubu records collected from elderly fishermen and integrating knowledge from geography and oceanography, leading to the conclusion that “Geng” serves as both a unit of time and a basis for calculating sailing distances, with one “Geng” approximately equivalent to 12 nautical miles (Choi et al., 2023; Wang et al., 2024; Li et al., 2016; Wang et al., 2017; Wang, 2019).

The significance of Genglubu in Chinese maritime history has been emphasized, as it documents more than 200 navigation routes, demonstrating the sophisticated techniques ancient fishermen employed to avoid underwater reefs and ensure safe passage. These navigation experiences reflect the extensive knowledge and continuous exploration of the South China Sea by Chinese fishermen while also showcasing their innovations in fishing tools and techniques, as well as the peaceful utilization of marine resources. Genglubu represents a comprehensive historical record of China's development and management of the South China Sea, providing a solid foundation for the governance and jurisdiction of the region by successive Chinese administrations (Li, 2019; Liu et al., 2017; Wang et al., 2017; Wen, 2019).

Additionally, Genglubu has been recognized as an essential component of ancient Chinese maritime culture, preserving detailed information on nautical charts, ocean currents, wind directions, reefs, and island locations, making it comparable to modern navigational maps and maritime guides. These handwritten manuscripts, primarily circulated among coastal communities in the South China

Sea, were continuously revised and supplemented by fishermen and commercial sailors over generations, forming a complete and systematic navigation guide. The records highlight the advanced level of ancient Chinese maritime technology and serve as valuable historical materials for studying maritime activities, trade routes, and cultural exchanges in the South China Sea (Chongyi, 2024; Hung et al., 2013; Ma et al., 2023; Shi, 2024; Yuan & Yan, 2021).

Furthermore, the historical achievements of ancient Chinese maritime exploration and resource utilization have been revealed through the systematic compilation and analysis of Genglubu, contributing to a deeper understanding of ancient maritime technology and culture. These studies are of great significance for the scientific understanding of maritime history and provide valuable insights for modern maritime research. With advancements in digital processing, the content of Genglubu has been widely disseminated and applied, establishing it as an important reference for the study of maritime history and culture (Chow-Bing, 2024; Liang et al., 2023; Wei et al., 2023).

In summary, the academic community has increasingly recognized the importance of Genglubu research. However, bibliometric analysis and knowledge mapping of Genglubu studies have not yet been conducted. Therefore, this study aims to systematically analyze the existing research on Genglubu and construct a comprehensive knowledge map based on bibliometric methods.

2.2 Genglu Culture

The Genglubu has been passed down through generations in the form of handwritten copies, classifying it as a historical document. From a material perspective, it is considered a historical artifact, while from a technological standpoint, it is recognized as an intangible cultural heritage. Maritime culture is shaped by human interaction with the ocean through understanding, utilizing, and managing marine resources, ultimately forming both material and spiritual civilizations. It manifests in human perceptions, attitudes, and behavioral adaptations toward the ocean, which influence ways of living. The Chinese nation has long engaged in maritime cultural development, continuously exploring and utilizing marine resources. As Hainan fishermen cultivated the South China Sea, they gradually enhanced their understanding of marine territories and islands, which is reflected in the Genglubu they carried aboard their vessels (Kurz, 2019; Sun et al., 2024; Wu & Young, 2023; Yang, 2024).

Fishermen in China's southeastern coastal regions, through their study and use of the Genglubu, developed a three-layered maritime awareness: the level of production and livelihood, the level of institutional management, and the level of fishermen's spiritual identity. These three dimensions are interconnected and overlap with each other.

It is worth noting that research on Geng Culture remains largely stagnant, with no established framework, and it has only been sporadically mentioned in academic discourse. Previous studies have extracted cultural elements from the place names and content of Genglubu, yet a systematic

conceptualization and comprehensive framework of Geng Culture have not been developed (Wei et al., 2023). Additionally, academic publications from the perspective of communication studies remain scarce, indicating that the academic community has not yet conducted an in-depth and systematic exploration of the connotation of Geng Culture (Wu, 2023; Li et al., 2016; Li et al., 2018). Most studies remain superficial, lacking both depth and breadth, and substantial expansion is urgently needed (Liang et al., 2023). Since the Genglubu serves as a crucial carrier of Geng Culture, understanding Geng Culture is essential for further advancing research on the Genglubu.

3. Research Methodology

The bibliometric analysis method is a quantitative analytical approach based on mathematical and statistical techniques, primarily used to examine the external characteristics of scientific literature (Lyu et al., 2023). As an effective quantitative research tool, it enables researchers to gain a macroscopic understanding of the research landscape and development trends within a specific field, providing a scientific basis for research decision-making. CiteSpace, as one of the key tools in bibliometric analysis, has achieved significant results in communication studies and serves as an essential method for constructing knowledge maps (Wu et al., 2021).

Therefore, this study employs CiteSpace to analyze 211 relevant publications retrieved from the China National Knowledge Infrastructure (CNKI) database. The study utilizes a “title, keyword, and abstract” search strategy to identify literature related to Genglubu and Geng Culture. After a deduplication process in CiteSpace, 211 valid publications were obtained. Based on this dataset, the study conducts several analyses, including annual publication trends, author collaboration network analysis, institutional collaboration network analysis, keyword co-occurrence analysis, keyword burst detection, and keyword clustering analysis.

4. Research Results

4.1 Trends in Publications

Figure 1 presents the major research outputs on Genglubu and Geng Culture available in the China National Knowledge Infrastructure (CNKI) database from 2014 to 2023. The data demonstrate a clear upward trend, with the number of publications increasing from 5 in 2014 to a peak of 36 in 2017, followed by a gradual decline, reaching 10 publications in 2023. This trend reflects a significant rise in research interest and scholarly activity in the Genglubu domain.

The changes in publication volume indicate a shift in research focus and priorities within this field. The steady increase in publications from 2014 to 2017 suggests an initial exploratory phase in Genglubu research. The relatively high number of publications in 2017 and 2019 indicates a period of methodological and thematic maturation within this research area. A slight decline in publications was observed in 2018.

As of 2024, only 8 publications have been recorded, signaling a possible transition in research trends, reduced funding, or another shift in thematic and methodological approaches within this field. This trend highlights the need for scholars engaged in Genglubu research to continue their efforts, actively contribute to the academic discourse, and ensure the sustained prominence of Genglubu studies in scholarly discussions.

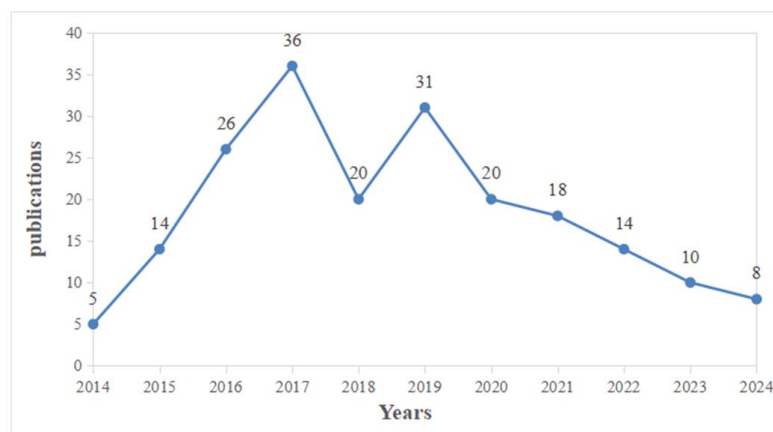


Figure 1. Trends in Publications on *Genglubu*: CNKI Data Analysis (2014–2024)

4.2 Author Collaboration Network

Table 1 and Figure 2 illustrate the author collaboration network in the context of Genglubu and cross-cultural communication studies. In academic research, knowledge mapping is an essential tool for understanding collaboration patterns and the scholarly impact within a field. Figure 2 highlights that Li Wenhua (李文化) and Yan Genqi (阎根齐) occupy central positions in the network, indicating their continuous contributions over the years. This suggests that they are key members and thought leaders in this research domain. The connecting lines between authors represent collaboration relationships. The presence of multiple dense research clusters in the figure indicates strong research teams and active partnerships in Genglubu studies.

The variation in publication volume over time reflects the overall growth and vibrancy of this research field. As shown in Table 1, there was a significant increase in publication volume in 2019, suggesting that new theories, technologies, or applications emerged to drive research during that period. The network also presents emerging scholars who published in different years, as well as researchers active only in earlier phases. For example, Zhao Jing (赵静) and Sun Jihua (孙继华) published between 2016 and 2018, indicating that their contributions were primarily during the early stages of research. In contrast, some authors who published in 2018 did not appear in subsequent years, suggesting shifts in research focus or author engagement.

Overall, the author collaboration network provides insights into the cooperation patterns, research activity levels, and influence distribution in the Genglubu research field. These findings are

crucial for understanding the historical development, current status, and future trends of the field, while also serving as a valuable reference for new researchers entering this domain. By interpreting these data from an academic perspective, it is possible to identify key researchers, assess the quality and intensity of research collaborations, and predict future research directions and potential collaboration opportunities.

Table 1: Publication Frequency of *Genglubu* Researchers in CNKI (2014–2024)

No.	Author	Publication Count
1	Li Wenhua (李文化)	16
2	Yan Genqi (阎根齐)	13
3	Xia Daiyun (夏代云)	12
4	Chen Hong (陈虹)	11
5	Zhang Zhengsheng (张争胜)	9
6	Liu Yijie (刘义杰)	6
7	Zhou Weimin (周伟民)	5
8	Wang Libing (王利兵)	5
9	Pang Wenyu (逢文昱)	4
10	Wu Chenhui (吴晨辉)	3

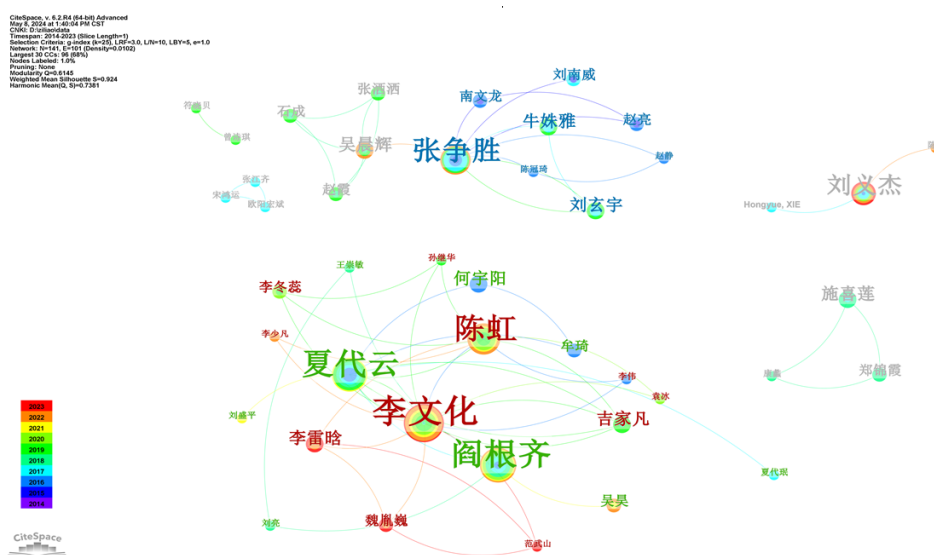


Figure 2: Author Collaboration Network Analysis in *Genglubu* Research (2017–2024)

4.3 Institutional Collaboration Network

Figure 3 presents the distribution of publishing institutions involved in *Genglubu* research. This distribution provides insights into the contributions and influence of various research institutions within this field. Hainan University (海南大学) is identified as the leading institution in this domain, indicating its significant academic contributions to *Genglubu* studies.

Figure 3 illustrates the collaboration between different institutions, reflecting the dissemination of knowledge and academic cooperation. The connections between institutions indicate the strength and frequency of research collaborations, as well as the formation of research alliances or joint research teams. The geographical distribution and temporal variation of publishing institutions highlight the regional characteristics and developmental trends of *Genglubu* research. For instance, the publication activities of Hainan University Social Science Research Center (海南大学社会科学研究中心) and Hainan University Library (海南大学图书馆) in multiple years demonstrate the sustained academic engagement of these institutions in this research field.

As shown in Table 2, a diverse range of institutions have contributed to *Genglubu* research, including comprehensive universities and specialized research centers. This diversity may indicate the interdisciplinary nature of this research field. The temporal distribution analysis also reveals that certain institutions experienced significant increases in publication output during specific years, which could be associated with key events or breakthroughs in the field.

The institutional collaboration network provides a deeper understanding of the roles and contributions of different institutions in *Genglubu* research, as well as how they interact and drive the advancement of this field.

Table 2: Major Publishing Institutions in Genglubu Research (2014–2024)

No.	Research Institution	Publication Count
1	Hainan University (海南大学)	28
2	Hainan University Library (海南大学图书馆)	15
3	School of Geography, South China Normal University (华南师范大学地理科学学院)	12
4	Hainan University Social Science Research Center (海南大学社会科学研究中心)	12
5	School of Humanities and Communication, Hainan University (海南大学人文传播学院)	8

6	School of Law, Hainan University (海南大学法学院)	6
7	China (Hainan) South China Sea Museum (中国(海南)南海博物馆)	5
8	School of Marxism, Hainan University (海南大学马克思主义学院)	5
9	Genglubu Research Center, Hainan University (海南大学更路簿研究中心)	5
10	Center for Maritime History and Culture, Dalian Maritime University (大连海事大学航海历史与文化研究中心)	5
11	Ocean Press (海洋出版社)	4
12	Hainan Provincial Museum (海南省博物馆)	4
13	Hainan Normal University (海南师范大学)	4
14	School of Materials and Chemical Engineering, Hainan University (海南大学材料与化工学院)	3
15	Archives, Hainan Normal University (海南师范大学档案馆)	3

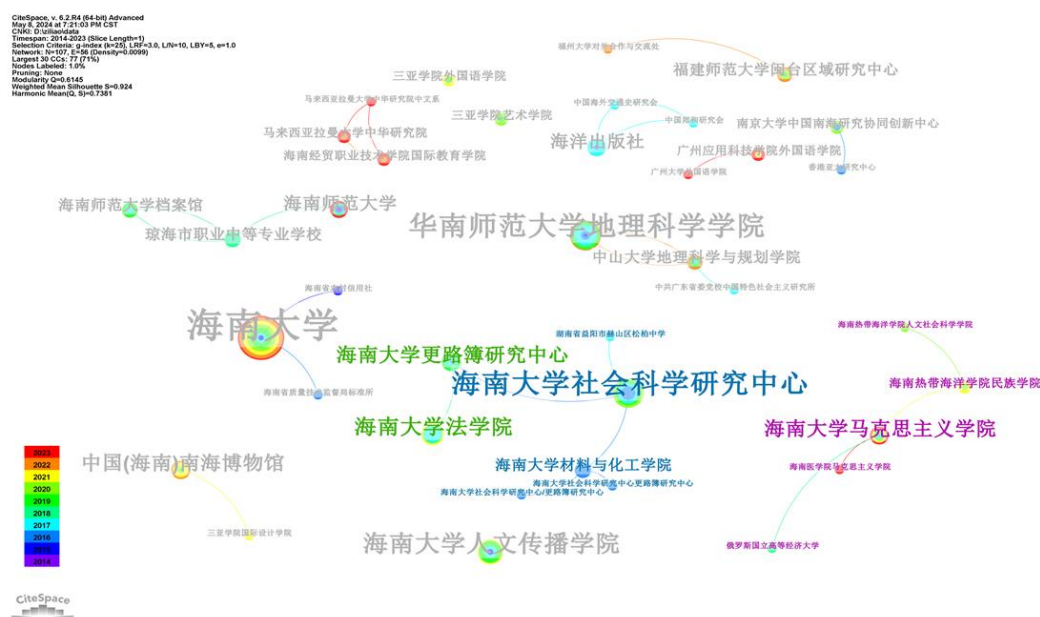


Figure 3: Institutional Collaboration Network Analysis in *Genglubu* Research (2014–2024)

4.4 Keyword Co-occurrence Knowledge Mapping

In academic research, keyword co-occurrence analysis is a crucial method for uncovering relationships between topics and concepts within a research field. This type of analysis helps identify research hotspots, knowledge structures, and developmental trends. Table 3 presents keywords with a frequency of three or higher, along with their corresponding betweenness centrality scores, while Figure 4 provides a visual representation of the keyword co-occurrence network in the examined literature.

The high frequency of "Genglubu" (更路簿) and "South China Sea" (南海) indicates that these are the most frequently studied topics within this field. The frequent co-occurrence of these two terms suggests that the South China Sea is a critical and inseparable factor in Genglubu research. The betweenness centrality index measures the significance of a keyword within the co-occurrence network. "Genglubu" exhibits the highest centrality (0.99), signifying that it is not only frequently mentioned but also serves as the central connecting point for other keywords, making it a core theme in this research network.

The connecting lines in the network diagram represent the frequency of simultaneous appearances of keywords in the literature. The density and intensity of these connections reflect the degree of association between different topics. The positioning and configuration of keywords in the network may further reveal the structural relationships among research themes.

By examining the data from Table 3 and Figure 4, deeper insights can be gained into how these keywords interact within the broader research landscape and how they collectively form the knowledge foundation of Genglubu studies. Additionally, by analyzing the temporal sequence of keyword co-occurrences, shifts in research focus and knowledge evolution over time can be observed.

Table 3: High-frequency Keywords and Betweenness Centrality in *Genglubu* Research (2014–2024)

Keyword	Frequency	Centrality
Genglubu (更路簿)	72	0.99
South China Sea (南海)	35	0.32
Hainan Fishermen (海南渔民)	12	0.14
South China Sea Islands (南海诸岛)	9	0.06
Digital Humanities (数字人文)	6	0.11
Place Names (地名)	5	0.04

Hainan (海南)	5	0.02
Geng Route (更路)	5	0
Hainan Island (海南岛)	4	0.02
South China Sea Rights Protection (南海维权)	4	0.04
Naming (命名)	3	0.06
Reef Naming (岛礁命名)	3	0.02
Fishermen (渔民)	3	0
Sovereignty (主权)	3	0.02
Needle Route (针路)	3	0

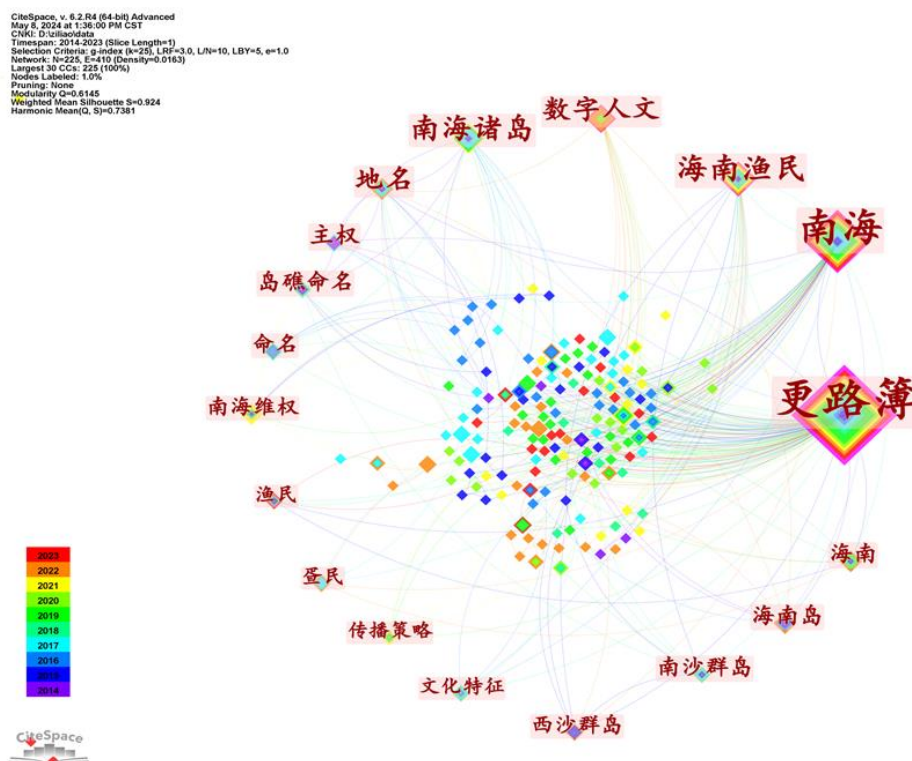


Figure 4: Keyword Co-occurrence Network Analysis in Genglubu Research (2014–2024)

4.5 Keyword Citation Burst Analysis

Figure 5 presents the top 16 keywords that experienced citation bursts in Genglubu research from 2014 to 2024. Citation bursts occur when the number of citations for a specific keyword suddenly increases within a given period, often signaling that a particular topic or concept has received widespread academic attention.

The burst strength represents the intensity of the citation increase, where higher values indicate a more significant surge in citations. For example, "Museum" (博物馆) exhibited a burst strength of 1.03 in 2020, suggesting that research related to museums experienced a notable surge in citations during that period. The begin-end time frame indicates the start and end years of the burst period. For instance, "Port Trade" (港口贸易) showed a burst strength of 1.11 in 2014, meaning that this topic was frequently cited in academic literature during that year.

The developmental trends of keywords provide insights into shifts in research interests. For example, the citation bursts of "Suzhou Ma Zi" (苏州码子) and "Hainan Fishermen" (海南渔民) from 2020 to 2023 indicate that these concepts have recently become emerging research hotspots. By analyzing citation bursts in keywords, a clearer understanding of knowledge evolution, research trend shifts, and areas of academic focus within Genglubu research can be obtained.

This suggests that topics such as "Port Trade," "Museum," "Suzhou Ma Zi," and "Hainan Fishermen," which have shown significant citation bursts, warrant continued attention and in-depth exploration. Researchers are encouraged to focus on these emerging themes to better understand the changing research landscape and evolving academic trends in Genglubu studies.

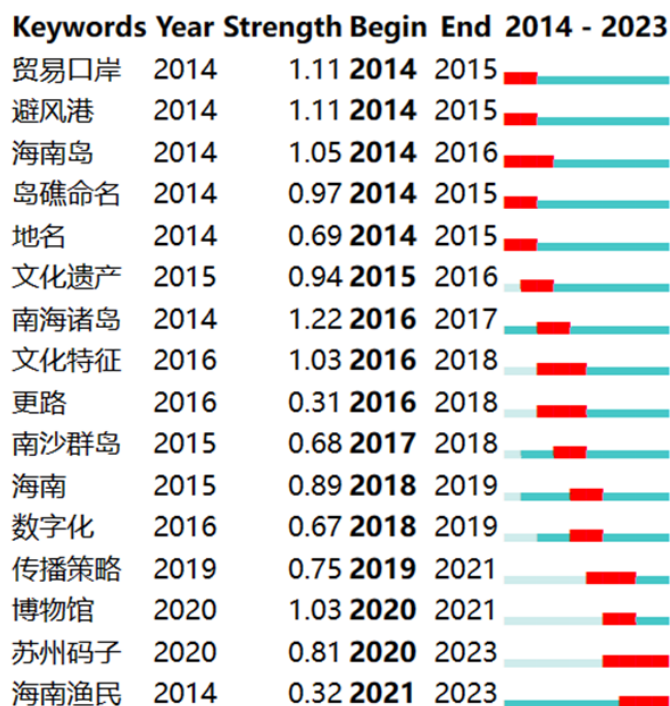


Figure 5: Citation Burst Strength Analysis of Keywords in Genglubu Research (2014–2024)

4.6 Keyword Clustering Analysis

Table 6 presents the keyword clustering results in Genglubu research, listing each cluster's index, label, and representative keywords. These clusters highlight the various themes and focal points within this research domain and illustrate how these themes interconnect at the keyword level.

Cluster #0: Genglubu (更路簿) – This cluster includes keywords such as "needle position" (针位), "cultural heritage" (文化遗产), and "digitization" (数字化), emphasizing the challenge of preserving cultural heritage in the modern era. This cluster likely focuses on efforts to preserve and translate cultural artifacts and how Genglubu can be adapted through digitization.

Cluster #1: South China Sea (南海) – This cluster, centered on "Tanka people" (疍民) and "shipbuilding" (造船), explores the relationship between Genglubu culture and the historical evolution of coastal Tanka communities and shipbuilding techniques.

Cluster #2: Hainan Fishermen (海南渔民) – In addition to "Hainan fishermen" (海南渔民) and "fishermen" (渔民), this cluster includes "Hainan" (海南) and "maritime rights" (海权), reflecting the historical development of maritime rights among Hainan's fishing communities.

Cluster #3: Place Names (地名) – This cluster, which contains "Hainan" (海南) and "reef naming" (岛礁命名), focuses on the origin and historical evolution of geographic names in Hainan and its surrounding islands.

Cluster #4: Digital Humanities (数字人文) – Keywords such as "Hainan" (海南) and "Suzhou Ma Zi" (苏州码子) suggest a focus on early commercial systems and their relationship to modern digital humanities.

Cluster #5: Chinese Traditional Culture (中国传统文化) – Containing "South China Sea reefs" (南海岛礁) and "historical sovereignty" (历史主权), this cluster discusses the South China Sea's historical claims from the perspective of Chinese traditional culture.

Cluster #6: Legal Basis (法理依据) – Centered around "South China Sea rights protection" (南海维权), "Maritime Navigation Canon" (航海针经), and "Waterway Register" (水路簿), this cluster explores the legal aspects of the South China Sea and historical documentation in maritime law.

Cluster #7: Communication Strategies (传播策略) – Focused on "communication value" (传播价值) and "regional communication" (区域传播), this cluster examines the contemporary dissemination of Genglubu culture and its regional impact.

Cluster #8: Geng Navigation Route (更路海道) – This cluster discusses "East China Sea Geng Route" (东海更路) and "harbor groups" (港湾群), providing detailed terminological insights into Genglubu navigation routes.

Cluster #9: Achievements (成就) – With keywords such as "Genglubu studies" (更路簿学) and "academic history" (学术史), this cluster evaluates the contributions of Genglubu research to academic disciplines.

Cluster #10: Tanmen (潭门) – Focused on "text" (文本) and "locality" (地方性), this cluster highlights Tanmen's unique local culture and its representation in Genglubu texts.

These clusters not only reflect the diversity and richness of research within this field but also demonstrate the specific themes that researchers have focused on over time. The clustering results help identify gaps in existing research, suggest potential new directions, and encourage interdisciplinary collaborations in Genglubu studies.

Table 6: Keyword Clustering Analysis in Genglubu Research (2014–2023, CNKI Data Perspective)

Cluster	Year	Representative Keywords
#0 Genglubu (更路簿)	2018	Needle position (针位), cultural heritage (文化遗产), translation (翻译), digitization (数字化), heritage (遗产)
#1 South China Sea (南海)	2018	Tanka people (疍民), shipbuilding (造船), southeast coastal region (东南沿海), South China Sea (南海), Maritime Silk Road (海上丝绸之路)
#2 Hainan Fishermen (海南渔民)	2017	Hainan fishermen (海南渔民), fishermen (渔民), Hainan (海南), era of emergence (产生时代), maritime rights (海权)
#3 Place Names (地名)	2016	Place names (地名), South China Sea (南海), reef naming (岛礁命名), customary law (习惯法), South China Sea broken line (南海断续线)
#4 Digital Humanities (数字人文)	2019	Digital humanities (数字人文), Hainan (海南), Suzhou Ma Zi (苏州码子), reef nicknames (岛礁俗名), <i>Suzhou Chengjin Waterway Register</i> (《苏承锦水路部》)
#5 Chinese Traditional Culture (中国传统文化)	2017	Chinese traditional culture (中国传统文化), South China Sea reefs (南海岛礁), historical sovereignty (历史主权), naming (命名), South China Sea (南海)
#6 Legal Basis (法理依据)	2017	Legal basis (法理依据), South China Sea rights protection (南海维权), Maritime Navigation Canon (航海针经), historical basis (历史依据), Waterway Register (水路簿)
#7 Communication Strategies (传播策略)	2019	Communication strategy (传播策略), communication value (传播价值), regional communication (区域传播), region (区域), value (价值)
#8 Geng Navigation Route (更路海道)	2020	Geng navigation route (更路海道), East China Sea Geng Route (东海更路), harbor groups (港湾群), overseas

路海道)		Geng Route (海外更路), North Sea Geng Route (北海更路)
#9 Achievements (成就)	2017	Achievements (成就), Genglubu studies (更路簿学), academic history (学术史), research (研究), Genglubu (更路簿)
#10 Tanmen (潭门)	2018	Tanmen (潭门), text (文本), locality (地方性), Genglubu (更路簿)

Figure 6 presents the keyword clustering network map, which reveals the interconnections among various research themes and identifies key research hotspots within the Genglubu field. This map visually represents the relationship between different keyword clusters using distinct colors and connecting lines, where each cluster corresponds to a specific research theme or domain, while the keywords within each cluster represent subtopics or focal points within that area of study.

The different colored regions in the map indicate distinct keyword clusters, highlighting the presence of clearly differentiated research themes within the Genglubu field. The size and color intensity of each cluster may suggest its significance and research activity level, with darker and larger clusters indicating more central or active research areas. The density of points within each cluster represents the degree of keyword concentration, where higher densities suggest more focused and well-established research directions.

The connecting lines in the map signify co-occurrence relationships between keywords, where thicker and more numerous lines indicate higher centrality, meaning these keywords frequently appear together in academic literature and serve as core concepts within the research network. The connections between different clusters illustrate their interrelations, providing insight into how research topics evolve and overlap. For instance, if the "Genglubu" (更路簿) cluster is linked to the "South China Sea" (南海) cluster, it suggests that discussions surrounding Genglubu frequently reference the South China Sea, reflecting its geographical and geopolitical relevance.

The proximity and connections between clusters may also suggest research trajectories and thematic transitions. For example, the evolution of research themes may be traced from technical applications of Genglubu to broader discussions on its societal impact, cultural significance, and legal considerations. The presence of well-defined but sparsely connected clusters indicates areas where interdisciplinary research could be further developed.

By examining the network structure, researchers can identify gaps in the literature, represented by regions with weak or absent connections between clusters. These gaps highlight underexplored areas, providing opportunities for future research directions. The macro-level perspective provided

presence of several core researchers and research teams that have maintained stable research activity and long-term collaboration. This suggests that *Genglubu* studies have formed a relatively mature and stable research community. Therefore, strengthening collaboration among scholars in this field is essential. Organizing regular academic seminars and inviting leading scholars such as Li Wenhua (李文化) and Chen Hong (陈虹) to share their research experiences could further enhance the exchange of ideas. Additionally, forming collaborative research teams with established scholars in the field could facilitate more in-depth academic cooperation.

The institutional collaboration network analysis highlights the need for increased inter-institutional partnerships. Establishing joint research programs, resource-sharing initiatives, and high-level academic conferences can foster greater interaction among institutions. Hainan University (海南大学), Hainan University Library (海南大学图书馆), and the School of Geography at South China Normal University (华南师范大学地理科学学院) are leading institutions in terms of research output, reflecting their significant contributions to *Genglubu* studies and demonstrating the academic community's recognition of this field. The observed institutional collaborations further emphasize the interdisciplinary and integrative development of *Genglubu* research, which spans across fields such as history, geography, law, and digital humanities.

The keyword co-occurrence analysis reveals that *Genglubu*, navigation technology, and intangible cultural heritage are the dominant themes in this research domain. The high co-occurrence and centrality of these keywords confirm their core status within the field and indicate frequent discussions in scholarly literature. Citation burst analysis highlights research trends, with emerging keywords such as "South China Sea" (南海), "fishing grounds" (渔场), and "traditional culture" (传统文化) showing significant citation bursts. These trends suggest that shifting research interests may be influenced by advancements in technology or changes in local cultural heritage preservation policies.

The keyword clustering analysis illustrates the multidimensional and complex nature of *Genglubu* research. For instance, the cultural heritage preservation cluster focuses on the conservation and transmission of *Genglubu* as an intangible cultural heritage. The navigation technology cluster explores the value and significance of traditional navigation techniques in modern applications. The Chinese traditional culture cluster examines the role of *Genglubu* in local cultural identity and historical narratives. The keyword clustering network further demonstrates the interconnections between different research themes and their developmental trajectories, shedding light on the evolution of this field and its potential future directions.

This study not only identifies the overall trends and patterns of *Genglubu* research but also unveils its core themes, research hotspots, and dynamic changes over time. Additionally, the analysis highlights two significant driving forces in this field: technological advancements and the growing

emphasis on cultural identity. This underscores the need for researchers to closely monitor emerging technological trends while integrating cultural considerations into the preservation and transmission of *Genglubu*. Ethical and social implications, such as those reflected in the "digital humanities" cluster, indicate an increasing academic discussion on the role and significance of *Genglubu* within society as technology and culture intersect.

One limitation of this study is its exclusive reliance on Chinese-language research for analysis. Moreover, the knowledge mapping and analytical techniques primarily depend on CiteSpace, which may constrain the comprehensiveness of the findings. Future research could incorporate both Chinese and English literature for comparative analysis, as well as adopt more advanced visualization techniques to explore how digital humanities and Chinese traditional culture interact with modern technological advancements while maintaining cultural authenticity and integrity. As cultural heritage preservation awareness continues to grow, research communities should also evaluate the practical applications and long-term impact of *Genglubu* in contemporary society.

In conclusion, the CNKI-based data reveal that *Genglubu* research is a dynamically evolving academic ecosystem characterized by multi-layered interdisciplinary intersections. The findings highlight the technological, cultural, and social dimensions within this research field, offering valuable insights and future research directions. With the advancement of technology and increasing societal attention to intangible cultural heritage conservation, this field is expected to undergo rapid and profound transformations in the coming years.

Reference

1. Chen, J., Guo, Z., Xu, S., Law, R., Liao, C., He, W., & Zhang, M. (2022). A bibliometric analysis of research on intangible cultural heritage tourism using CiteSpace: The perspective of China. *Land*, 11(12), 2298. <https://doi.org/10.3390/land11122298>
2. Chen, Y., Zhang, S., Ruan, W., Ma, Y., Wang, M., & Zhou, Y. (2024). What kind of UGA is effective for heritage tourism marketing? Matching effects of human elements and review types. *Humanities and Social Sciences Communications*, 11(1), 1114. <https://doi.org/10.1057/s41599-024-03613-1>
3. Choi, G.-H., Lee, W., & Kim, T.-w. (2023). Voyage optimization using dynamic programming with initial quadtree based route. *Journal of Computational Design and Engineering*, 10(3), 1185-1203. <https://doi.org/10.1093/jcde/qwad055>
4. Chongyi, F. (2024). Frontier politics in the family empire and party empire: the position of Hainan in the Chinese State. *Eurasian Geography and Economics*, 65(6-7), 799-815.
5. Chow-Bing, N. (2024). The Rise of China's South China Sea Think Tanks. *China Review*, 24(1), 197-232. <https://www.jstor.org/stable/48765665>

6. Hung, H.-c., Nguyen, K. D., Bellwood, P., & Carson, M. T. (2013). Coastal connectivity: long-term trading networks across the South China Sea. *The Journal of Island and Coastal Archaeology*, 8(3), 384-404. <https://doi.org/10.1080/15564894.2013.781085>
7. Ju, F. (2024). Mapping the Knowledge Structure of Image Recognition in Cultural Heritage: A Scientometric Analysis Using CiteSpace, VOSviewer, and Bibliometrix. *Journal of Imaging*, 10(11), 272. <https://doi.org/10.3390/jimaging10110272>
8. Kurz, J. L. (2019). Gauging the South China Sea: Route Books (genglubu) since 1974. *The China Quarterly*, 240, 1135-1143. <https://doi.org/10.1017/S0305741019000353>
9. Liang, B., Zhang, Z., Zhang, N., & Feng, Q. (2023). Heterogeneity of residents' heritage responsibilities in the process of cultural communication: the case of the Genglubu heritage site in Tanmen, China. *International Journal of Heritage Studies*, 29(9), 881-907. <https://doi.org/10.1080/13527258.2023.2225037>
10. Li, W. (2019). A profound interpretation of the academic value and historical significance of the Nanhai Genglubu—A review of Nanhai Genglubu: A historical testimony of China's administration over ancestral seas. *China Book Review*, 8, 117-120. <https://doi.org/10.3969/j.issn.1002-235X.2019.08.015>
11. Li, W., Chen, H., Chen, T., & Li, W. (2016). Digitization and application of "Genglu". *Computer Knowledge and Technology: Academic Edition*, 10X, 235-237. <https://doi.org/10.14004/j.cnki.ckt.2016.4059>
12. Li, W., Xia, D., & Ji, J. (2018). Interpretation of the meaning of "Geng" based on digital Genglubu. *Nanhai Journal*, 4(1), 20-27.
13. Liu, G., Li, Z., & Zeng, C. (2017). A study on the historical value of Genglubu. *Journal of Hainan University (Humanities & Social Sciences Edition)*, 35(6), 16-25. <https://doi.org/10.15886/j.cnki.hnus.2017.06.003>
14. Liu, N., & Zhang, Z. (2015). The origin and historical-cultural value of place names in the Xisha and Nansha Islands. *Tropical Geography*, 35(2), 162-169.
15. Lyu, P., Liu, X., & Yao, T. (2023). A bibliometric analysis of literature on bibliometrics in recent half-century. *Journal of Information Science*, 01655515231191233. <https://doi.org/10.1177/01655515231191233>
16. Ma, M., Lu, Y., Dong, G., Ren, L., Min, R., Kang, L., Zhu, Z., Li, X., Li, B., & Yang, Z. (2023). Understanding the transport networks complex between South Asia, Southeast Asia and China during the late Neolithic and Bronze Age. *The Holocene*, 33(2), 147-158. <https://doi.org/10.1177/09596836221131698>

17. Mody, M. A., Hanks, L., & Cheng, M. (2021). Sharing economy research in hospitality and tourism: a critical review using bibliometric analysis, content analysis and a quantitative systematic literature review. *International Journal of Contemporary Hospitality Management*, 33(5), 1711-1745. <https://doi.org/10.1108/IJCHM-12-2020-1457>
18. Shi, X. (2024). Maritime China, sea temples, and contested heritage in the Indian Ocean. *International Journal of Heritage Studies*, 30(6), 653-672.
19. Sun, C., Yang, Z., & Yang, Y. (2024). Navigating the tides of change: The local dynamics of China's marine economic policy. *Marine Policy*, 165, 106207. <https://doi.org/10.1016/j.marpol.2024.106207>
20. Wang, C., Yan, G., & Xia, D. (2017). On the research value and significance of Genglubu. *Journal of Ocean University of China (Social Sciences Edition)*, (2), 45-49. <https://doi.org/10.16497/j.cnki.1672-335x.2017.02.009>
21. Wang, L. (2019). Memory and identity: Nanhai Genglubu as intangible cultural heritage. *Pacific Journal*, 27(3), 50-60. <https://www.pacificjournal.com.cn/CN/>
22. Wang, G., Wang, J., Wang, X., Wang, Q., Han, J., Chen, L., & Feng, K. (2024). A method for coastal global route planning of unmanned ships based on human-like thinking. *Journal of Marine Science and Engineering*, 12(3), 476. <https://doi.org/10.3390/jmse12030476>
23. Wang, J., & Zhang, S. (2022). Cross-Cultural Learning: A Visualized Bibliometric Analysis Based on Bibliometrix from 2002 to 2021. *Mobile Information Systems*, 2022(1), 7478223. <https://doi.org/10.1155/2022/7478223>
24. Wei, Y., Li, Y., & Zhou, X. (2023). A Study on Toponymic Entity Recognition Based on Pre-Trained Models Fused with Local Features for Genglubu in the South China Sea. *Electronics*, 13(1), 4. <https://doi.org/10.3390/electronics13010004>
25. Wen, X. (2019). The history, current status, and future prospects of Genglubu research. *Nanhai Journal*, 5(2), 76-89.
26. Wu, C. (2023). The politics of heritage and place-making in Tanmen, China. *Environment and Planning C: Politics and Space*, 41(6), 1243-1260. <https://doi.org/10.1177/239965442331182325>
27. Wu, C., & Young, C. (2023). Critical toponymies beyond the power-resistance nexus: multiple toponymies and everyday life in the (re-) naming of South China Sea Islands. *Social & Cultural Geography*, 24(10), 1732-1751.

28. Wu, M., Long, R., Bai, Y., & Chen, H. (2021). Knowledge mapping analysis of international research on environmental communication using bibliometrics. *Journal of Environmental Management*, 298, 113475. <https://doi.org/10.1016/j.jenvman.2021.113475>
29. Xie, H., Zhang, Y., Wu, Z., & Lv, T. (2020). A bibliometric analysis on land degradation: Current status, development, and future directions. *Land*, 9(1), 28. <https://doi.org/10.3390/land9010028>
30. Yang, G. (2024). New Outlook for the Ocean and Maritime Humanities and Social Sciences. In G. Yang (Ed.), *Compass on the Ocean: Chinese Maritime Theory, History and Culture* (pp. 1-59). Springer Nature Singapore. https://doi.org/10.1007/978-981-97-7612-2_1
31. Yuan, W., & Yan, G. (2021). Gen Lu Bu of the South China Sea and Maritime Culture: Conference Report. *China Oceans L. Rev.*, (38),158-168. <https://www.airitilibrary.com/Article/Detail?DocID=P20201016006-202106-202109130007-202109130007-158-168>
32. Zhang, Q. (2020). Intangible cultural heritage safeguarding in times of crisis. *Asian ethnology*, 79(1), 91-113. <https://www.jstor.org/stable/26929486>