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RESEARCH ARTICLE

The Impact of the Erhai Protection Policy on the Way of Life of the Bai People's Practicing Cormorant Fishing in the Erhai Lake Area

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Abstract

The study examines the relationship between ecological conservation and the transmission of intangible cultural heritage (ICH) skills through the cormorant fishing tradition at Erhai Lake in Dali, Yunnan Province, Southwest China. Cormorant fishing, with a history spanning over 4,000 years, was recognized as a provincial-level intangible cultural heritage in 2009. Since the implementation of ecological protection policies in 2015, cormorant fishing activities have been relocated away from Erhai Lake. The resulting decline in traditional practice cannot be attributed solely to ecological governance. Rather, it reflects the combined influence of market-oriented development, shifting cultural values, and policy interventions. The study identifies how ecological governance has reconfigured the transmission of ICH skills from everyday water-based livelihoods toward performance-oriented cultural display, reducing their practical continuity. While ecological governance has improved environmental conditions, it has also unintentionally limited the spatial and social contexts necessary for sustaining cormorant fishing as a lived practice. This research highlights the structural tension between ecological restoration and cultural continuity, suggesting that sustainable governance must integrate cultural considerations and community participation. A balanced approach to heritage preservation requires understanding how ecological protection and cultural transmission can co-evolve under contemporary environmental governance.

Keywords: Erhai cormorant water culture, Erhai Lake, Erhai cormorant, Bai people

Introduction and research objective

Ecological protection in China has shifted from environmental management towards the broader goal of building an ecological civilization. The concept of ecological protection has gradually expanded from a narrow focus on environmental control to a national strategy that emphasizing sustainable development and ecological civilization (Hou et al., 2020; Yang et al., 2023; Wang, 2025). Meanwhile, China's framework for safeguarding intangible cultural heritage has continued to evolve. From foundational legislation to digital transmission, community-based cultural initiatives have contributed to the establishment of a multi-level structure for cultural and ecological protection (Wang & Zaibon, 2024). At the national level, these policy developments demonstrate an integrated approach to managing the relationship between culture and ecology. They also shape how local societies engage with ecological conservation and heritage practices in daily reality.

For the Bai people, cormorant fishing tradition has long represented more than a means of livelihood—it is a cornerstone of their cultural identity, deeply intertwined with rituals, folklore, and community life. However, this tradition has faced significant challenges in recent decades due to modernization, environmental policies, and socio-economic transformations. Declining fish stocks, stricter fishing regulations, and shifting economic structures have contributed to its decline (Chen, 2018). A pivotal turning point occurred in 2015 when the Dali Municipal Government issued the

Notice on the Complete Withdrawal of Cormorant Performance Tourism Activities in Erhai Lake, mandating that all businesses related to cormorant performances cease operations or relocate by mid-July 10, 2015. This policy severed the final connection between cormorant fishing culture and Erhai Lake's fishery industry, forcing the Bai fishermen to abandon performances and seek new livelihoods. Field research conducted in February 2025 reveals that only four households in S Village continue to raise cormorants, though all have adopted varied strategies to sustain their traditional practice.

Against this background, this study takes the cormorant fishing tradition at Erhai Lake as a case and aims: (1) To analyze the interaction between ecological conservation policies and intangible cultural heritage (ICH); (2) To reveal how policy transformations have influenced the continuity and transformation of local cultural practices; (3) To explore the necessity of integrating cultural sustainability into environmental governance.

Research methodology

This study employs a qualitative research approach combining fieldwork, literature review, policy document interpretation, and participant observation. Conducted in S Village around Erhai Lake, purposive sampling involved 26 interviews and 3 in-depth interviews with local villagers, government officers, and academic experts. Thematic and interpretive analyses were employed to identify the interaction mechanisms between ecological policy and ICH. All participants provided verbal informed consent prior to participation.

Historical development

The relationship between the Bai people and Erhai Lake has evolved through distinct stages over thousands of years. To illustrate this long-term process, the following table summarizes five historical periods, highlighting the continuous interaction between the cormorant fishing tradition within Bai Water Culture and the lake's ecological system.

Table 1 Cultural and ecological Interaction between the cormorant fishing tradition within water culture and Erhai Lake's ecological environment.

Stage	Period	Culture	Ecological	Interaction
Emergence	2000 BCE – 2 C CE	Primitive belief	Adaptation	Coexistence
Flourishing	7th – 19th C	Water culture	Stability	Balance
Expansion	19th – Early 20th C	Culture al extension	Exploitation	Weakening
Modernization	1985 – 2015	Functional shift	Restriction	Rupture
Post-Decline	2015 – Present	Reflection	Adaptation	Renewal

Each stage reflects, from different perspectives, the interaction between Erhai's cormorant fishing tradition and the lake's ecological environment. From the early worship of water to the gradual transformation of traditional fishing practices, and finally to the present policy-driven ecological conservation, these transitions reveal the ongoing evolution of cultural– ecological relations in the Erhai Lake region.

1. Emergence stage (2000 BCE – 2nd Century CE, Neolithic - Han Dynasty)

Archaeological investigations (Li & Yang, 2011) suggest that the Bai people's cormorant fishing tradition at Erhai Lake can be traced back at least 4000 years, with relics such as the cormorant motifs on bronzes from Aofeng Mountain (Figure 1) and bronze cormorant scepter head found in Tomb No. 14 at Hongtupo (Figure 2). Over time, the cormorant became central to their social and economic structures, influencing rituals, traditions, and daily life Yang & Yang, 2020). Early Bai communities relied on fishing, hunting, and agriculture, laying the foundation for their cultural identity.

The bronze cormorant artifact unearthed from Aofeng Mountain in Jinchuan dates to the early Bronze Age (around 2000 BCE, approximately 4,025 years ago). This suggests that its presence was not merely coincidental. It was likely more than just a decorative motif; rather, it carried cultural or practical significance,

indicating that cormorants had already become an integral part of the Bai people's daily life at that time.

The bronze cormorant staff head excavated from Hongtupo in Xiangyun dates to the late Warring States period to the Western Han dynasty (approximately 230 BCE – 8 CE, around 2,200 years ago). This artifact may directly reflect the dependence of fishing and hunting activities on water resources at the time. It suggests that cormorants had both practical and symbolic values in daily life— possibly regarded as guardians of water bodies or symbols of abundance. The casting of cormorant imagery onto a bronze staff may have served ritualistic, devotional, or status-signifying purposes, further confirming the deep historical roots of cormorants within Bai Water Culture in the Erhai Lake region.

At this early stage, the knowledge system of the Bai ancestors around Erhai Lake was still in its formative phase. They closely connected natural water resources with their daily livelihood, viewing the practice of cormorant fishing as a primitive form of human–nature symbiosis. During this period, the stable ecological environment and abundant water resources provided the fundamental conditions for the emergence of the relationship between cormorants and the Bai ancestors of Erhai.

Figure1 Erhai cormorant water cultural relics
Source: Zhou (2019)

2. Flourishing stage (7th–19th Century, Tang - Ming/Qing Dynasties)

During the Qin-Han period through to the Tang Dynasty, Fan Chuo of the Tang Dynasty documented the Erhai cormorant fishing tradition in the Erhai Lake region his work Yunnan Baiyi Zhi Early written records indicate: "West Erhai Lake River and Kunchi south of Daichi, during winter months, fish, geese, [ducks], rich pheasants, and 'water bird' referring to the cormorant are abundant in the wild waters." In this context, "water Za bird" refers to cormorants (He, 2018). The domestication of a significant number of Erhai cormorants for fishing purposes likely commenced during the Tang and Song dynasties and continued into subsequent periods. This practice ultimately led to a peak in the development of the cormorant fishing tradition within Bai Water Culture (Liu, 2016). By the Song-Yuan period, cormorant fishing had become a well-established practice (Liu, 2017). The Ming and Qing Dynasties further institutionalized the practice (Tan, 1990), reflecting the critical role of cormorants in society at that time.

Within the relatively stable ecological environment and abundant water resources of the Erhai region, the Bai ancestors developed a social structure that integrated ritual, ceremony, and aquaculture practices. The ecological balance enabled cormorant fishing to become embedded within the Erhai Bai water culture system, further strengthening the cultural identity of harmony and coexistence between humans and nature.

Figure 2 Cormorant cultural artifacts from Erhai Lake
Source: Li and Yang (2011)

3. Expansion stage (19th - Early 20th Century)

In the late imperial to Republican-era period, including the Republic of China, featuring distinctive waterbird-based livelihoods in central Yunnan. as well as Charles Patrick Fitzgerald's Wuhua Lou, which is also documented in detail in the Rural Survey of Yunnan Province: "The Erhai Lake Bai people still mainly fish, and their main fishing gear is hand-woven silk or hemp nets. When fishing with nets, the Bai people usually throw the nets into the water for one or two hours and then inspect them. Cormorant fishermen, with a boat full of fishing warblers, were sailing on the Erhai lake. They glimpsed a fish, and one of the warblers jumped into the water from the boat to catch it. After capturing the fish, it returned to the boat. The fishermen took the fish from its mouth. In 1932, The fishing methods were detailed in Newly Compiled Yunnan Gazetteer, further validating their economic and cultural significance (Ma, 2013; Henri d'Orléans, 2001).

The abundant fishery resources of the Erhai region gradually transformed household- based cormorant fishing into a more commercial and socially organized practice. The richness of ecological resources sustained the continuation of the Erhai Bai water culture, while the cultural beliefs in turn expanded the use and meaning of those natural resources, revealing a reciprocal relationship between ecology and cultural identity.

4. Modernization and decline stage (1985 - 2015)

From 1985 to 2000, the cormorant fishing tradition at Erhai Lake underwent a sharp decline. The enforcement of China's 1987 Fisheries Law, which banned the use of cormorants for fishing, played a major role. Additionally, cultural changes, environmental degradation in Erhai Lake, and the rise of industrialization and commercialization further contributed to the fading of this traditional practice. As a result, many Bai fishermen gradually gave up cormorant fishing as a way of life. In 2009, the Yunnan provincial government designated Erhai Cormorant fishing as an Intangible Cultural Heritage, marking an effort to preserve this traditional practice. That same year, the S Cormorant Performance Base was officially

established. Between 2009 and 2015, cormorant performance tourism became a major attraction, generating over 30 million RMB in ticket sales and providing a livelihood for many individuals who relied on these performances for their income. This shift marked the transformation of the cormorant fishing tradition from a livelihood practice to a staged cultural performance.

With the deterioration of the ecological environment and the implementation of fishing bans, cormorant fishing and the Erhai Bai water culture have gradually shifted from traditional productive practices to performative tourism activities. This transformation of ecological practice altered the logic of cultural survival, turning its function from a practical livelihood activity into a symbolic expression of heritage.

5. Post-decline stage (2015 - Present)

Since 2015, according to field research in Village S, only four households continued raising cormorant for cultural practice alongside fishing or tourism. One household worked for a tourism company, relying on staged cormorant demonstrations while also engaging in fishing. Another household relocated to Xishuangbanna to conduct tourism-oriented cormorant demonstrations. A third household maintained cormorant breeding and small-scale subsistence fishing without external support. The fourth household relocated to Weishan to continue demonstration-based cormorant practice.

The continuous enforcement of ecological protection policies has, in the short term, weakened the continuity of the Bai Water Culture around Erhai Lake. Yet this change has also prompted local people to reflect on the relationship between environmental conservation and cultural continuity, leading them to explore new ways of co-adaptation between ecological protection and cultural continuity.

These historical records highlight the deep historical roots of cormorant fishing within Bai cultural life and reflect a longstanding understanding and respectful engagement with local water resources.

Cultural and value: Beliefs, traditions, and social identity

In the Bai community around Erhai Lake, cormorant fishing culture is more than a subsistence technique; it represents a longstanding relational bond between people and the lake environment. Beyond their practical role in fishing, cormorants hold profound cultural and spiritual significance, deeply embedded in Bai traditions. The Bai people integrate cormorants into their beliefs and rituals, emphasizing a shared status between humans and cormorants in both nature and culture. Over time, the cormorant has transcended its original function as a "fishing tool" and evolved into an intermediary between nature and human traditions. The presence and decline of cormorants are closely connected to the community's daily life and social functioning (Chen, 2018).

Oral accounts and field research reveal how the Bai community integrated the cormorant into their water culture as both a spiritual and practical being. Erhai Lake Bai fishermen maintained ritual practices and customary taboos surrounding cormorant raising and fishing. These practices, rooted in spiritual beliefs, guided key life events— including cormorant incubation, fishing activities, and even burial rituals.

During the cormorant incubation period, fishermen would conduct specific rituals to seek blessings from the Benzhu (village guardian deity worshiped in Bai communities) and ancestral masters. As Interviewee E (local resident) recalled, a common prayer recited at the time was: "Benzhu Lord and esteemed ancestors, today our household begins the incubation of cormorants. Please bless us with the strongest and largest cormorants. May they grow into powerful birds capable of catching fish—big fish. Grant us an abundant harvest, as plentiful as willow leaves, and keep us safe and prosperous." As Interviewee A (cormorant inheritor) recalled: "Once I attended a funeral during the hatching period. After that, none of the eggs hatched that year; the parent cormorants refused to return to the nest."

Alongside these prayers, Bai people often assign names to each cormorant according to its temperament, treating the bird as a family member rather than a tool. As Interviewee C (local resident) recalled: "I named my most hard-working and clever cormorant after my eldest daughter, because she works harder than most men, and so does that bird." For the Bai people, such naming embodies a deeply humanized relationship with the cormorants that extends beyond mere utility (Chen, 2018). Interviewee D (local resident) put it plainly: "People say 'live off the mountains or the sea.' We live

off cormorants." In this sense, names mark a bomd that connects emotion and livelihood.

Prior to fishing, a short rite was held to seek the protection of the Dragon King of Erhai. Facing the lake, Bai people offered a set prayer. Interviewee E (local resident) recounted: "Dragon King of Erhai, today we set out to catch your fish and live by your blessings. Only under your protection do we have food to eat and clothes to wear. Please grant us calm waters and keep both us and our cormorants safe."

These rituals and beliefs, once an integral part of Bai people's daily lives, reflected the deep spiritual bond they shared with their cormorants and the lake. Interviewee B (cormorant inheritor) recalled: "Since the 1990s, when I was in sixth grade, I have been working with cormorants. My grandfather taught my father, and my father taught me." With the decreasing dependence on fishing as a livelihood, these ritual practices have gradually diminished and now persist mainly in memory and cultural documentation.

When a cormorant passes away, the Bai people carried it to the mountains for burial and held memorial ceremonies during the Qingming Festival (Tomb-Sweeping Day, honoring ancestors in spring), the Zhongyuan Festival (Ghost Festival, offering prayers to departed spirits), and the first day of the ninth lunar month to pay their respects. (Chen, 2018). Interviewee C (local resident) also mentioned: "In the past, when a cormorant died, we would bury it and set up a separate headstone for it. We regularly held ceremonies to honor the bird, burned incense, and bowed to pray for its blessings — for our family's peace, the elders' good health, and our children's academic success." This practice undoubtedly demonstrates the continuing relationship between the Bai people and the Erhai cormorants, symbolizing their connection with Erhai Lake, nature, and the spiritual world.

Historical records highlight the long- standing relationship between the Bai people and cormorants. In Dianhai Yuheng Zhi, Tan Cui documented: "Eagles are raised to catch pheasants and rabbits, while cormorants are trained to catch fish. These birds are under human control and serve their intended purposes effectively." The use of cormorant eggs and excreta in traditional medicine, as evidenced in the Compendium of Materia Medica, underscores the significance of cormorants in traditional healing practices (Chen, 2018). Despite the acknowledged antipyretic properties of the gall bladder of Erhai cormorants. the Bai community around Erhai Lake maintains a cultural taboo against eating cormorants, reflecting a deep respect for life and nature. This historical record reveals the long-standing tradition of using cormorants for fishing in the Erhai Lake region, showcasing their practical value and the wisdom embedded in Bai daily life (Liu, 2017).

Malinowski (1922) proposed that cultural practices evolve to fulfill both material and psychological needs. Erhai Cormorant fishing exemplifies this theory, as it not only sustains livelihoods but also provides spiritual reassurance through associated rituals and beliefs (Fei, 1992). Culture, in this sense, is an organized system that satisfies both practical and symbolic needs. The Erhai cormorants, as a traditional cultural element, likely emerged to fulfil specific needs of the community — where usefulness equates to function (Fei, 1992). In this sense, Erhai Cormorant Water Culture functions as a system that fulfills both practical and symbolic purposes.

Interviewee A (ICH practitioner) said: "As long as I can move, I will continue to raise cormorants. But after I pass away, there will be no one to carry it on. I have received the cormorants' blessings in my life — even if I have no money, I will never let them go hungry." Such enduring attachment makes cormorants in Erhai an inseparable part of both cultural tradition and daily life.

In recent years, the younger generation has shown little interest in continuing the Bai tradition of cormorant fishing. Field interviews and observations indicate that most young people now regard it as a symbol of local heritage rather than a way to make a living. Many have turned to tourism or migrant work, while only one family keeps cormorants for occasional performances at tourist sites. The skills of raising and training cormorants are passed down orally in the Bai language, without written records. As one inheritor explained, "In the past, we relied on cormorants to feed our families. Now it's the opposite—we must feed them. Without income, no one wants to take it on." Highlighting a reversed economic logic in which cormorants have shifted from supporting livelihoods to requiring financial care

These changes reveal how modernization and ecological regulations have reshaped the social and

economic foundations of this tradition. During fieldwork, some visitors expressed disappointment that they could no longer see cormorant fishing in person.

As Geertz (1973) further conceptualized society as a web of meanings. The symbolic role of cormorants in Erhai Lake Bai culture illustrates this perspective, showing how these illustrates how ecological practices become embedded within symbolic meaning-making. (Chen, 2018).

Environmental challenges and adaptation

In the Erhai Lake region, the practice of cormorant fishing has long been shaped by ecological pressures and institutional shifts. Before the establishment of the People's Republic of China (pre-1949), land-use patterns varied due to differing ruling parties. In Kuomintang-controlled areas, individuals paid taxes to local governments for land rights, while in Communist-controlled areas, land was publicly owned with restricted private ownership (Song, Zhang, &, Jiang, 2021). At the time, due to the lack of clear governmental water policies, Erhai's fishery resources were primarily managed by self-governing fishermen's organizations. After the founding of the People's Republic of China (1949-1995), the government implemented land reforms, and fishing production teams were gradually established. Cormorant fishing continued to function as a key livelihood practice at Erhai Lake. Field research revealed that during the collectivization period, village S established a cormorant fishing team, where members were connected through kinship and marriage. Seventy percent of the fish they caught had to be handed over to the state, with the remaining portion allocated to the commune and then distributed to individuals based on their work points. After the household responsibility system was introduced in 1978, cormorant fishermen resumed to family-based production units. In 1986, with the introduction of the "Regulations on the Implementation of the Fisheries Law," China officially banned the use of cormorants for fishing. Entering the market economy era (1995 to present), fishermen faced a transition in their livelihoods. Some chose to work elsewhere, while others turned to tourism. Under livelihood pressures, fishermen sought new means of subsistence, and traditional cormorant fishing gradually transformed into tourism-oriented performances, a shift reflecting the transition of Erhai cormorants from a "natural water body-domestication-fishing" production cycle to performance-exhibition practices oriented toward market demand.

The fish community structure of Erhai Lake has undergone sustained and substantial change, directly influencing the viability of cormorant fishing livelihoods. In the 1950s, Erhai Lake had 17 species of fish, with relatively balanced ecological niches among them. However, since the 1960s, large-scale artificial aquaculture and the introduction of non-native fish species have taken place (Cai et al., 2013). By the 1970s, native fish gradually disappeared, and in the 1980s, Erhai Lake had 30 fish species, with crucian carp numbers increasing dramatically, accounting for over 70% of total catch by 1985. Taihu Neosalanx taihuensis, first introduced to Erhai Lake in 1984, was successfully cultivated by 1991, leading to a continuous rise in fish production and further exacerbating the extinction of native fish species (Wang et al., 2015). After 2015, three invasive fish species appeared in Erhai, with invasion by Japanese smelt (Hypomesus nipponensis) being the most severe and rapidly growing. This species' invasion significantly altered Erhai's fish community, particularly affecting Neosalanx taihuensis, Hemiculter leucisculus, Pseudorasbora parva, and Carassius auratus (Yin et al., 2021). Additionally, seven native fish species are endangered, and Schizothorax taliensis has already become extinct (Tang et al., 2013). Consequently, Erhai's fish diversity has declined, damaging ecosystem resilience (Gong et al., 2023).

In response to resource depletion, regulatory and ecological restoration measures have gradually reshaped the fish community structure. By 2025, Erhai had approximately 30 fish species, though not equivalent to the 1980s, with the fish population transitioning toward a new equilibrium state (Dali Prefecture Erhai Management Bureau, 2025). However, the decline in fish resources over the past several decades has directly affected the fishing efficiency of Erhai cormorants. Before the 1950s, cormorants at Erhai Lake could collectively catch over 100 kg of fish per day. By the early 2000s, however, average daily catches rarely exceeded 5 kg per boat, illustrating a drastic decline in resource availability. Erhai cormorants had limited fishing ranges and faced challenges from these environmental changes (Manzi & Coomes, 2002). These changes in fishery resources have significantly reduced

the types of fish that cormorants can catch, forcing cormorant fishers to modify their fishing practices, adapt equipment (Figure 3), or shift to alternative livelihoods.

Governmental efforts to safeguard the ecological environment of Erhai Lake have intensified, resulting in increasing restrictions on traditional fishing practices. For example, in 1997, the Dali Prefecture government banned the use of motorized boats and net enclosures to protect Erhai's fishery resources (Liu, 2015). These measures altered traditional fishing practices and further constrained cormorant fishing at Erhai Lake, with some fishermen adopting modern fishing techniques or transitioning to other industries. Additionally, the rapid growth and strong reproductive capacity of certain fish led to decreased numbers of native fish, affecting cormorant fishing. By the early 2000s, cormorant fishing was no longer sufficient to sustain household livelihoods (Manzi & Coomes, 2002). prompting many cormorant fishers to turn to tourism-oriented staged performances and service-related work as adaptive livelihood strategies.

In recent years, although Erhai has implemented fishery resource restoration projects such as population enhancement and wetland protection (Wang et al., 2015), although these interventions have primarily prioritized ecological restoration. This has disrupted the traditional lake–domestication–fishing livelihood cycle. Particularly after 2015, Erhai governance has followed an "ecology-first" policy approach, with strict limitations on water area usage, progressively shrinking the aquatic space available for Erhai cormorants. Erhai protection exemplifies China's broader environmental governance strategy, carrying strategic significance and involving multiple levels of state actors (Feng & Zhang, 2024). Within this governance framework, Erhai Lake has increasingly been managed through authoritarian environmental governance, characterized by centralized, top-down enforcement and limited channels for public participation (Beeson, 2010; Gilley, 2012; Li & Shapiro, 2020). This governance model has effectively advanced ecological restoration, yet it has also reshaped local cultural practices by restricting the spatial and social contexts necessary for the continuation of cormorant fishing as lived heritage.

The Erhai Lake Protection and Management Regulations (1988) represented China's first locally formulated ecological protection regulation, was the first special regulation enacted by Chinese local government, as well as the first special regulation and first ecological environmental protection regulation formulated by China's ethnic autonomous regions. The subsequent revisions in 1998, 2004, 2014, 2019, and 2023 (Standing Committee of the People's Congress of Dali Bai Autonomous Prefecture, 2023) expanded the scope of governance from basic ecological protection to integrated watershed, land-use, and tourism management, as summarized in Table 2.

Figure 3 Fishing net used for catching silverfish (Neosalanx sp.) in Erhai Lake
Source: Wang (2024)

Table 2: Historical revisions of the "Erhai Protection and Management Regulations of Dali Bai Autonomous Prefecture, Yunnan Province".

Time	Revision Background	Core Direction	Impact
1998	First Erhai Lake Cyanobacterial bloom outbreak in 1996	Initial establishment of legal framework	Clarified management entities and enforcement authority
2004	2003 government meeting directives	Shift from utilization to protection	Restricted agricultural fertilizers, fishing, and water extraction
2014	Advancement of ecological civilization construction	Systematization of institutional framework	Strengthened governance and legal responsibilities
2019	Implementation of Xi Jinping's ecological civilization thought	Comprehensive control of Erhai watershed and basin	Established three-level protection zones
2023	Implementation of 20th Party Congress spirit and local governance experience	Normalization of institutional framework	Consolidated governance achievements

The revisions shown in Table 2 indicate that Erhai protection has gradually shifted from localized, issue-specific management to a strategically coordinated governance system involving provincial, prefectural, and municipal levels under central oversight. This institutional development demonstrates that Erhai protection has become a governance priority rather than a routine environmental adjustment. Within this multi-level framework, ecological governance of Erhai has also functioned as an administrative performance metric for local governments, resulting in policies characterized by continuity, consistency, and strong enforcement. In addition, On May 21, 2025, the Dali Prefecture People's Government also issued a revised version of the Implementation Measures, further institutionalizing the continuity of Erhai's ecological protection efforts (Dali Prefecture People's Government, 2025).

Under this policy framework, Erhai Lake has exhibited observable improvements in ecological conditions. Since 2015, multiple restoration measures have been implemented, and phased outcomes have been documented. On August 15, 2025, Dali Prefecture released the Erhai Index, a composite evaluation metric assessing governance outcomes across water quality, water environment, and aquatic ecology. Figure 4 presents the annual changes in the index from 2015 to 2025, a composite evaluation metric assessing governance outcomes across water quality, water environment, and aquatic ecology. The dataset is compiled from state and prefecture-level functional agencies— including the Dali Prefecture Erhai Management Bureau, Housing and Urban-Rural Development Bureau, Agriculture and Rural Affairs Bureau, Hydrology and Water Resources Bureau, and Ecological Environment Bureau— ensuring that assessment results are based on authoritative and systematically collected data.

Overall, substantial progress has been achieved in Erhai protection and governance. Since 2015, the central government has intensified efforts to build an ecological civilization, with the State Council issuing the "Comprehensive Reform Plan for Ecological Civilization Construction," a move promoted as one of President Xi Jinping's key governance achievements (Kostka & Zhang, 2018). During his visit to Dali that same year, President Xi Jinping emphasized the importance of protecting Erhai Lake, stating, "We must ensure the protection of Erhai Lake," and expressed his hope that "in a few years, the water will be even cleaner" (China Economic Weekly, 2018). Following this directive, Erhai Lake's ecological protection became the top priority of the Dali municipal government (Feng & Zhang, 2024). "The Dali municipal government issued a notice requiring the relocation of cormorant performances from Erhai Lake, but the notice did not specify the exact reasons for this relocation" (Interviewee A, ICH practitioner). Against this policy backdrop, Erhai's ecological governance entered a phase of systematic reinforcement. However, while ecological governance has achieved results, traditional culture faces new dilemmas.

Field interviews reveal that "in 2015, the Dali municipal government issued a notice requiring cormorant performance tourism to relocate from Erhai, but the notice did not specify the exact reasons for this relocation" (Interviewee B, ICH practitioner). Although policy documents did not explicitly state the reasons for relocation, interviewees generally commonly interpreted as an enhancement and extension of Erhai protection measures. In 2017, the Dali municipal government designated the Erhai Lake Protection Core Zone, imposing strict controls on all lakeside projects, leading to the closure of 2,498 guesthouses and restaurants (People's Daily, 2017). In 2019, the Dali municipal government enacted the "Regulations on the Protection and Management of Erhai Lake," implementing the most stringent conservation policies in the city's history (Standing Committee of the People's Congress of Dali Bai Autonomous Prefecture, 2023).

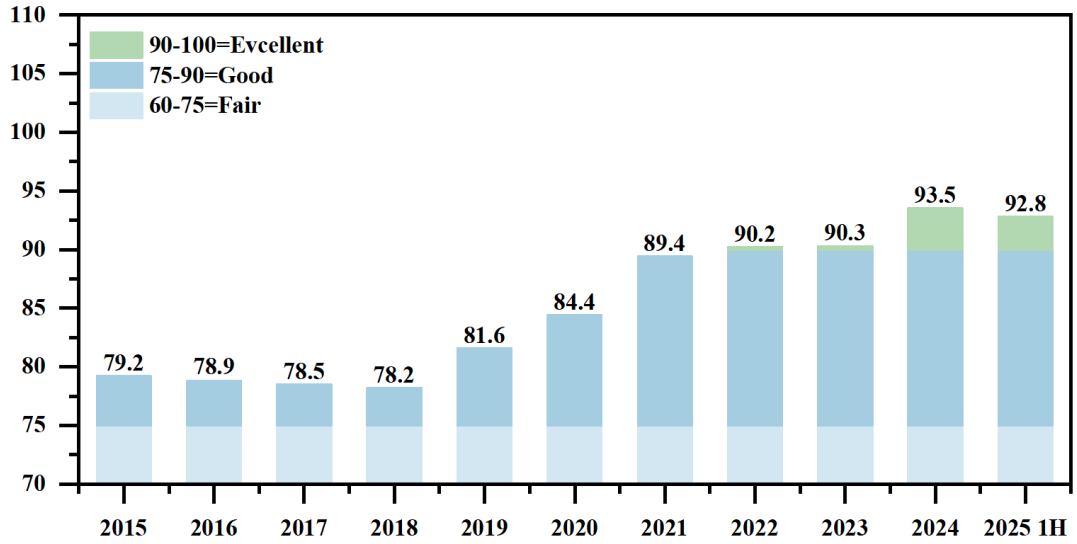

Figure 4 Erhai index
Source: Dali Prefecture People's Government (2025).

While enforcing environmental policies, the local government also faces social pressures (Feng & Zhang, 2024). On one hand, higher authorities demand strict implementation to demonstrate political commitment (Pearson et al., 2021); on the other hand, the local government must address public livelihood concerns. "Protecting Erhai is a strict requirement, and the municipal government now seeks to strike a balance between ecological protection and alleviating the burden on residents" (Interviewee J, government official). Interviewee F (government official) explicitly stated: "Erhai cormorant fishing is an intangible cultural heritage. We never intended to abolish it, only to relocate it from the Erhai lake surface to designated areas." This reflects that the policy is not merely an administrative resteiction, but rather a structural misalignment between cultural continuity and ecological protection. Moreover, since 2016, the central environmental inspection teams have conducted multiple inspections of Erhai Lake's protection, urging local governments to intensify conservation efforts (Ministry of Ecology and Environment, 2021).

Against this backdrop, Erhai Cormorant Water Culture performances originally conducted on Erhai Lake became restricted. Some cormorant practitioners were forced to relocate to artificial water bodies, enclosed scenic areas, or move to other regions for performances. "In the past, tourists could watch cormorants fishing up close from boats and interact with the cormorants. Now, performances are only allowed restricted to land-based demonstrations, which greatly diminishes the immersive quality and authenticity of the experience" (Interviewee A, ICH practitioner). Ecological protection policies have inadvertently reduced commercial opportunities for cormorant

performances, leading some fishermen to leave the trade, with cultural continuity facing challenges.

In response to these changes, Erhai Cormorant Water Culture practitioners and related practitioners have begun exploring adaptive strategies. Some have attempted performances in enclosed parks to bypass the lake's waterway restrictions (Figure 4). However, due to the limitations of scenic areas, visitor engagement has declined, and the market appeal is weaker compared to lakeside performances. Meanwhile, some cormorant houuseholds have turned to running guesthouses or engaging in heritage exhibitions to offset losses from the shrinking tourism sector. Although these adaptations have helped some sustain their livelihoods, they cannot fully replace traditional cormorant fishing performances. These adaptations function more as "substitutes" than genuine "continuations," failing to preserve the original integrated practice of the "water-bird- human" relationship. For younger generations, especially weak economic incentives for cultural participation undermine the motivation needed to sustain cultural transmission.

Figure 4 Erhai Cormorant Performance at the scenic area
Source: Jiaqi (2024)

Field data further reveal that the formation of Erhai cormorant performances as a livelihood strategy is closely tied to the establishment of the Erhai Cormorant Performance Base in 2009. This base capitalized on the reputation of Erhai Cormorant Water Culture and tourism market demand to create an integrated performance operation targeting tourists. However, Interviewee G (government official) noted: "The 'Erhai Cormorant Performance Base' established in 2009 conflicted with Erhai protection regulations. According to the 1987 Fisheries Law implementation rules, cormorant fishing is not permitted on natural lake surfaces." This indicates that this livelihood model operated outside policy boundaries from its inception. Nevertheless, it also generated considerable income for locals. "In the past, our Village S depended on cormorant fishing for survival, with no other income sources. Later, we began supporting our families through cormorant performances" (Interviewee K, local resident). "We' ve relied on cormorants for our retirement and to purchase commercial real estate" (Interviewee C, ICH practitioner). These accounts demonstrate that policy legitimacy and sustainability ultimately depend on the scale and flexibility of management.

As performances gradually replaced traditional fishing, our investigation identified "over-commercialization" in Erhai Cormorant Water Culture performances. As one Cormorant practitioners emphasized, "Because cormorants killed display fish in the performance area, the local tourism group no longer allows them to fish in those waters. As a result,

cormorants have been fed only the fish we provide for extended periods, and they are gradually losing their natural fishing skills. They still need access to suitable waters" (Interviewee B, ICH practitioner). Interviewee A (ICH practitioner) further noted: "The water areas designated by the government are either too shallow or too turbid for effective training." This illustrates that cultural practice necessitates not only institutional permission but also hinges on specific ecological conditions and operational environments. When available waters lack suitability, the craft may be "permitted to exist" yet remains difficult to practice. Compared to traditional Erhai Lake fishing, cormorant performances depend more heavily on tourist traffic. Cormorant fishing has gradually evolved into a "performance-oriented practice" activity, undermining its original cultural authenticity. Interviewee H (cultural scholar) observed: "The core of the Erhai Cormorant Water Culture lies in the people, not in the birds or the performance." Interviewee I (local resident) posed a more pointed question: "Are cormorants separated from Erhai Lake still Erhai cormorants?" These testimonies indicate that when traditional practice becomes disconnected from its native environment, cultural identity becomes destabilized.

Drawing from policy document analysis, the Erhai Lake protection regulations clearly adopt an "ecology-first" governance orientation. The Regulations and Implementation Measures set strict standards for water quality protection, pollution control, lake-area use boundaries, and ecological zoning, with the primary objective of restoring and maintaining ecological stability in Erhai Lake. However, corresponding support mechanisms for the transmission of Erhai Cormorant Water Culture have not been established. At the cultural level, the practice is treated primarily as an object of registration, documentation, and display through intangible cultural heritage designation, while the spatial and everyday conditions required for its practice are not integrated into the institutional framework. This structural gap constitutes the fundamental cause of the asymmetry between ecological protection outcomes and cultural continuity.

Conclusion

This study examines the historical transformation and present conditions of Erhai Cormorants Water Culture in the Erhai Lake region, analyzing how ecological conservation policies, lake water governance, community livelihood transitions, and intangible cultural heritage preservation interact with one another. The research demonstrates that cormorant fishing constitutes more than a productive skill or performative symbol—it represents a cultural system interwoven with aquatic ecology, everyday life, local knowledge, and social relationships. Yet as water environmental pressures have mounted, invasive fish species have spread, and ecological conservation policies have tightened, traditional cormorant fishing has lost its practical basis as a livelihood strategy, reorienting toward performance-oriented cultural practice as its primary functions. Cultural meaning has not vanished, however; rather, it has undergone reorganization from every day "place-based daily practice" toward "symbolic expression and educational transmission."

Through historical timelines, policy chronologies, and data including the "Erhai Index (2015-2025)," the study shows that Erhai ecological conservation governance has produced sustained improvements in water quality and ecosystem health. Cultural participation and community experience, however, remain largely absent from governance processes. The tension between ecological conservation and cultural transmission thus stems fundamentally from asymmetries among policy objectives, governance actors, and recognition of cultural value. This study develops a knowledge repository grounded in fieldwork, oral history, community observation, and action research to explain the dynamic mechanisms behind this tension: cultural practices endure not through unidirectional protection but through how communities understand and reinvest culture with contemporary significance.

Accordingly, this study argues that future ecological governance must incorporate cultural dimensions into policy frameworks through participatory collaborative governance mechanisms involving community participation, granting cultural inheritors and residents substantive rights and participatory space in policy discussions, ecological monitoring, and cultural presentation. Cultural transmission can shift from passive continuation to active regeneration only when community members recognize traditional craft culture as "locally embedded

cultural capital" convertible into narrative authority, employment opportunities, and local identity—thereby attracting young people to participate in learning and creation, generating internal cultural renewal rather than dependence on subsidies or symbolic policy protection.

These conclusions connect directly to United Nations Sustainable Development Goals: SDG 11 emphasizes strengthening protection of cultural and natural heritage; SDG 14 addresses sustainable governance of aquatic ecosystems; and SDG 15 emphasizes protection and restoration of freshwater ecosystems. The Erhai case shows that when ecology and culture function as mutually reinforcing elements within governance rather than competing resources, local societies can achieve new forms of sustainable cultural-ecological balance.

Future directions

Future research may extend this inquiry to other lakeside or riparian communities that share similar ecology–culture configurations. Small-scale community pilots could be used to explore the replicability of ecology- culture collaborative governance pathways," allowing the model to be gradually refined through practice and shaped into knowledge that can be adapted across regions. Meanwhile, attention should be directed to intergenerational differences within communities regarding ecological memory, cultural identity, and value expression, in order to understand the internal mechanisms of cultural reproduction and avoid reducing transmission to a one-directional transmission model.

The Erhai case suggests that when "culture" and "ecology" are positioned within the same policy framework and supported through collaborative community practice, local societies become more capable of maintaining a relatively stable cultural-ecological balance between environmental restoration and cultural continuity. Accordingly, future research and practice may continue to build comparative frameworks across regions and work toward the development of a shared knowledge repository culture–ecology collaborative governance. Such a repository could assist regions experiencing simultaneous pressures of ecological conservation and intangible heritage transmission in exploring more practicable and locally embedded pathways of coexistence at institutional, cognitive, and everyday practice levels.

Declaration of generative AI in scientific writing

 Generative AI tools were used only to improve the readability and language clarity of this manuscript during the revision stage.

 All research design, fieldwork, data analysis, interpretation, and conclusions were conducted independently by the authors.

 The authors retained full control over the research process and remain fully responsible for the content of this publication.

 No generative AI tools were listed as authors or contributed to the intellectual or scientific claims of the paper.

CRediT author statement

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