A New Approach to the Interpretation of Geotourism Texts

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Abstract:

The importance given to geotourism reflects public awareness of the urgency of environmental conservation that includes geomorphological, ecological, and cultural knowledge. The recent growth of geotourism has increased the demand for high-quality geotourism interpretation to ensure accurate data communication. Nonetheless, the lack of systematic theoretical guidance has meant interpreters frequently resort to haphazard and ineffective interpretation strategies. Therefore, to enhance interpretation, Li et al. (2022b; 2022c; 2024) established the **S**emantic, **S**tyle and **C**ultural (SSC) equivalence Model and the taxonomy of geotourism interpretation strategies (hereafter, Taxonomy) based on a corpus-based method and the theoretical framework of Hu's (2003) Eco-Translatology. Since this research is so recent it remains untested in the field. This paper aims to evaluate the effectiveness of these models using new geotourism data concerning **A**biotic, **B**iotic and **C**ultural elements from three Chinese UNESCO Global Geoparks (UGGps)—Fangshan, Xiangxi, and Mount Kunlun, the corpus-based method and Eco-Translatology.

Quantitative and qualitative analysis findings support the validity of both the SSC Model and the Taxonomy. Firstly, we found that most of the geotourism interpretation strategies employed to interpret geodata were derived from the Taxonomy in alignment with principles of Eco-Translatology to attain the SSC equivalence. Secondly, with the new data, we were able to find usage patterns that were previously missing in Li et al.'s (2022b; 2024) Taxonomy. Thirdly, we identified a completely new strategy used in interpreting geological processes. Finally, this paper further illustrated how potentially ineffective geotourism interpretations can be optimised by effective interpretation strategies from Li et al.'s Taxonomy (2022b; 2024) to achieve SSC equivalence.

Keywords: Geotourism interpretation; SSC Model; Interpretation strategies; Corpus-based method; Eco-Translatology

1. Introduction

Geotourism is a type of tourism which focuses on geology and landscape as the basis for providing visitor engagement, learning, and enjoyment (Geological Society of Australia 2015; Dowling and Newsome 2018). It prioritises the exploration of the earth's geomorphology (geological features and processes) to promote appreciation and preservation of both ecological (flora and fauna) and cultural (people's lifestyle) aspects of geotourism. According to Dowling (2013), geotourism focuses on three elements: **A**biotic; **B**iotic; and **C**ultural (or, A, B, and C). Dowling (2013) argues for the primary importance of the **A**biotic element, specifically geological features (GF) and processes (GP), because they determine flora and fauna (i.e., **B**iotic element). By extension, he claims the interplay between its **A**biotic and **B**iotic components influence the **C**ultural ways in which people have lived in the area both past and present (Dowling 2013).

Geoparks are the ideal destination for geotourism activities, as these provide access to a wide range of features of landscape, as well as to living creatures, in mostly pristine geological condition (Dowling 2013). The United Nations Educational, Scientific and Cultural Organisation (UNESCO 2006) defines a geopark as 'a nationally protected area that contains a number of geoheritage sites of particular importance, rarity or aesthetic appeal'. In the past few years, the rapid growth in geotourism has created a need for effective geotourism interpretation. In geoparks, interpretation can be carried out through interpretive signage, display boards, brochures, and geological museum displays, all of which provide sources of geotourism data related to the ABC elements noted above. Unfortunately, the majority of interpreters involved in servicing geotourism interpretation seem not to be equipped to effectively interpret all Chinese-to-English (C-E) geotouristic texts. As Ng (2017) highlights, the lack of a systematic approach to interpretation not only impedes the accurate transfer of geotourism data and therefore the objectives of learning, education, and conservation, but also impedes the development of geotourism research. Both Ng (2021) and Li et al. (2022a) emphasise that the establishment of a systematic interpretation system is of utmost urgency to optimise the C-E interpretation process, and to provide guidance to interpreters working with geotourism data.

To address this issue, Li et al. (2022b; 2022c; 2024) have developed a rigorous system for the interpretation of the ABC elements in geotourism contexts. This system comprises: 1) the SSC (Semantic, Style and Cultural) equivalence Model for evaluating the quality of C-E geotourism interpretation; and 2) the taxonomy of effective geotourism interpretation strategies (hereafter, Taxonomy; see Appendix A). The Model and Taxonomy were developed through quantitative and qualitative analysis of a corpus representing C-E interpretations of informational texts found in Chinese UGGps. The analysis used Hu's (2003) Eco-Translatology as a guidance to evaluate the effectiveness of interpretations of the ABC elements and to improve the ineffective interpretations identified in the data. Although the SSC Model and Taxonomy have great potential to enhance interpretation quality of geotourism expressions, their utility has not yet been validated by empirical research. Therefore, in this paper, we use interpreted geotourism data from three Chinese UGGps (i.e., Mount Kunlun, Fangshan and Xiangxi) to examine the effectiveness of the Model and the Taxonomy described above.

2. Literature Review

The interpretive concept of the ABC (**A**biotic, **B**iotic and **C**ultural) elements, first proposed by Dowling (2013), is gaining wider acceptance because of its geographical adaptability and application across many fields of study, including geotourism. For example, using the ABC concepts, Pásková et al. (2021) conducted a comparative

analysis of interpreted geotouristic texts pertaining to two locations: the Colca canyon and volcanoes in Andagua, Peru; and Muroto in Japan. The researchers in Muroto observed a high level of quality in their interpreted texts which employed audio and visual images on interpretive boards. In contrast, Andagua depended only on a minimum amount of text on interpretive boards (informational display boards), resulting in substantial omission of local cultural information. Later research by Migoń and Pijet-Migoń (2022) explored interpretation of the relationships between Cenozoic volcanic activity and host sedimentary rocks (mainly Cretaceous sandstones). They used a three-tiered framework (i.e., field work, website resource, and literature survey) to review and evaluate the interpretation of ABC elements and found that the accurate adherence of complex geological relationships in interpretations preserve the essence of biodiversity and sources of mineral wealth. Migoń and Pijet-Migoń (2022) concluded that effectively interpreting these geological and biological relationships to geotourists can create significant opportunities for the popularisation scientific education. Meanwhile, Rohaendi et al. (2022) applied the ABC concept to investigate geodiversity, biodiversity, and cultural diversity in the mining landforms (anthropogenic landforms) of Sawahlunto National Geopark in Indonesia. They found that providing effective interpretation to managers of tourism development promoted a balance for conservation against unchecked mining activities in the geopark.

Although previous studies (i.e., Pásková et al. 2021; Migoń and Pijet-Migoń 2022; Rohaendi et al. 2022) applied the ABC concept for the purposes of evaluating interpretation of geotourism, their research did not use linguistic methods (Li et al. 2022a). To fill this research gap, Li et al. (2022c) pioneered the use of linguistic methods in the C-E interpretation of Chinese UGGps. Specifically, Li et al. (2022c) created a corpus of text interpretations of the ABC elements used in two Chinese UGGps (Taishan and Leiqiong). These linguistic data were manually identified and categorized into effective and ineffective interpretations based on Hu's Eco-Translatology (2003). Through careful qualitative and quantitative analysis, the author eventually established the SSC Model used for benchmarking the quality of geotourism interpretation. Thus, they concluded the following the SSC Model can help to minimize ineffective interpretation of C-E geotourism expressions and ensure precise transmission of geotourism information in Chinese UGGps. They revealed eight interpretation criteria in all of the SSC categories. For semantic equivalence, these are linguistic accuracy, scientific accuracy of terminology, reader acceptability of terminology, and semantic completeness of information. For style equivalence, these are logical syntax, concise syntax, and appropriate voice syntax. The final criterion pertains to accurately conveying the connotation of the original cultural elements. Along the same line of research, Li et al. (2022b, 2024) empirically demonstrated that the SSC model would serve as an effective tool for constructing a taxonomy of interpretation strategies pertaining to geotourism. Using different Chinese UGGps, Li et al. (2022b) recommended effective strategies for interpreting various elements in A (GF and GP) and C (local human lifestyle), while Li et al. (2024) discussed six subgroups of interpretation in B (flora and fauna). Appendix A provides a detailed description of each of the interpretation strategies with examples.

Therefore, Li et al. (2022b; 2022c; 2024) contributed to the establishment of a quality assessment model (i.e., SSC) and a taxonomy of effective interpretation strategies for geotourism. However, without any empirical evidence to test their SSC model and taxonomy in the innovative field of geotourism interpretation, their work remains a theory and still leaves important aspects unvalidated. Therefore, this paper aims to validate the use of geotourism interpretation strategies using data from three other Chinese UGGps to determine whether the Model

and the Taxonomy can be applied to broader context. Specifically, we propose the following research question (RQ):

> RQ: Would the Chinese-to-English geotourism interpretation data in three Chinese UGGps (Mount Kunlun, Fangshan and Xiangxi) align with the SSC model and taxonomy of interpretation strategies based on Eco-Translatology?

If it is aligned, that means the SSC Model and the Taxonomy, developed using geotourism interpretation data in other UGGps can be generalised and applied to new dataset. More specifically, this means that the C-E geotourism interpretations in the new dataset should be able to successfully categorised and identified into the Taxonomy developed by Li (2022b; 2024) to achieve SSC equivalence, and if problematic interpretations are identified in the new dataset, the Taxonomy should be able to help with systematically improving the interpretation problems as well. If the empirical evidence show alignment, it should solidify the validity of the existing model; meanwhile, if misalignment is identified, it may signify a need for modifications of the existing model.

To address this research question, we follow Li et al. (2022b; 2022c; 2024) and apply the corpus-based method with the guidance of Eco-Translatology for quantitative and qualitative analysis of geotourism expressions obtained from the above mentioned three Chinese UGGps: Fangshan, Xiangxi and Mount Kunlun. In the next section, we proceed to discuss in detail the theoretical framework of Eco-Translatology. More details of the research data and method are described in Section 4.

3. Theoretical Framework

As mentioned above, this study uses a corpus-based method to examine geotourism interpretation in geoparks. We employ the Hu's (2003) Eco-Translatology as the theoretical foundation. Hu's approach (2003) emphasises the fluid role of the translator to 'adapt' and 'select' using a multi-dimensional process of interpretation. His concept of 'multi-dimensional adaptation' refers to prioritising the language and cultural needs of the audience. These adaptations aim at the optimal translation outcome for the target readers. This theory applied to geotourism interpretation means interpreters are required to adapt their approach to accommodate the language proficiency, cultural background, and age groups of geotourists. Embedded in this theory of adaption is flexibility. For instance, when interpreting the formation of GF, in complex Chinese sentences, the interpretation must be linguistically changed into the simpler English syntax. Effective adaption and flexibility in interpretation ensures high quality of information transmission among the general public, as well as, the geotourism researchers; therefore, it facilitates the purposes of geotourism - appreciation, learning, and contribution to the preservation of the Earth.

Eco-Translatology highlights a three-dimensional transformation which is considered in the interpretation process: linguistic, cultural, and communicative. The linguistic dimension of transformation concerns the language in word choice and language style (Hu 2003). The cultural dimension of transformation focuses on communicating the connotations of the source culture (Hu 2003). The communicative dimension of transformation emphasises the effectiveness of communication outcome between texts and audience (Hu 2003). The more dimensions are met, the higher the quality is of the interpretation.

Therefore, Eco-Translatology provides a framework that allows for the identification of effective interpretation. It also provides a process of removing and optimising ineffective interpretation in all ABC categories. As an example of effective interpretation at the **A**biotic (GF and GP) level, the interpreter literally interpreted the GF

‘熔岩流’ into ‘lava flow’, choosing accurate words in Leiqiong UGGp. This interpretation aligns with the linguistic and communicative dimensions of transformation (Hu 2003). An ineffective example of interpretation at the **A**biotic level can be found in Shilin UGGp, where the GP ‘在 2.7 亿年前的早二叠纪时代，石林地区为海洋环境，海底沉积形成了数百米厚的石灰岩，后经地壳抬升, 石林地区处于湿热古海岸边缘，溶蚀形成了最早期的石林。’ was ineffectively interpreted into ‘In the early Permian era 270 million years ago, the Shilin area was a Marine environment, and hundreds of meters of thick limestone was deposited on the seabed, the crust lifted up, and the Shilin area was at the edge of the hot and humid ancient coast, and the earliest stone forest was formed by dissolution.’ This English interpretation falsely adhered to the Chinese sentence style where multiple subject-verb structures are combined into one long complex sentence, making it a run-on sentence in English. While in reality, an accurate English interpretation should have been altered into a more simplistic style with clauses or shorter sentences to achieve style equivalence. Thus, guided by the Hu’s (2003) linguistic and communicative dimensions of transformation, we could revise it into ‘In the early Permian period, 270 million years ago, the Shilin region was a marine environment. The sedimentation on the seabed created a layer of limestone hundreds of meters thick. After the uplift of the earth’s crust, this region shifted to the edge of the hot and humid ancient coast where the forces of corrosion formed the early stone forest landscape.’

As an effective interpretation example at the **B**iotic level, the interpreter employed the Latin and English strategy to interpret the common flora name ‘香榧树’ into ‘*Torreya grandis* (Chinese nutmeg tree)’ in the Yandangshan UGGp. The simultaneous use of both English and Latin is an illustration of linguistic and communicative transformation, which preserves the scientific essence of flora name interpretation while aiding geotourists in remembering the specific plants (Li et al. 2022c). On the contrary, the following case of fauna process interpretation at the **B**iotic level can be seen as an ineffective example of interpretation that failed to meet style equivalence. When describing the features of ‘*Buteo Buteo* (Common Buzzard)’, the following Chinese description ‘体色变化较大，上体主要为暗褐色，下体主要为暗褐色或淡褐色，具深棕色横斑或纵纹，尾淡灰褐色，具多道暗色横斑。’ was ineffectively interpreted into a very long English sentence ‘The body colour changes greatly; the upper body is mainly dark brown, and the lower body is mainly dark brown or light brown, with dark brown horizontal spots or longitudinal stripes; the tail is light grayish brown with multiple dark horizontal spots.’. As mentioned before, the Chinese syntax allows multiple subject-verb structures to be in the same sentence where a comma is applied at the very end of a long combination of clauses. However, it is rarely so in English. The English sentence style is typically more concise where main ideas are separated by sentences, rather than piling up short clauses. Therefore, when a long Chinese sentence of the source text (ST) was interpreted into a long English sentence, it violates the style equivalence.

At the **C**ultural level, in Zhangjiajie UGGp, the interpreter successfully employed a cultural interpretation according to Buddhist culture that aligns with principles in Eco-Translatology: the term ‘送子观音’ was interpreted as ‘Songziguanyin, a Goddess in Chinese folk religion, who is believed to send children to people who piously worship her’. This Buddhist fertility goddess, ‘送子观音’ was worshipped by Chinese people in the feudal era. There is no equivalent name for such a cultural character in English, so the ‘addition’ strategy (providing additional information of a term) was used to achieve semantic and cultural equivalence. As an ineffective example, in Taishan UGGp, ‘小篆’, a form of Chinese calligraphy, was ineffectively interpreted as ‘Xiaozhuan’ via using

Chinese Pinyin to replace English words without providing additional information. This results in communication failure with geotourists because it failed to convey the connotation of such a term. Guided by Hu's Eco-Translatology, we effectively revised it into 'Xiaozhuan (an ancient Chinese calligraphy style) through the 'addition' strategy.

These examples of the three elements (ABC) in geotourism, demonstrate that Eco-Translatology is an effective solution for the challenges encountered in geotourism interpretation. It addresses the issues related to language, culture, and communication and provides effective strategies to overcome them.

4. Corpus and Methods

4.1 Data collection

In this present study, we selected three Chinese UGGps (Mount Kunlun, Fangshan and Xiangxi) as a case study for data analysis. These parks were chosen because their interpretation systems were recently updated by an advanced CATTI (China Accreditation Test for Translators and Interpreters) certified interpreter in 2023. Thus, the interpretation of geotourism expressions is of a superior quality. The managers of the three Chinese UGGps provided us with all the interpretation materials, such as geoparks' interpretative signs, brochures, and data from geological museums in the form of Word documents (The Chinese and English geotourism data are stored in parallel format in these Word files.).

The purpose of this paper is to test the effectiveness of the SSC model and the taxonomy of geotourism (ABC) interpretation strategies; therefore, irrelevant information in the original texts (e.g., geoparks' route indication and safety regulations) was removed prior to the composition of the corpus. As a result, the dataset specifically includes passages related to the A (GF and GP), B (flora and fauna) and C (human lifestyle) elements. Once the data cleaning for all documents was completed, the datasets were consolidated into a single Word document. In this single document, we performed a manual check to ensure the accurate correspondence between the geotourism data in Chinese and its English interpretation. The original Chinese interpretation was displayed first, followed by the corresponding English interpretation. The final C-E parallel geotourism corpus (PGC) includes 31,679 Chinese characters and 50,686 English words, totaling 82,365 words.

4.2 Analytical procedure

Following the composition of the C-E PGC, a sequence of procedures was undertaken to analyse the corpus using corpus software tools. First, we imported the generated document containing ABC elements into Tmxmall, which is a tool that allows alignment of the parallel texts in both languages to ensure accurate correspondence between Chinese and English interpretation. Secondly, according to the categorisation of Dowling (2013), we further identified and labelled the ABC data into subcategories. A element has geological feature (GF) and geological process (GP); B element has flora (FL) and fauna (FA), plus common plant names (CPN), common animal names (CAN), local Chinese plant names (CCPN), local Chinese animal names (CCPN), flora processes (FLP), and fauna processes (FAP); the C element has people's lifestyle (PL). PL category includes: both past and present such as local religion, art, and architectural culture (Dowling 2013). After this identification of data into subcategories, we proceeded to linguistically identify (i.e., tag) the effective and ineffective interpretations based on three-dimensional transformations of Eco-Translatology. The tags are based on the appropriate types of interpretation strategies proposed by scholars (Li et al. 2022b; Li et al. 2024), such as literal interpretation (LI) or creative

interpretation (CI). In the same way, ineffective interpretation (i.e., interpretation problems) were labeled as Misinterpreted or Incongruent Interpretation for Same Name (IISN) for potential optimisation. The annotation scheme used in this paper is given in Appendix B.

With the help of Tmxmall, we tagged effective and ineffective geotourism interpretation incidences. For example, the interpretation of the GF '单面山' as 'Cuesta' was tagged as an effective interpretation, because 'Cuesta' is a direct English equivalent to the Chinese word '单面山'. The use of literal interpretation (LI), based on linguistic and communicative dimensions, ensures that the meaning is accurately conveyed in the target language. The label we used for this effective interpretation was <AE, IS, GF, LI>. The four tags in this label respectively represent 1) its main elements in geotourism ('AE' stands for the 'Abiotic Element'), 2) its category of effectiveness (IS represents interpretation strategies as opposed to interpretation problems), 3) sub-categories of the main element ('GF' stands for 'geological feature' which is one of sub-categories of the Abiotic element), and 4) interpretation strategy ('LI' represents a specific interpretation strategy, literal interpretation). In another example, the interpreter ineffectively interpreted the GF '银狐洞' into 'Yinhu Cave'. This fails to capture the semantic meaning and communicative purpose of the GF. The name '银狐洞' derives from its resemblance to a fox, emphasising its distinctive shape. Therefore, we annotated this ineffective interpretation as <AE, IP, GF, Misinterpreted>. This tagging system allows for the retrieval of both effective (i.e., IS) and ineffective interpretations (i.e., IP) within the corresponding subcategories of ABC elements. Following this process, we imported the annotated data into Sketch Engine for quantitative and qualitative analysis. Sketch Engine is a language processing tool with a wide range of features such as extracting and counting target linguistic features using corpus query language (CQL).

After importing the C-E PGC in Sketch Engine, we first performed the quantitative analysis of the effective interpretations within each subcategory of ABC elements (A element: GF and GP; B element: CPN, CAN, CCPN, CCAN, FLP and FAP; C element: PL). We counted the frequency of interpretation strategies occurred in the corpus to determine the interpretation norms of geotouristic texts. To do this: We provided the function formula (see Figure C1 in Appendix C) to Sketch Engine (on the PARALLEL CONCORDANCE page) to accurately identify the different types of interpretation strategies, as well as, calculate their frequencies and proportions in the C-E PGC. After the quantitative analysis, based on the annotations, we returned to the individual examples of each interpretation strategy and qualitatively examined the similarities and differences in the application of the same type of interpretation strategy, across each subcategory in ABC elements (Laviosa 2002).

Although the CATTI-certified translator translated the geotourism information of three Chinese UGGps (Mount Kunlun, Fangshan and Xiangxi), it is possible to encounter ineffective interpretations that have been identified through the three-dimensional transformations of Eco-Translatology. We first entered the function formula into the PARALLEL CONCORDANCE page of Sketch Engine to retrieve interpretation problems in each subcategory of ABC elements (see Figure C2). As evident from the comparison with the formula employed to retrieve the effective interpretation strategy, the difference in this formula lies in the utilisation of IP (interpretation problem) rather than IS (interpretation strategy). We then identified the interpretation problems that arose in each subcategory of ABC to optimise them. After this quantitative analysis, we proceeded to use the CQL to look at all the examples of each type of interpretation problem within each geotourism (ABC) subcategory for qualitative analysis.

To review, the overall purpose of our analysis is to show: 1) which types of effective interpretation strategies and problems were prevalent in the geotourism data; 2) whether interpretation strategies used align with the Taxonomy proposed by Li et al. (2022b; 2024); and 3) how the ineffective geotourism interpretations are optimised by the strategies proposed by Li et al. The following section reports the results of both quantitative and qualitative analysis of each subcategory and the type of interpretation strategy or problem that appeared.

5. Results and Discussion

This section reports the results of the quantitative and qualitative analysis of the PGC dataset. The following subsections are arranged according to the ABC elements and their subcategories. All of the examples for the following section are presented in Appendix D for the nine geotourism sub-categories. For ease of reference, the source text of a specific example is ST followed by its number (e.g., ST 18 for '山茶'), and the target text are referred to as TT followed by its number (e.g., TT 18 for 'camellia').

5.1 Interpretation strategies and SSC equivalence in Abiotic element

5.1.1 Interpretation strategies and SSC equivalence in geological features (GFs)

Results of the GF subcategory in the A element showed an unsurprising tendency to literal interpretation, given the relative simplicity of its nature, that of naming a physical object. In this category, the interpreter was able to use a straightforward literal interpretation (LI) while employing two other interpretation strategies, namely Transliteration and Free Interpretation (TFI) and addition (Addition). To calculate the frequency and proportion of these three interpretation strategies, we used the CQL function formula [word="AE"] [word=","] [word="IS"] [word=","] [word="GF"] [word=","] [word="Specific IS"], where the 'Specific IS' within the last square brackets could be replaced by 'LI', 'TFI' or 'Addition' depending on which interpretation strategy was being analysed. Figure 1 shows that LI comprises by far the largest percentage among the three strategies, accounting for 83.74%, followed by TFI (12.38%). The proportion of addition strategy is minimal, at less than 4%. All of the LI examples of GFs from the PGC can be mapped onto dimensions of linguistic and communicative transformations in Hu's (2003) Eco-translatology to achieve semantic equivalence.

Interpretation Strategies	Frequency	Percentage
Literal Interpretation	1427	83.74%
Transliteration and Free Interpretation	211	12.38%
Addition	66	3.88%
Total Number	**1704**	

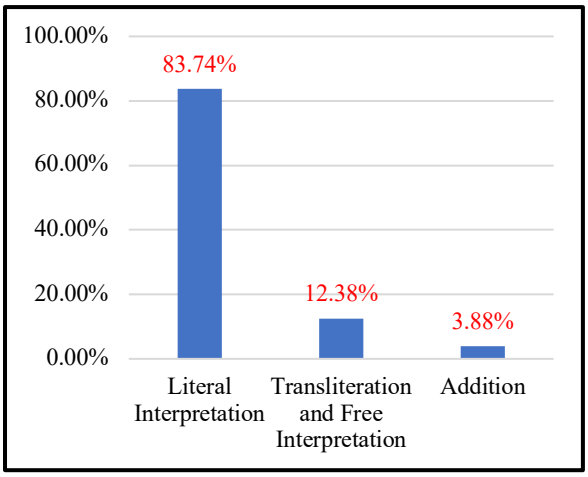

Fig. 1 Frequency of Interpretation Strategies for Geological Features in Chinese-to-English PGC

As shown in the results, LI was used to effectively handle most terminology related to GFs. Through a closer qualitative analysis of the GF terms in the PGC, we identified three distinct patterns to which the LI strategy can

be applied. The first pattern is where there exists a corresponding English equivalent. For example, the interpreter literally rendered '夷平面' into 'planation surface' using the English equivalent. The second pattern is where interpretation of rocks, caves, and peaks reflects their shapes. For instance, the shape of '鳄鱼石' resembles a crocodile so the interpreter provided a direct interpretation of the Chinese character description '鳄鱼石 (crocodile-shaped rock)', thus aiding geotourists' visualisation. The last pattern is where GFs are described using the Chinese-four-character structure. The 'four-character structure' in Chinese refers to a traditional linguistic form in which a complete phrase or idea is expressed using only four characters (Xiao 2010). For instance, through choosing precise and dramatic English terms, the interpreter effectively captured the landscape of '山谷陡峻' into 'steep cliffs and narrow gorges'. These patterns of literal GFs are consistent with Li et al.'s (2022b) research findings.

The two strategies, TFI (12.38%) and Addition (3.88%), account for less than 20% of the total. These strategies, although much lower in frequency, are important for tackling nuanced cultural meanings that cannot be resolved through LI. The TFI strategy was used when the source text of Chinese cultural elements is composed of proper nouns and common nouns, with both noun elements containing cultural references that require the interpreter to make explicit. As a result, the interpreted texts do not conform neatly to the **style** of the source texts, but convey the most accurate cultural meaning. Addition is a strategy used to provide additional information that was not originally contained in the source texts. This strategy is used when the terminology of a GF has implicit cultural connotations behind its literal wording, but unlike TFI, Addition typically that need explanatory information in a parenthesis that does not interfere with the style of the source texts.

In our analysis of 211 specific examples of TFI within the PGC, we identified a pattern indicating that GFs consist of two parts: the former part being cultural function characters, and the latter part being common nouns. Direct interpretation cannot adequately reflect the complexity of this combined meaning. In such cases, the former part can be transliterated, while the latter part can be interpreted by free interpretation. For instance, '灵洞天窗群' was effectively interpreted into 'Lingdong cave karst window groups' by aligning it with three dimensional transformations to achieve semantic equivalence. In this example, the former part '灵洞' is the sound change of '利洞嘎 ($li^{35}tuŋ^{35}ka^{53}$)' in Tujia language, which belongs to Chinese cultural function characters (Chen and Xiang 2019). Thus, it was interpreted into 'Lingdong cave' by transliteration, which closely resembles the original. The literal meaning of the latter part '天窗群' is 'skylight group', which, through free interpretation, was interpreted into 'karst window groups'. This interpretation accurately expressed that the GF of '天窗' corresponds to the karst landform, thereby avoiding any ambiguity in meaning that could arise from a literal interpretation. The pattern of this strategy matches Li et al.'s (2022b) Taxonomy. Meanwhile, the interpretation strategy 'Addition' was used in 66 occurrences in the PGC. For example, to achieve to semantic and cultural equivalence, '圣米' was effectively interpreted into 'Holy rice (Quartz grains)'. As a GF, the quartz grains appear as small rice shapes. Quartz grains are caught and deposited in cave fissures during the long process of geological filtration. The quartz crystals are clean and shiny. By adding the explanation of 'Quartz grains' to the interpretation, the interpreter facilitates geotourists' understanding the GF of 'Holy rice'. The pattern of this strategy also corresponds to Li et al.'s (2022b) Taxonomy.

Further analysis reveals there are two types of GF interpretation problems, IISN and Misinterpreted. Firstly, there is only one example of IISN found in the PGC. IISN refers to the phenomenon where same terms were interpreted into multiple different versions of English (Li et al. 2022b). For example, the interpreter inconsistently rendered '昆仑山' into three versions: 'Mount Kunlun', 'Kunlun Mountains' and 'Mt. Kunlun'. Li et al. (2022b) highlighted that when GFs have official names already recognised by UNESCO, the interpreter should use the official names. Thus, we selected the term 'Mount Kunlun', the UNESCO official name (https://en.unesco.org/global-geoparks/mount-kunlun). In terms of Misinterpreted examples, we only found two in the corpus. The first example is the interpretation of a geographical marker between the strata of two different global geological eras: '金钉子', which was literally interpreted into 'Golden Spike'. This interpretation is misleading as it is not a spike nor does it resemble the shape of one. Thus, in this case a literal interpretation results in the loss of semantic meaning. This is confirmed by Li et al. (2022b) emphasising that by adding descriptive words to interpret GFs, the function and characteristics of these features can be better understood. Thus, we revised 'Golden Spike' into 'Golden Spike (Global Standard stratotype section and point)' to achieve semantic equivalence. The other example of Misinterpreted is the GF '斩云剑', which is vertical joints formed by spherical weathering. Originally, it was ineffectively interpreted into 'cutting cloud sword'. In Chinese, '斩云' is a verb-object construction where the verb is used attributively. However, in the structure of English, verbs cannot be used as attributives to modify nouns, whereas adjectives can. Therefore, in this case, we can use the shift strategy to revise it. Part-of-speech conversion (shift) is necessary to adapt to the grammar and expression habits of target readers to achieve semantic equivalence (Laviosa 2002). Thus, guided by linguistic and communicative transformations, we interpreted '斩云剑' as 'Cloud-cutting sword'. The verb phrase '斩云' in Chinese was converted into the English adjective 'cloud-cutting' to modify the noun 'sword'.

It is worth noting that, in Li et al.'s (2022b) Taxonomy (see Appendix A), although the Shift strategy employed in the interpretation of GFs was included, the specific pattern for its use was not established due to the limited sample size (N=3) at the time of the research. One of the three examples in Li et al.'s (2022b) study was the interpretation of the GF '仙人造田'. This Chinese ST was effectively interpreted as 'Divinely Crafted Farmland' using the shift strategy. '造田' is a verb-object construction similar to the verb phrase in the previous example. Thus, the verb '造' needed to be converted into an adjective (i.e., 'Crafted') using the Shift strategy, and the noun '仙人' should be converted into an adverb (i.e., 'Divinely'). Considering both examples found in Li et al. (2022b) and those found in the current study, we can establish a pattern for the Shift strategy: when interpreting GFs, the interpreter should select the appropriate part of speech based on English grammar rules.

5.1.2 Interpretation strategies and SSC equivalence in geological processes (GPs)

GPs by their complex nature were found to demand more diverse interpretation strategies. In fact, five strategies were identified in the PGC: Division and Shift (DS), Combination, Literal Interpretation (LI), Shift and Division. The calculation of interpretation strategies for GPs followed a similar process to those of the GFs[1]. Figure 2 demonstrates that the top two most frequently used strategies (i.e., DS; Shift) account to more than 50%. What is

[1] We applied the function formula [word="AE"] [word=","] [word="IS"] [word=","] [word="GP"] [word=","] [word="Specific IS"] in CQL to search the entire C-E PGC, where 'Specific IS' in the last square brackets can be replaced by 'DS', 'Combination', 'LI', 'Shift' and 'Division'.

significantly different from the Shift strategy used in GFs is that, in interpretations of GPs, the shift often occurs to convert voice, rather than part of speech. This is because GPs involve the action of natural forces, such as crustal movement and sedimentation, which lends itself toward the use of passive voice for description of inanimate processes (Li et al. 2022c). In the Chinese language, many phrases need to be contextually identified for the correct use of voice (i.e., active voice and passive voice can appear in the exact same wording). For that reason, C-E interpretations of GPs need to take into consideration the appropriate conversion of voice. In addition, compounded sentences are commonly used in Chinese where chunks of meaning are expressed in the same sentence only separated by comma, but if this form of sentence is directly borrowed into English, it is incoherent in English.

Interpretation Strategies	Frequency	Percentage
Division and Shift	461	32.91%
Shift	337	24.05%
Literal Interpretation	266	18.99%
Division	183	13.06%
Combination	154	10.99%
Total Number	**1401**	

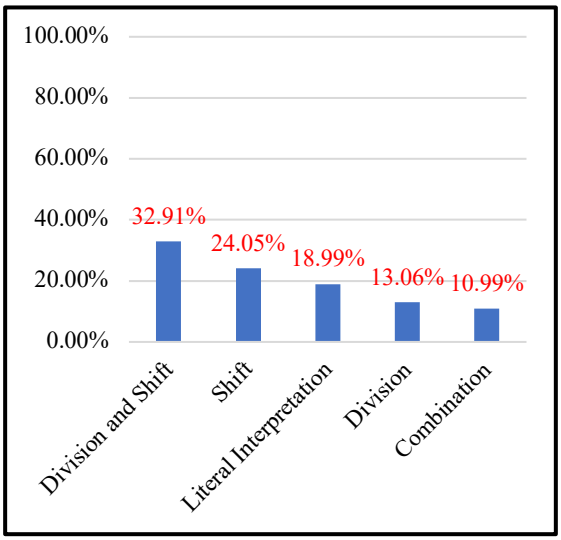

Fig. 2 Frequency and Interpretation Strategies for Geological Processes in Chinese-to-English PGC

As shown in Figure 2, DS strategy (32.91%) is the most frequently used of the five interpretation strategies. The analysis of PGC reveals that the Chinese GPs contain long complex sentences with explicit and implicit passive structures. Explicit passive structure in Chinese means it uses the passive marker (i.e., 被), and the implicit passive structures can vary in their forms but can only make sense when interpreted contextually as passive voice. The process of shifting either of these two passive structures into English passive voice is simply labelled 'Shift'. As noted in Chu (1973) and Xiao, McEnery, and Qian (2006), the process of interpreting or translating a passive-voice Chinese sentence into a passive-voice English sentence is called an 'equivalence shift'. For example, ST 6 (see Appendix D) was interpreted into TT 6, where the interpreter divided the long Chinese sentence into two simple sentences. The explicitly marked phrase '被抬升' was rendered into the English passive verb phrase 'were uplifted' while the implicit passive '形成' was interpreted into 'was formed'.

The second most frequent strategy of this subcategory is Shift (24.05%). In the PGC, we found that explicit and implicit passive structures were embedded into a short Chinese sentence used to describe GPs, so the Shift strategy without the step of division was sufficient. For example, ST 7 was interpreted into TT 7, where the interpreter achieved style equivalence by respectively rendering the explicit passive '被不断侵蚀' as 'are continuously

eroded' and the implicit passive '形成' as 'are formed'. This strategy is also part of the Taxonomy proposed by Li et al. (2022b).

The next two strategies, namely LI (18.99%) and Division (13.06%) are primarily used in interpreting the formation of GFs. Through the qualitative analysis of the PGC, we identified two patterns for interpreting GPs using LI: 1) GPs consisting of jargon that has its equivalent in English; and 2) GPs that are described in short sentences without implicit and explicit passive structures. For instance, ST 8 was literally interpreted into TT 8, whereas the terminology (GP) '拔蚀、磨蚀和冻融风化' was directly interpreted into 'plucking, abrasion, and free-thaw weathering'. This interpretation aligns with the linguistic and communicative transformation to achieve semantic and style equivalence. In terms of division, we examined 183 examples and discovered that they shared a common pattern: GPs were described in long Chinese sentences without explicit ('被' marker) and implicit passive structures. For instance, ST 9 was interpreted into TT 9, where the interpreter divided the long Chinese sentence into two short English sentences, in alignment with linguistic and communicative transformations to achieve style equivalence. Up to this point, the four mentioned strategies (DS, Shift, LI, and Division) are consistent with the Taxonomy proposed by Li et al. (2022b).

The last strategy is the Combination strategy, accounting for 10%. The PGC revealed that all 154 examples shared a common pattern of close logical relationship between two consecutive Chinese sentences describing GPs. The Combination strategy is employed to avoid repetition by using conjunctions or adverbial phrases to link clauses with a shared subject. For example, in the original text ST 10 which contains two separate sentences, the subject of the first sentence and second sentence is the same, which is '白云岩 (Dolomite)'. As we can see in TT 10, the interpreter thus used clause structures to combine the meaning in both Chinese sentences into one coherent English interpretation. The Combination strategy creates coherent English sentences with the same meaning using an adverbial phrase. The Combination strategy is a new approach which was not previously included in the Taxonomy proposed by Li et al. (2022b). This is a valuable new strategy and will be included in future taxonomy of geotourism interpretation strategies as shown in Appendix E.

Finally, in GPs through qualitative analysis, we found nine cases of interpretation problems where implicit passive sentences were not effectively interpreted. For instance, ST 14 was ineffectively interpreted into TT 14 where the Chinese implicit passive structures '形成' and '变成' were not effectively shifted into English passive voice. Guided by linguistic and communicative transformations of Eco-Translatology, better style equivalence could be achieved by revising it into 'The greyish-green andesite with pores is formed by the cooling of erupted magma from volcanoes. After undergoing long-term weathering and erosion, the rock is transformed into various colours.'

5.2 Interpretation strategies and SSC equivalence in Biotic element

5.2.1 Interpretation strategies and SSC equivalence in common biotic names

Element B refers to flora and fauna, which have far different interpretation strategies. After initial analysis, four interpretation strategies were found which reflect expectations of literal and parallel Latin/English interpretation dominance. The four strategies found in the PGC --- Latin and English strategy (LE), Literal Interpretation (LI), Creative Interpretation (CI) and Foreignisation --- were used by the interpreter to interpret common biotic names. It is worth noting that for LE, the flora and fauna names are respectively interpreted using the official scientific names of the International Code of Nomenclature for algae, fungi, and plants (ICN 2018) and by the International

Code of Zoological Nomenclature (ICZN 2022)[2]. Figure 3 summarises the quantitative results of interpretation strategies found in the PGC. As we can see, LI and LE are the most frequently used strategies in interpreting common biotic names, while CI and Foreignisation are used much less frequently. The most used strategy is LI in interpreting common biotic names (45.34% for flora, and 57.31% for fauna). This is because that many common biotic names in Chinese already have existent corresponding English names (Li et al. 2024). Fauna names, have a slightly higher frequency of LI suggesting that plants exhibit more complexity and diversity compared to animals (Li et al. 2024). Next is the LE strategy, which involves using Latin names and English names to interpret common biotic names in Chinese. In this strategy, the Latin interpretation conforms to the principle of using Latin scientific names for flora and fauna by the International Code of Nomenclature for algae, fungi, and plants (ICN 2018) and the International Code of Zoological Nomenclature (ICZN 2022). The English interpretation in the LE strategy shows other interpretation patterns that are discussed in detail in the qualitative examples below. CI and Foreignisation are used but not as frequently in interpreting common biotic names in the PGC.

	Common Flora Names		**Common Fauna Names**	
Interpretation Strategies	Frequency	Percentage	Frequency	Percentage
Literal Interpretation	345	45.34%	349	57.31%
Latin and English	255	33.51%	170	27.91%
Creative Interpretation	107	14.05%	56	9.20%
Foreignisation	54	7.10%	34	5.58%
Total Number	**761**		**609**	

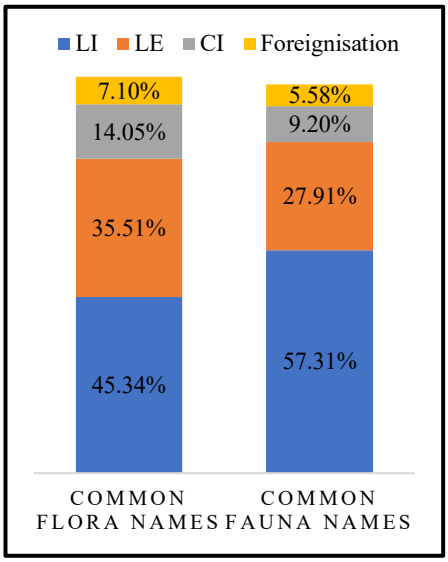

Fig. 3 Frequency and Interpretation Strategies for Common Biotic Names in Chinese-to-English PGC

The LI strategy is used when flora and fauna names are embedded in the text of interpretative boards and have direct English equivalents. For example, the Chinese phrase '翠雀' in ST 15 was literally interpreted as 'Chinese Delphinium' in TT 15. Similarly, the term '黑鹳' in ST 19 was literally interpreted into 'black stork' in TT 19. Both these Chinese terms have existent counterparts in English. This set of examples aligns with linguistic and communicative transformations to achieve semantic equivalence and Li et al.'s (2024) Taxonomy.

The CI strategy is used when dealing with plants and animals originating in China whose names did not have existent English counterparts. In these cases, the interpreter needs to creatively interpret either by borrowing the meaning of their Latin scientific names or by providing details about their appearance and connotation. For

[2] We respectively used the CQL function [word="BE"] [word=","] [word="IS"] [word=","] [word="CPN"] [word=","] [word="Specific IS"] and [word="BE"] [word=","] [word="IS"] [word=","] [word="CAN"] [word=","] [word="Specific IS"] to obtained the frequency and proportion of the above four strategies used in interpreting common biotic names. The 'Specific IS' can be replaced by 'LE', 'LI', 'CI' and Foreignisation.

example, the term '唐古拉点地梅' in ST 16 was interpreted as 'Tanggulashan rock jasmine' in TT 16. In this text, the flora name was creatively interpreted by borrowing its Latin name. The scientific name of '唐古拉点地梅' is '*Androsace tanggulashanensis*'. The specific epithet '*tanggulashanensis*' means a place, 'Tanggulashan' in China, and the genus '*Androsace*' means 'rock jasmine'. Similarly, '藏管尾犁胸蝉' in ST 20 describes an insect and was interpreted as 'Tibetan treehopper' in TT 20. In this case, the scientific name of '藏管尾犁胸蝉' is '*Darthula xizangensis*'. The specific epithet '*xizangensis*' refers to 'Tibetan' indicating its origin from Tibet, a region in southwestern China, and the genus '*Darthula*' means 'treehopper'. Thus, it was creatively interpreted as 'Tibetan treehopper' by borrowing the meaning of its Latin scientific name. These examples adhere to the principles of Eco-Translatology, and the CI strategy is validated in Li et al.'s (2024) Taxonomy.

The LE strategy is only used when common biotic names are stand-alone titles or captions. It entails a two-step process: Latin usage, followed by English. As the result of this strategy, Latin scientific names followed by English in parentheses (Li et al. 2024). For example, the fauna name '野牦牛' was interpreted as '*Bos mutus* (Wild yak)' in the title above the explanatory text on the interpretive boards, where the Latin name '*Bos mutus'* is provided in front of its English interpretation 'Wild yak' in parentheses. Another example, the flora name '独花兰' was interpreted as '*Changnienia amoena* S.S.Chien (Beautiful Changnienia)', where the Latin name was provided in front of its English name in parenthesis. In the LE strategy, the interpretation of the Latin names follows the guidelines provided by the ICN (2018) and ICZN (2022), while interpretation of the English names follows the strategies of CI and LI, as discussed above. As an illustration, in the examples provided above, the Latin interpretation '*Bos mutus'* of the fauna name '野牦牛' is provided by ICZN (2022), and its English interpretation 'Wild yak' used the strategy of LI. For the example of the flora name '独花兰', its Latin name was provided by the ICN (2018), and its English interpretation uses the strategy of CI.

Finally, the strategy of Foreignisation is used with the purpose of respecting the Chinese cultural origin or meaning of the interpreted terms. It refers to the interpretive process of selecting the appropriate English interpretation for certain common biotic names, even though there may be available Latin names for them. These Latin names are not chosen because they may contain affixes that indicate foreign origins (rather than China), which is typically a result of naming a species under colonisation by the person who discovered it rather than where the species is actually from. For example, the flora of Chinese origin '山茶' was interpreted into 'camellia' in the PGC, instead of its Latin scientific name '*Camellia japonica* L.' In this case, the specific epithet '*japonica*' means 'Japanese', and in many cases it was also referred to as 'Japanese camellia' because of this Latin interpretation. However, to avoid confusion in the interpretated name regarding its origin, the PGC documented its name as 'camellia'. Similarly, the Latin scientific name of '中华对角羚' was '*Procapra przewalskii*', where the specific epithet '*przewalskii*' refers to a Russian geographer, Noeolei Przewalski, who discovered this fauna native (gazelle) in China in 1875. Although this naming convention was conventional in honoring the discoverer, it may cause confusion about the origin of the fauna itself. Therefore, '中华对角羚' was interpreted as 'Chinese gazelle', providing an origin to the species. According to Ren (2020), the country of origin plays a significant role in determining the interpretation of biotic names. Thus, in a step towards authenticity of meaning, 'camellia' and 'Chinese gazelle' were chosen to effectively convey their Chinese origins to geotourists, and their Latin scientific names were omitted as unnecessary to identification. These two examples of interpreting local Chinese biotic

terms can be justified according to the three-dimensions of Eco-Translatology. The general pattern of Foreignisation of flora and fauna names is identified in Li et al.'s (2024) Taxonomy.

All of the above discussed strategies (i.e., LI, LE, CI, and Foreignisation) conform to Li et al.'s (2024) Taxonomy of effective geotourism interpretation strategies. The LI, LE, and CI strategies align with Hu's (2020) linguistic and communicative transformation to achieve semantic equivalence, while Foreignisation aligns with all of Hu's (2003) three dimensional transformations to attain semantic and cultural equivalence. Among all, we found one case that enhances Li et al.'s (2024) described patterns for the CI strategy because it is a fauna example. In Li et al.'s (2024) Taxonomy, the CI strategy was described as either 1) using Latin names as a bridge for English interpretation or 2) providing details about appearances of the flora or fauna. However, Li et al. (2024) only found examples for describing appearances of flora but not fauna names. In this research, we found the fauna name '阳彩臂金龟', which can be interpreted as 'Chinese varicoloured beetle'. Since the entire body of '阳彩臂金龟' shines in metallic green, metallic copper green and gold colour, therefore it was interpreted as 'Chinese varicolored beetle'.

So far in this section, although we have regarded strategies for interpreting common biotic names, we also discovered examples of their misinterpretation from the PGC[3]. For instance, the flora name '槭叶铁线莲' as the title on the interpretative board was inaccurately interpreted as '*Clematis acerifolia* Maxim. (clematis)'. In this example, the English name of '槭叶铁线莲' was simply interpreted as 'clematis'; however, there are hundreds of varieties of clematis, simply using 'clematis' to interpret this very specific type of flora is not loyal to its meaning. Moreover, since '槭叶铁线莲' is a unique type of flora native to China with no corresponding English term, which necessitates a creative strategy (Li et al. 2024). Thus, guided by Eco-Translatology, the English name of '槭叶铁线莲' should be optimised into 'maple-leafed clematis' through borrowing its Latin scientific name, '*acerifolia*' which means 'maple-leafed' (Li et al. 2024). Then, we searched for the misinterpretation of common fauna names[4]. We discovered seven examples. For example, the fauna name '中华奥锹甲' as the title on the interpretative board was interpreted as '*Odontolabis cuvera sinensis* (Chinese beetle)'. The English name of '中华奥锹甲' was ineffective interpreted as 'Chinese beetle', because there are many species that could be categorised as Chinese beetle. Li et al. (2024) have highlighted that the strategy of CI can be applied to interpreted English names of fauna that originate in or are native to China. Thus, a creative strategy can be employed from the Latin scientific name (Li et al. 2024). The Latin scientific name of '中华奥锹甲' is '*Odontolabis cuvera sinensis*'. In Latin, 'sinensis' indicates 'Chinese', while '*Odontolabis* cuvera' signifies 'Golden stag beetle'. Thus, guided by the linguistic and communicative transformations of Eco-Translatology, we revised '中华奥锹甲' as 'Chinese golden stag beetle' to achieve semantic equivalence.

5.2.2 Interpretation strategies and SSC equivalence in local Chinese biotic terms

The interpretation of local Chinese biotic terms largely parallels the interpretation of common biotic names as discussed in section 5.2.1. The difference lies in how the interpretation of local Chinese biotic terms encompasses

[3] We used the function [word="BE"] [word=","] [word="IP"] [word=","] [word="CPN"] [word=","] [word="Misinterpreted"] to retrieve the misinterpretation of common flora names. Eleven examples of native plants were found.

[4] The function [word="BE"] [word=","] [word="IP"] [word=","] [word="CAN"] [word=","] [word="Misinterpreted"] was used

local dialect and other elements of ecological culture. The choice of the three particular Chinese UGGps (Mount Kunlun, Fangshan and Xiangxi) used in this study allowed us to focus on local varieties of Chinese dialects to denote their local plants and animals, such as the Tibetan language, Fangshan, and Xiangxi dialects. The main patterns found in this subcategory were Literal Interpretation (LI) and Creative Interpretation (CI)[5]. In the PGC, all local Chinese biotic terms interpreted using these strategies conform to the three-dimensional transformations of Hu's (2003) Eco-Translatology to achieve semantic and cultural equivalence. Figure 4 illustrates that LI is the at least three times more frequently employed as an interpretation strategy for both local Chinese flora and fauna names. This indicates that the English names of most local Chinese biotic terms have direct equivalents in English. Therefore, the usage of CI is less prevalent.

	Local Chinese Flora terms		**Local Chinese fauna terms**	
Interpretation Strategies	Frequency	Percentage	Frequency	Percentage
Literal Interpretation	112	76.19%	78	87.64%
Creative Interpretation	35	23.81%	11	12.36%
Total Number	**147**		**89**	

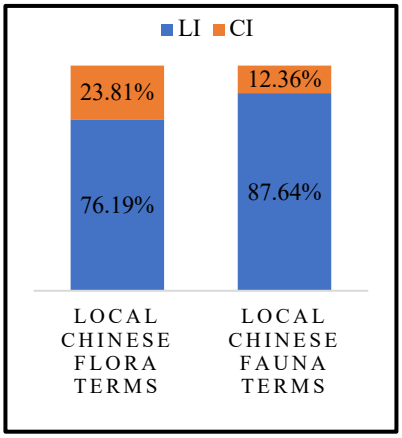

Fig. 4 Frequency and Interpretation Strategies for Local Chinese Biotic Terms in Chinese-to-English PGC

Firstly, the dominant pattern is LI. It was used when local Chinese biotic terms are embedded in the main texts of interpretative boards with English equivalents. For instance, the term '扯丝皮' in ST 24 was interpreted into 'Chinese rubber tree' in TT 24. In this text, the local Chinese flora terms was originally in the Fangshan dialect, which refers to '杜仲' – a common biotic name whose interpretation has an English counterpart 'Chinese rubber tree'. Similarly, '黄鸭叫' in ST 27 was interpreted into 'yellow head catfish' in TT 27, where '黄鸭叫' signifies '黄颡鱼' in the Xiangxi dialect, and its English counterpart is 'yellow head catfish'.

When there is no English equivalent for the local Chinese biotic terms in the main text of the interpretative boards, the CI strategy was used. As mentioned above, when using the CI strategy, the interpreters could either use a Latin term as an interpretation bridge for English interpretations of the local Chinese biotic term, or they could describe the appearance or connotations of the species. In terms of the former, for instance, the Tibetan used the flora term '阿仲尕布' to refer to the native Chinese flora '雪灵芝' for which there is no English equivalent. The Latin scientific name of '雪灵芝' is '*Arenaria bryophylla*'. The specific epithet '*bryophylla*' means 'mossy' in English, and the genus '*Arenaria*' means 'sandwort'. Therefore, using the CI strategy, the term '阿仲尕布' in ST 25 was effectively interpreted into 'mossy sandwort' in TT 25. Similarly, '泥雀儿' in ST 28 was interpreted into 'Xiangxi

[5] We employed specific functions [word="BE"] [word=","] [word="IS"] [word=","] [word="CCPN"] [word=","] [word="Specific IS"] and [word="BE"] [word=","] [word="IS"] [word=","] [word="CCAN"] [word=","] [word="Specific IS"], with the option to replace 'Specific IS' with 'LI' and 'CI', to obtain the data of literal and creative interpretations used in interpreting local Chinese flora and fauna names in the PGC.

high-plateau loach' in TT 28. Since in the Xiangxi dialect, '泥雀儿' signifiers '湘西盲高原鳅' whose Latin scientific name is '*Triplophysa xiangxiensis*'. '*xiangxiensis*' refers to Xiangxi (a place in China), and '*Triplophysa*' means 'high plateau loach'. The interpreter used the creative approach to include both the origin of the species and the English name derived from their Latin interpretation as a bridge. In terms of describing the appearance or connotations of local Chinese biotic terms using the CI strategy, for example, '猴欢喜' in ST 26 is a term in Xiangxi dialet for an indigenous Chinese flora called '仿栗'. This flora is a tree with many chestnut-like fruits on its top; therefore, it was interpreted as 'chestnut-like tree' in TT 26. Similarly, '杂咕' in ST 29 was interpreted into 'stippled-pattern carp' in TT 29. In the Tibetan language, '杂咕' refers to a Chinese native fauna '石花鱼'. Because '石花鱼' is a type of carp with stipple on its skin. Thus, the interpreter interpreted '杂咕' as 'stippled-pattern carp'. What is worth noting is that '杂咕' was found in this study in the PGC corpus, but the use of appearance description in the interpretation of fauna name was not found in Li et al.'s (2024) previous Taxonomy. This example provides an extension of interpretation of local Chinese fauna terms in Li et al.'s (2024) previous Taxonomy and can be added for future interpretation.

In the PGC, we also found cases of misinterpretation of local Chinese biotic terms[6]. These misinterpretations can be attributed to a lack of familiarity with dialects. For example, the interpreter interpreted '阿不夜那' in ST 42 as 'Kudzu vine' in TT 42. In Chinese, 'Kudzu vine' means '粉葛', but the Xiangxi people used '阿不夜那' to refer to '葛根' rather than '粉葛 (Kudzu vine)'. Li et al. (2024) pointed out that an essential step for interpreting local Chinese biotic terms is to first interpret them into appropriate common biotic names. When the English names of the local Chinese flora name was found in English, the interpreter should interpret them via using literal interpretation. 'Kudzu root' can corresponds to '葛根'. Thus, we shall revise the interpretation of '阿不夜那' as 'Kudzu root'. Similarly, '齐哇' in ST 43 was misinterpreted as 'Tibetan dwarf hamster' in TT 43. In Tibetan language, '齐哇' signifies '喜马拉雅旱獭' rather than '西藏侏儒仓鼠 (Tibetan dwarf hamster)'. In English, because 'Himalayan marmot' can correspond to '喜马拉雅旱獭', LI should be used (Li et al. 2024), and this fauna term should be interpreted as 'Himalayan marmot'. Guided by Eco-Translatology, these revised versions eventually achieve semantic and cultural equivalence.

5.2.3 Interpretation strategies and SSC equivalence in ecological processes

This section pertains to the ecological processes (i.e., characteristics and functions) of flora and fauna. Five interpretation strategies were identified[7] in interpreting ecological processes: Literal Interpretation (LI), Division, Shift, Division and Shift (DS), and Combination. As seen in Figure 5, LI, Division, and Combination are the dominant interpretation strategies in interpreting both flora processes and fauna processes. The application of Shift and 'DS' strategies are less frequent, with both being below 10%. Li et al. (2022c) noted that because ecological processes are mainly related to flora and fauna characteristics, the Chinese source text can be anticipated to contain

[6] We respectively employed the function [word="BE"] [word=","] [word="IP"] [word=","] [word="CCPN"] [word=","] [word="Misinterpreted"] and [word="BE"] [word=","] [word="IP"] [word=","] [word="CCAN"] [word=","] [word="Misinterpreted"] to retrieve examples of misinterpretation in local Chinese flora and fauna terms. Through this process, we found 13 examples of misinterpretation in local Chinese flora names and nine examples in local Chinese fauna terms.

[7] We respectively employed the function [word="BE"] [word=","] [word="IS"] [word=","] [word="FLP"] [word=","] [word="Specific IS"] and [word="BE"] [word=","] [word="IS"] [word=","] [word="FAP"] [word=","] [word="Specific IS"] to retrieve the above five interpretation strategies used in interpreting flora and fauna processes. The last item 'Specific IS' can be substituted with 'LI', Division, Shift, 'DS' and Combination.

active voice, simple possessive, and descriptive verbs like '有 (have/has)' and '是 (is/are)'. This implies that Division and DS strategies are employed much less frequently compared to the other three strategies (LI, Division, and Combination).

	Flora Processes		Fauna Processes	
Interpretation Strategies	Frequency	Percentage	Frequency	Percentage
Division	114	36.31%	67	32.06%
Literal Interpretation	92	29.30%	59	28.23%
Combination	68	21.65%	51	24.39%
Division and Shift	25	7.96 %	19	9.10%
Shift	15	4.78%	13	6.22%
Total Number	**314**		**209**	

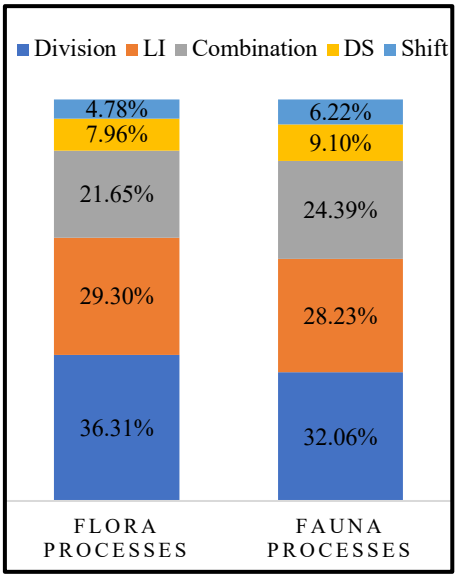

Fig. 5 Frequency and Interpretation Strategies for Ecological Processes in Chinese-to-English PGC

A detailed qualitative examination revealed that, in the PGC, the strategy of Division is the most used strategy in interpreting both flora processes and fauna processes. When the Chinese ecological processes are described in active voice and complex sentences that are relatively long, these sentences are broken down into shorter active sentences in English using the strategy of Division. This strategy may result in more numbers of English sentences than the original Chinese source text. Because in Chinese, a long and complex sentence can be joined with commas without a clear clausal structure or linking words; however, in English, sentence structures are governed by more strict syntax rules. Therefore, the strategy of Division ensures that the English interpretation maintains their grammatical integrity while including all the information expressed in the original Chinese sentence. The interpretation of the characteristics of the barrenwort (ST and TT 30) and giant salamander (ST and TT 35) illustrates this pattern. According to Li et al. (2022c), Chinese and English exhibit distinct linguistic styles. Thus, informed by linguistic and communicative transformations within Eco-Translatology, and while adhering to the English language style, the interpreter divided lengthy Chinese ecological processes (ST 30 and ST 35) into multiple English sentences (TT 30 and TT 35), aiming to attain style equivalence. This strategy aligns with Li et al.'s (2024) Taxonomy.

The second most used strategy is LI. When Chinese ecological processes are expressed using active voice and relatively short sentences, they were interpreted into active voice English sentences of similar length. In these cases, a literal interpretation of both the voice and the words in the source texts were directly interpreted into the target texts. For example, the flora (purple spear grass) processes in ST 31 and the fauna (male Tibetan antelopes) processes in ST 36 (Appendix D, Table D3) illustrate this pattern, where the source texts were literally interpreted to source texts while retaining the style and meaning of the source texts. Thus, interpretation using this strategy aligns with linguistic and communicative transformations to achieve style equivalence. This interpretation strategy was also documented in Li et al.'s (2024) Taxonomy.

The strategy of Combination is employed when there is a close logical relationship between two or more independent and consecutive Chinese sentences describing the same ecological processes (i.e., the subjects of the sentences are the same). For situations like this, sentence length of the source text does not play as important a role in deciding the strategy as the logical connections of the meaning between sentences. The Combination strategy uses conjunctions or adjoint adverbials to connect meaning in multiple Chinese source sentences into one complex English sentence that retains all the information in the Chinese sentences. For example, the two sentences in ST 32 share the same subject '紫树 (Chinese tupelo)', and the rest of the information in the Chinese sentences can be logically and relatively concisely interpreted into the same English sentence using clauses. We can see that in TT 32 the interpreter used a relative clause linked by the conjunction 'which' to link all the information into the same complex English sentence to avoid repetition and redundancy. Similarly, in ST 37, the two sentences that describe the same subject '金凤蝶 (The Old-World swallowtail)' was interpreted into one English sentence using the linking adverbial 'with' in TT 37. These two examples were mapped onto linguistic and communicative transformations of Eco-Translatology to achieve style equivalence. This strategy corresponds to Li et al.'s (2024) Taxonomy.

While the Shift and the DS strategies are relatively infrequent in PGC compared to the other strategies, they play important roles in achieving style equivalence. As mentioned in section 5.1.2, the strategy of DS is in fact a sequential combination of the strategy Division and the strategy of Shift. The only difference is that when only using Shift, the source texts are relatively short and do not require additional division. In the interpretation of ecological processes, DS and Shift all together counts for 12.74% for flora processes, and 15.32% for fauna processes. The DS strategy can be illustrated by the examples of the flora processes described in ST 33 and the fauna processes described in ST 38. Both examples used explicit passive voice with the Chinese marker '被', and there were first broken down into multiple English sentences, and then interpreted into passive voices respectively (see TT 33 and TT 38 in Appendix D, Table D3). Another case of using DS is where the passive meaning in the source texts was not expressed using an explicit marker (i.e., when the marker '被' was absent). ST 34 and ST 39 illustrate such situations. In ST 34, the implicit passive '排列而成' and '酷似…状' were respectively interpreted into 'formed by' and 'be characterised by' in TT 34, because of their implicit passive meaning. Similarly, in ST 39, '布' and '饰' were respectively interpreted into 'be banded with' and 'be marked with' in TT 39. Thus, these English interpretations correspond to linguistic and communicative transformations to achieve style equivalence. The 'DS' strategy is consistent with the research findings of Li et al. (2024).

Using the discussed effective interpretation strategy, the misinterpreted examples of flora and fauna processes in the PGC can be improved systematically, once identified[8]. For example, when interpreting the flora process described in ST 44, the interpreter used a long English sentence (TT 44) that structurally resemble the original Chinese sentence, but with run-on elements and failed to convert the implicit semantic passive meanings ('盖' and '具') into English passive voice. This example can be optimised using the DS strategy (Li et al. 2024) into:

[8] we used the function [word="BE"] [word="‚"] [word="IP"] [word="‚"] [word="FLP"] [word="‚"] [word="Misinterpreted"] and [word="BE"] [word="‚"] [word="IP"] [word="‚"] [word="FAP"] [word="‚"] [word="Misinterpreted"] to search and found ten misinterpreted examples in flora processes and seven in fauna processes.

The sporangia are tiny balls borne on small veins on the underside of the leaf. The sporangia may form sacs that **are covered with** a membrane and are kidney-shaped with some serrated edges. At maturity, the sacs are large and close together, even extending over the edge. The glands **are situated on** the underside of the leaf.'

Guided by linguistic and communicative transformations of Eco-Translatology, '盖' and '具' were respectively interpreted into 'be covered with' and 'be situated on' and the long Chinese sentence is broken down into an appropriate target style. Similar interpretation problems can be found in fauna processes as well. For example, ST 45 was written in two separate Chinese sentences and was interpreted into two English sentences in TT 45. However, the two sentences in ST16 share the same subject (i.e., '麦穗鱼', 'stone moroko') and can be logically combined into one English sentence to avoid redundancy. The clarity of the interpretation, thus, can be improved by using the combination strategy (Li et al. 2024). Guided by linguistic and communicative transformations, we revised the English interpretation into 'The snout of the stone moroko is slightly pointed and prominent, with large eyes and thin lips but no barbels.' to achieve style equivalence.

5.3 Interpretation strategies and SSC equivalence in Cultural element

For cultural elements, in addition to strategies mentioned in previous categories (i.e., Addition in section 5.1.1; TFI in section 5.1.1; LI in section 5.1 & 5.2), the strategy Free Interpretation (FI) was also identified in the PGC[9]. The results illustrated in Figure 6 serves to describe the interpretation norms of cultural elements. Unsurprisingly, direct interpretation provided by the LI strategy (32.24%) is insufficient to effectively convey the breadth of Chinese civilization involved in the interpretation of cultural elements (Li et al. 2022c). Therefore, we see the frequent use of Addition (42.86%), FI (13.86%) and TFI (11.04%) in bridging the cultural gap to supply additional cultural information for geotourists.

Interpretation strategies	Frequency	Percentage
Addition	501	42.86%
Literal Interpretation	377	32.24%
Free Interpretation	162	13.86%
Transliteration and Free Interpretation	129	11.04%
Total Number	**1169**	

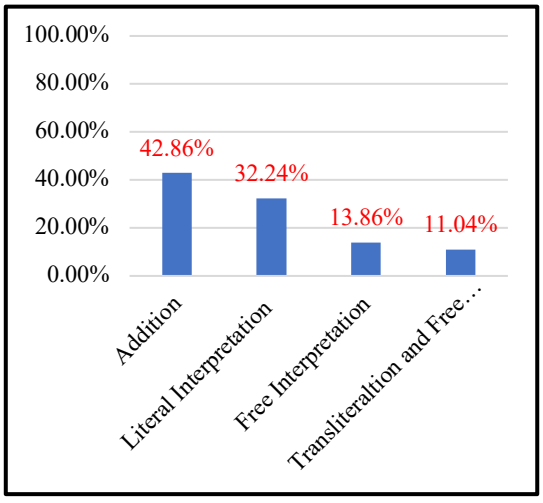

Fig. 6 Frequency and Interpretation Strategies for the Cultural Element in Chinese-to-English PGC

[9] To analyse the data from the four interpretation strategies, we put the function formula:[word="CE"] [word=","] [word="IS"] [word=","] [word="PL"] [word=","] [word="Specific IS"], into CQL, where 'Specific IS' within the square brackets represents 'LI', 'Addition', 'FI', and 'TFI'

Firstly, we observed that the strategy Addition (42.86%) is frequently used for cultural communication where Chinese terms with cultural references or implicit meanings do not have direct equivalents in English. Among the 501 cases we identified for instance, the interpreter rendered '云居寺', as a Buddhist temple, into 'Yunju Temple (a Buddhist temple)' to realise semantic and cultural equivalence. The explanatory text 'a Buddhist temple' was added to the name 'Yunju Temple' to provide explicit cultural reference of the temple. This pattern of addition of supplementary information aligns with the findings of Li et al.'s (2022b) Taxonomy.

LI (32.24%) was the next most frequently used strategy. In the PGC, through the observation of 377 examples, we identified two patterns in interpreting cultural elements using the LI strategy: 1) cultural elements can find equivalent words in English; and 2) The interpreter could translate poems literally because there are no deeper cultural references. For example, the interpreter rendered the name of an ancient Chinese book '《山海经》' as '*The Classics of Mountain and Sea*'. The book is related to treasured cultural Chinese classics concerning geography, mythology, and religion. This interpretation has English equivalents that correspond to the suggested breadth of geography and history. Another example is the interpretation of poems with a non-cultural image: Du Qing's poem '独爱昆仑风韵壮，骋眸苍莽巨龙蟠。' was literally interpreted into 'Dearest to my heart is the magnificent Mount Kunlun; Where I see no mountain but a crouching loong under the sky.' LI is effective in capturing the author's deep admiration and reverence for the magnificent Mount Kunlun. These two examples align with the theoretical guidelines to achieve semantic and cultural equivalence and concur with Li et al.'s (2022b) Taxonomy.

FI (13.86%), as a complement to Addition and LI, assists geotourists understand the connotation embedded in cultural words. In other words, FI was used when the source text conveys deeper cultural meanings that could not be simply interpreted with English text that matches the original style of the Chinese text. We performed a qualitative analysis of the PGC and identified two patterns for interpretating cultural elements using FI. The first pattern is interpreting highly concentrated Chinese cultural elements carrying rich cultural connotations, which cannot be adequately conveyed through alternative strategies. For instance, '赶秋节' is an annual harvest festival for the Hmong people at the beginning of autumn. It was effectively interpreted into 'Autumn Harvest Festival of Miao Ethnic Group' mapped onto three-dimension of Eco-Translatology to achieve semantic and cultural equivalence. The second pattern involves interpreting poems with cultural images such as allusions. For example, Jingting Yang's poem , '最怕人情红白事，知单一到便为难。', was rendered into 'Thus attending weddings and funerals is most dreadful, For with the invitation often comes unavoidable cost.' by the interpreter. In English, the literal meaning of '红白事' is 'red and white events'. In this poem, however, '红白事', is a specific cultural allusion to weddings and funerals. The interpreter considered the connotation of the source language, ensuring the accuracy of the interpretation. Additionally, in traditional Chinese culture, '红白事' shares similar cultural connotations with weddings and funerals in English. Hence, according to Hu's (2003) Eco-Translatology, this interpretation achieves both semantic and cultural equivalence. These two patterns of free interpretation applied to cultural elements align with the Taxonomy proposed by Li et al. (2022b).

The TFI strategy is the least frequently used at 11.04% with 129 cases. For example, '磕长头礼' was effectively interpreted into 'Kowtow worship'. '磕长头礼' can be divided into two parts. The former part '磕长头' is a proper noun referring to one of the sincerest ways for followers of Tibetan Buddhism to pay respect to Buddha. Using

transliteration, the English interpretation preserves the phonology of the cultural words from the source language and enables geotourists to gain an understanding of the sound characteristics inherent in the source language. The latter part '礼' is a common noun which literally means 'ceremony' or 'etiquette' in English. However, because the source text refers to a specific worship of Tibetan Buddhism, it was interpreted as 'worship' to convey the most accurate cultural meaning. The utilisation of the TFI strategy in interpreting cultural elements. This aligns with Li et al.'s (2022b) Taxonomy.

Regarding misinterpretation of cultural elements, seven examples were found in the PGC[10]. These examples share a common feature: they contain implicit meaning that lacks a direct English equivalent and was typically misinterpreted using literal interpretation. For example, '猴儿鼓' was ineffectively interpreted into 'Monkey drum dance', which was a word by word interpretation of the source text. This interpretation fails to grasp the cultural meaning of the dance. '猴儿鼓' is a traditional Hmong folk dance with drumming, where multiple dancers imitate various behaviours of the monkey, such as nibbling on corn or swinging. Considering the characteristics of the '猴儿鼓', the Addition strategy proposed by Li et al. (2022b) for interpreting cultural elements suggests revising into 'Drum dance imitating monkeys' to achieve semantic and cultural equivalence.

6. Conclusions

In this paper, we used geotourism data from three Chinese UGGps (Xiangxi, Fangshan and Mount Kunlun) to examine the effectiveness of the benchmarking model (SSC equivalence) for C-E geotourism interpretation and the Taxonomy based on Hu's (2003) Eco-Translatology proposed by Li et al. (2022a; 2022c; 2024). The data from the three Chinese UGGps were analysed quantitatively and qualitatively, with the aim of using field data processed through a corpus to validate the SSC Model and Taxonomy. The method of research was framed by Eco-Translatology and the systematic ABC elements of geodata organisation.

Methodologically, we started coding the raw corpus data from the PGC by identifying the effective and ineffective interpretation, guided by Eco-Translatology. After all text data were tagged, we developed CQL functions to extract the frequency of each interpretation strategy occurring in the C-E PGC. This quantitative step confirms the interpretation norms of ABC elements within geotourism. Qualitatively, we extracted incidences of interpretation text examples to test whether they supported the Taxonomy (Li et al. 2022c). At the same time, guided by Eco-Translatology, we optimised the interpretation problems using the Taxonomy (Li et al. 2022a; 2024) to determine whether it could be effectively used to attain SSC equivalence. Additionally, we discovered new usage patterns and new strategies to add to the original Taxonomy proposed by Li et al. (2022a; 2024). The revised Taxonomy was included in Appendix E. Thus, this research validated the rigour of the Taxonomy and the reliability of the SSC Model in interpretation purposes of C-E geotourism data. Furthermore, our methodology systematically investigates the language of interpretation used in geoparks, delivering a reliable and comprehensive perspective on geotourism interpretation. This was possible because our computerised approach efficiently processed and analysed a vast amount of geotourism data related to ABC elements from Chinese UGGps. Thus, in other words, the large amount of data validated the specific effective interpretation strategies

[10] The function formula, [word="CE"] [word=","] [word="IP"] [word=","] [word="PL"] [word=","] [word="Misinterpreted"], was applied to retrieve all instances of 'Misinterpreted'.

and interpretation problems; therefore, the size of the analysed data sample undergirds the robustness of the SSC Model and Taxonomy framework for translators or interpreters.

The implications of this specific study mean the Taxonomy and Model can be upheld as useful and reliable for geotourism interpretation. In practice, this would enable geotourism interpreters to identify problems of geotourism interpretation and formulate strategies for optimisation. The wider implications are in the fields of interpretation in Chinese and other languages, several aspects of education including linguistic and scientific, and in other scientific aspects of geotourism. Therefore, the proposed evaluation model (SSC model) and the Taxonomy (Li et al. 2022b; 2022c; 2024) provide valuable theoretical guidance or standardisation for future geotourism interpretation practices. Moreover, the results from this study provide practical implications for the field of science education and interpretation training. For example, the qualitative results where we optimise problematic interpretations in the data can be shared with popular science education centers in Chinese UGGps, so that new generation interpreters have access to data-driven pedagogical materials that could enhance their skills and the quality of geotourism interpretation. A final implication is that the enhanced interpretation quality provided to Chinese UGGps helps to facilitate the expansion of the geotourism sector, given that effective geotourism interpretation promotes better geomorphological, ecological, and cultural communication.

For future research, scholars can employ the corpus-based method presented this paper, as described in Section 4, to investigate geotourism interpretation in other languages. To be more specific, researchers can draw insights from the approach to corpus tagging and the procedures of quantitative and qualitative analyses to construct a benchmarking model (i.e., similar to the SSC model) and the Taxonomy for languages other than Chinese to English.

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Declarations

Ethical Standard: Not applicable

Conflict of Interest: The authors report there are no competing interests to declare.

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Appendices

Appendix A. Taxonomy (Li et al. 2022b; 2024) based on Hu's Eco-Translatology

Geotourism categories	Geotourism subcategories	Interpretation strategies	Usage patterns for interpretation strategies for ABC elements
Abiotic (A) element (AE)	Geological feature (GF)	Literal Interpretation (LI)	(1) When interpreting GF, there are existing equivalent words in English corresponding to the Chinese expressions.
			(2) When interpreting some names of rocks, caves, peaks, and waterfalls, equivalent nouns which reflect their shapes can be used.
			(3) When interpreting Chinese-four-character structures of GF, existing equivalent descriptive words in English can be used.
		Transliteration and Free Interpretation (TFI)	When interpreting some names of rocks, caves, peaks, and waterfalls, direct interpretation cannot reflect their name/s meaningfully. So, the former part (cultural function characters) can be used with transliteration and the latter part interpreted by free interpretation.
		Addition	When interpreting GF jargon in which there is cultural difference that hinders comprehension from literal interpretation, approximate descriptive terms can be added.
		Official Name Used by UNESCO	When GFs have official names given by the UNESCO Global Geoparks, these recognised names are used.
		Shift	The shift strategy only occurred three times in the Chinese-to-English parallel geotourism corpus.
		Foreignisation	When there are no existing English counterparts, the interpreter chose to interpret the GF that may contain foreign words or cultural references that preserve the uniqueness of the original Chinese texts. *The foreignisation strategy occurred once only in the Chinese-to-English parallel geotourism corpus (Chapter 4).
	Geological process (GP)	Division and Shift strategy (DS)	When GPs are described in long Chinese sentences, they were interpreted into several simple and short English sentences. When passive structure is embedded into the Chinese GP expressions, passive voice is to be used in the target interpretation.
		Literal Interpretation (LI)	(1) When GP jargons exist in English, Chinese GP jargons are interpreted literally.
			(2) Interpreting short Chinese GPs that are written in active voice directly into active-voice English sentences of similar length. *using and interpreting of passive voice is categorised as 'Shift', which is explained below.
		Shift	When the Chinese GPs are simple short sentences that contain either explicit or implicit passive voice structures, passive voice was used in the English interpretations.
		Division	When GPs are complex long sentences and do not contain explicit or implicit passive structures, the original long sentences are divided into simple clauses, and active voice is used in the clause.
Biotic (B) element (BE)	Common biotic (flora and fauna) names (CPN; CAN)	**Common biotic names appear as the title or stand alone on the interpretative boards.**	
		Latin and English strategy (LE)	**Latin part:** Use the scientific names for flora and fauna provided by latest International Code of Nomenclature for algae, fungi, and plants (ICN 2018) and the International Code of Zoological Nomenclature (ICZN 2022).
			English part: **(1) Literal interpretation:** Use the English equivalents if common flora and fauna names can be found in English. **(2) Creative interpretation:** a. There is no English equivalent for endemic Chinese flora. According to their features or connotations, direct interpretation can be widely accepted. However, this pattern used to interpret native Chinese fauna names in creative interpretation is not found and needs further research. b. When the native flora and fauna of China lack an English equivalent, borrow the English meaning of their Latin scientific names (genus and species epithet).

		Foreignisation	If a species originates from China and its scientific name contains affixes indicating foreign countries rather than China, or foreigners who discovered the species, English will be used exclusively.
		Common biotic names in the main text of interpretative boards.	
		Literal Interpretation (LI)/ Creative Interpretation (CI)	These two interpretation strategies correspond to the English part of the Latin and English strategy.
	Local Chinese (flora and fauna) terms (CCPN; CCAN)	The interpretation strategies of local Chinese biotic names can adopt the broader taxonomy of interpretation strategies of common biotic names above.	
	Ecological processes (FLP; FAP)	Literal Interpretation (LI)	Interpreting short Chinese ecological processes that are written in active voice directly into active-voice English sentences of similar length. *using and interpreting of passive voice is categorised as 'Shift', which is explained below.
		Division	When the Chinese ecological processes are described in active, complex sentences, these sentences are broken down into shorter active sentences in English.
		Combination	When there is a close logical relationship between two consecutive Chinese sentences describing ecological processes (e.g., the subject of the two sentences is the same), the use of conjunctions or adjoint adverbials can be used to make them into one complex English sentence that retains all the information in the Chinese sentences.
		Shift	When the ecological processes are described using passive structures in the Chinese sentence, passive voice was used in interpreting ecological processes into English.
		Division and Shift strategy (DS)	When ecological processes are described in long Chinese sentences, they were interpreted into several simple and short English sentences. When passive structure is embedded into ecological processes, passive voice is to be used in the target interpretation.
		Restructuring the Word Order (RWO)	Important information, such as a category or generality of ecological processes, should be placed first in the sentence, followed by supporting details when interpreting ecological processes.
Cultural (C) element (CE)	People's lifestyle (PL)	Literal Interpretation (LI)	(1) When the C elements in Chinese have existing English counterparts, the counterparts are used directly.
			(2) When the poems do not have specific cultural images, the poems can be interpreted literally.
		Transliteration and Free Interpretation (TFI)	Interpreting the C element which consisted of two parts: the former part is a proper noun, and the latter is a common noun. The former part use transliteration and the latter part use free interpretation (explained below).
		Free Interpretation (FI)	(1) When highly concentrated Chinese cultural elements contain rich cultural connotations, the target English interpretation focuses on communicating the sense and cultural connotations rather than word-to-word meanings.
			(2) When interpreting poems with cultural images which include strong cultural connotations including allusions and personal names, the target interpretation adheres more to the sense and meaning rather than the original wording.
		Addition	When interpreting C elements with implicit cultural meanings or with no English equivalence, additional explanation is added.

Appendix B. Tags Applied to the Targets in Chinese-to-English Parallel Geotourism Corpus

Label elements				Label example
Element 1	**Element 2**	**Element 3**	**Element 4**	
Abiotic Element <AE>	Interpretation Strategies <IS>	Geological Features <GF>	Literal Interpretation <LI>	<AE, IS, GF, LI>
			Transliteration and Free Interpretation <TF>	<AE, IS, GF, TF>
			Addition <Addition>	<AE, IS, GF, Addition>
		Geological Processes <GP>	Literal Interpretation <LI>	<AE, IS, GP, LI>
			Division <Division>	<AE, IS, GP, Division>
			Shift <Shift>	<AE, IS, GP, Shift>
			Division and Shift <DS>	<AE, IS, GP, DS>
			Combination <Combination>	<AE, IS, GP, Combination>
	Interpretation Problems <IP>	Geological Features <GF>	Misinterpreted <Misinterpreted>	<AE, IP, GF, Misinterpreted>
			Incongruent Interpretation for Same Name <IISN>	<AE, IP, GF, IISN>
		Geological Processes <GP>	Misinterpreted <Misinterpreted>	<AE, IP, GP, Misinterpreted>
Biotic Element <BE>	Interpretation Strategies <IS>	Common Plant Names <CPN>	Latin and English <LE>	<BE, IS, CPN, LE>
			Literal Interpretation <LI>	<BE, IS, CPN, LI>
			Creative Interpretation <CI>	<BE, IS, CPN, CI>
			Foreignisation <Foreignisation>	<BE, IS, CPN, Foreignisation>
		Common Animal Names <CAN>	Latin and English <LE>	<BE, IS, CAN, LE>
			Literal Interpretation <LI>	<BE, IS, CAN, LI>
			Creative Interpretation <CI>	<BE, IS, CAN, CI>
			Foreignisation <Foreignisation>	<BE, IS, CAN, Foreignisation>
		Chinese Cultural Plant Names <CCPN>	Literal Interpretation <LI>	<BE, IS, CCPN, LI>
			Creative Interpretation <CI>	<BE, IS, CCPN, CI>
		Chinese Cultural Animal Names <CCAN>	Literal Interpretation <LI>	<BE, IS, CCAN, LI>
			Creative Interpretation <CI>	<BE, IS, CCAN, LI>
		Flora Processes <FLP>	Literal Interpretation <LI>	<BE, IS, FLP, LI>
			Division <Division>	<BE, IS, FLP, Division>
			Shift <Shift>	<BE, IS, FLP, Shift>
			Division and Shift <DS>	<BE, IS, FLP, DS>
			Combination <Combination>	<BE, IS, FLP, Combination>
		Fauna Processes <FAP>	Literal Interpretation <LI>	<BE, IS, FAP, LI>
			Division <Division>	<BE, IS, FAP, Division>
			Shift <Shift>	<BE, IS, FAP, Shift>
			Division and Shift <DS>	<BE, IS, FAP, DS>
			Combination <Combination>	<BE, IS, FAP, Combination>
	Interpretation Problems <IP>	Common Plant Names <CPN>	Misinterpreted <Misinterpreted>	<BE, IP, CPN, Misinterpreted>
		Common Animal Names <CAN>	Misinterpreted <Misinterpreted>	<BE, IP, CAN, Misinterpreted>
		Chinese Cultural Plant Names <CCPN>	Misinterpreted <Misinterpreted>	<BE, IP, CCPN, Misinterpreted>
		Chinese Cultural Animal Names <CCAN>	Misinterpreted <Misinterpreted>	<BE, IP, CCAN, Misinterpreted>
		Flora Processes <FLP>	Misinterpreted <Misinterpreted>	<BE, IP, FLP, Misinterpreted>
		Fauna Processes <FAP>	Misinterpreted <Misinterpreted>	<BE, IP, FAP, Misinterpreted>
Cultural Element <CE>	Interpretation Strategies <IS>	People's Lifestyle <PL>	Literal Interpretation <LI>	<CE, IS, PL, LI>
			Transliteration and Free Interpretation <TF>	<CE, IS, PL, TF>
			Free Interpretation <FI>	<CE, IS, PL, FI>
			Addition <Addition>	<CE, IS, PL, Addition>
	Interpretation Problems <IP>	People's Lifestyle <PL>	Misinterpreted <Misinterpreted>	<CE, IP, PL, Misinterpreted>

Appendix C. Sketch Engine Formula

Search in

English

Query type

CQL

CQL

[word="one of three main elements of geotourism"] [word=","] [word="IS"] [word=","] [word="one of subcategories in ABC elements"] [word=","] [word="Specific IS"]

Default attribute: word

Subcorpus: non (the whole corpus)

Fig.C1 Function Formula Used to Retrieve Effective Geotourism Interpretation Strategies in Sketch Engine

Search in

English

Query type

CQL

CQL

[word="one of three main elements of geotourism"] [word=","] [word="IS"] [word=","] [word="one of subcategories in ABC elements"] [word=","] [word="Specific IP"]

Default attribute: word

Subcorpus: non (the whole corpus)

Fig.C2 Function Formula Used to Retrieve Ineffective Geotourism Interpretation in Sketch Engine

Appendix D. Examples of Effective and Ineffective Geotourism Interpretations

Table D1. Effective Interpretation of the Abiotic (GF and GP) Element

Categories	Text No.	Source Text (ST)	Target Text (TT)	Interpretation Strategies
Geological Features (GF)	1	夷平面	Planation surface	Literal interpretation
	2	鳄鱼石	Crocodile-shaped rock	
	3	山谷陡峻	Steep cliffs and narrow gorges	
	4	灵洞天窗群	Lingdong cave karst windows groups	Transliteration and free interpretation
	5	圣米	Holy rice (Quartz grains)	Addition
Geological Processes (GP)	6	火山岩造型石**形成**于距今约2.05～1.44 亿年的侏罗纪，经过漫复杂的长地质演化，它**被**抬升到现在的位置。	The landscape-forming volcanic rocks **were formed** during the Jurassic period 205 to 144 million years ago. Through a long and complicated geological evolution, they **were uplifted** to the current location.	Division and Shift
	7	因为河流凹岸的岩石**被不断侵蚀**破坏导致河岸崩塌，所以**形成**了陡壁。	The rocks on the concave bank of the river **are continuously eroded** until damage can result in a collapse of the riverbank, so steep cliffs **are formed**.	Shift
	8	冰川不断地通过拔蚀、磨蚀和冻融风化作用侵蚀底床和谷壁。	The glacier continually erodes the bed bottom and valley walls by plucking, abrasion, and free-thaw weathering.	Literal interpretation
	9	河弯不断向两侧扩展，又向下游移动，使河谷展宽，并在山谷中积聚了大量的砾石和沉积物。	The river bends continuously, expanding on both sides. It moves downstream widening the valley and accumulating a large amount of gravel and sediment in the valley.	Division
	10	**白云岩**是长期通过沉积作用形成的。**其**底部又受到侵入岩浆的烘烤，逐渐变成了白色的大理岩。	Dolomite is formed through long-term deposition, with its bottom subject to intruding magma, gradually transforming into white marble.	Combination

Table D2. Ineffective Interpretation of the Abiotic (GF and GP) Element

Categories	Text No.	Source Text	Target Text	Interpretation Problems
Geological Features (GF)	11	昆仑山	Mount Kunlun	IISN
			Kunlun Mountains	
			Mt. Kunlun	
	12	金钉子	Golden Spike	Misinterpreted
	13	斩云剑	Cutting cloud sword	
Geological Processes (GP)	14	带有气孔的灰绿色安山岩是火山喷发的岩浆冷却后**形成**的，经过长期的风化和侵蚀，岩石**变成**了各种各样的颜色。	The greyish-green andesite with pores results from cooling of erupted magma from volcanoes. After undergoing long-term weathering and erosion, the rock would become various colours.	Misinterpreted

Table D3. Effective Interpretation of the Biotic (CPN, CAN, CCPN, CCAN, FLP and FAP) Element

Categories	Text No.	Source Text	Target Text	Interpretation Strategies
Common Flora Names (CPN)	15	**翠雀**椭圆形的萼片呈蓝色。	The elliptical sepals of the **Chinese Delphinium** are blue.	Literal interpretation
	16	**唐古拉点地梅**的主根呈棕色。	The taproot of the **Tanggulashan rock jasmine** is brown in colour.	Creative interpretation
	17	独花兰	*Changnienia amoena* S.S.Chien (beautiful Changnienia)	Latin and English
	18	山茶	camellia	Foreignisation
Common Fauna Names (CAN)	19	**黑鹳**的头、颈、脚均甚长。	The **black stork** has a particularly lengthy head, neck, and legs.	Literal interpretation
	20	**藏管尾犁胸蝉**的前翅狭长，呈红褐色。	The forewings of the **Tibetan treehopper** are narrow and reddish-brown in colour.	Creative interpretation
	21	野牦牛	*Bos mutus* (Wild yak)	Latin and English
	22	阳彩臂金龟	*Cheirotonus jansoni* (Chinese varicoloured beetle)	
	23	中华对角羚	Chinese gazelle	Foreignisation
Local Chinese Flora Terms (CCPN)	24	**扯丝皮**的花不显眼，小而呈绿色。	The flowers of the **Chinese rubber tree** are inconspicuous, small, and greenish.	Literal interpretation
	25	**阿仲尕布**枝叶密集，花白色，寒冬盛开。	The **mossy sandwort** has dense branches and leaves, with white flower blooming in the cold winter.	Creative interpretation
	26	**猴欢喜**的叶片簇生于枝顶。	The leaves of the **chestnut-like tree** are clustered at the top of the branches.	
Local Chinese Fauna Terms (CCAN)	27	**黄鸭叫**的头大且扁平。	The **yellow head catfish** has a large and flat head.	Literal interpretation
	28	**泥雀儿**的鼻孔很大，鼻瓣膜发育良好。	The nostrils of the **Xiangxi high-plateau loach** are large, and the nasal valve membrane is well-developed.	Creative interpretation
	29	**杂咕**头锥形，吻突出。	The **stippled-pattern carp** has a conical head with a prominent snout.	
Flora Processes (FLP)	30	淫羊藿根状茎粗短，暗棕褐色；二回三出复叶基生和茎生，叶缘具刺齿；圆锥花序，花白色或淡黄色，5-6 月开花。	The dark brown barrenwort root is short and thick. Basal and stem leaves are compound, that is, with two or three serrated edged leaflets. This plant has a conical inflorescence with white or pale-yellow flowers, blooming from May to June.	Division
	31	紫花针茅叶膜质，披针形，长 3-6 毫米。	The leaves of the purple spear grass are membranous, lanceolate, and measure 3-6 millimetres in length.	Literal interpretation
	32	**紫树**高达 13 余米，小枝有短柔毛。**紫树**小枝上的叶呈椭圆形，长 8-15 厘米，表面暗绿色，背面淡绿色，侧脉上有短柔毛。	The Chinese tupelo stands over 13 metres with villous branchlets and has oval leaves 8-15 cm long, **which** are dark green, have light greabaxial surface piloseen facing abaxially, and are pubescent on lateral veins.	Combination
	33	歪头菜通常数茎丛生，具棱，疏**被**柔毛，老时渐脱落，茎基部表皮红褐色或紫褐红色。	The two-leaf vetch usually grows in clumps. Its edges **are** sparsely **covered with** soft hairs that gradually shed as it ages. The base of the stem is reddish or purplish, brown.	Division and Shift
	34	地上部分为半球形的垫状体，由极多的根出条紧密**排列而成**；根出条**酷似**莲座**状**叶，覆瓦状排列。	The part exposed above the ground is a hemispherical cushion-shaped body, **formed by** multiple roots spreading densely. The root spread **is characterised by** an imbricated leafage in a withering rosette shape.	
Fauna Processes (FAP)	35	大鲵头部扁平、钝圆，口大，眼小；身体前部扁平，至尾部逐渐	The head of the giant salamander is flat and bluntly rounded, with a large mouth and small eyes. The front part of the body is flattened, gradually becoming laterally	Division

		转为侧扁；体两侧有明显的肤褶。	compressed towards the tail. There are distinct skin folds on both sides of the body.	
	36	雄性藏羚羊有垂直向上的角，尖端稍向前弯曲，雌性无角。	The male Tibetan antelopes have long horns that point almost vertically upward, with tips bending slightly forward, while the females have no horns.	Literal interpretation
	37	**金凤蝶**是一种大型蝶。**它**的双翅展开有8-9厘米宽，体翅金黄色，有光泽。	The Old-World swallowtail is a large, ornamental butterfly **with** glossy yellow wings and a wingspan of 8-9 cm.	Combination
	38	野牦牛四肢强壮，身**被**长毛，胸腹部的毛几乎垂到地上，可遮风挡雨，舌头上长有肉齿，凶猛善战。	The wild yak **is covered with** long fur and has powerful legs. The long fur on its chest and abdomen almost reaches the ground and provides protection from wind and rain. Additionally, there are extra teeth on its tongue, making it a fiercely equipped opponent in combat.	Division and Shift
	39	大灵猫的侧颈和下颈**布**黑条纹，与白色毛皮形成对比，尾巴上**饰**多个黑白相间的环。	The side and lower neck of the large Indian civet **are banded with** black stripes contrasting against white fur. The tail **is marked with** several black and white rings.	

Table D4. Ineffective Interpretation of the Biotic (CPN, CAN, CCPN, CCAN, FLP and FAP) Element

Categories	Text No.	Source Text	Target Text	Interpretation Problems
Common Flora Names (CPN)	40	槭叶铁线莲	*Clematis acerifolia* Maxim. (clematis)	Misinterpreted
Common Fauna Names (CAN)	41	中华奥锹甲	*Odontolabis cuvera sinensis* (Chinese beetle)	Misinterpreted
Local Chinese Flora Terms (CCPN)	42	**阿不夜那**是藤本植物的可食用部分。	The **Kudzu vine** is an edible part of a climbing vine.	Misinterpreted
Local Chinese Fauna Terms (CCAN)	43	**齐哇**是大型陆生啮齿动物，四肢粗壮，尾巴短。	The **Tibetan dwarf hamster** is large terrestrial rodent with stout limb and short tail.	Misinterpreted
Flora Processes (FLP)	44	孢子囊群是生长在叶片下部小脉上的小球；孢子囊可形成囊群，囊群**盖**膜质，呈肾状，边缘疏具锯齿，成熟时，囊状物大，彼此靠近，甚至延伸到叶外，叶下**具**腺体。	The sporangia are round, borne on the small veins on the back; the sacs are membranous, round to round kidney-shaped, with sparsely serrated edges, large, close to each other after maturity and often extend beyond the edge of the leaf, with glands on the back.	Misinterpreted
Fauna Processes (FAP)	45	**麦穗鱼**的吻略尖而突出。**它**的唇薄，无须。	The snout of the stone moroko is slightly pointed and prominent. This kind of fish has large eyes, thin lips, and no whiskers.	Misinterpreted

Table D5. Effective interpretation of the Cultural (PL) Element

Categories	Text No.	Source Text	Target Text	Interpretation Strategies
People's (Human Lifestyle (PL)	46	《山海经》	*The Classics of Mountain and Sea*	Literal interpretation
	47	独爱昆仑风韵壮，骋眸苍莽巨龙蟠。	Dearest to my heart is the magnificent Mount Kunlun; Where I see no mountain but a crouching loong under the sky.	
	48	云居寺	Yunju Temple (a Buddhist temple)	Addition
	49	赶秋节	Autumn Harvest Festival of Miao Ethnic Group	Free interpretation
	50	最怕人情红白事，知单一到便为难。	Thus attending weddings and funerals is most dreadful, For with the invitation often comes unavoidable cost.	
	51	磕长头礼	Kowtow worship	Transliteration and free interpretation

Table D6. Ineffective Interpretation of the Cultural (PL) Element

Categories	Text No.	Source Text	Target Text	Interpretation Problems
People's (Human Lifestyle (PL)	52	猴儿鼓	Monkey drum dance	Misinterpreted

Appendix E. Future Taxonomy based on Hu's Eco-Translatology

Highlighted in yellow are new emerging patterns found in this paper compared to previous project (Appendix A)

Geotourism categories	Geotourism subcategories	Interpretation strategies	Usage patterns for interpretation strategies for ABC elements
Abiotic (A) element (AE)	Geological feature (GF)	Literal Interpretation (LI)	(1) When interpreting GF, there are existing equivalent words in English corresponding to the Chinese expressions.
			(2) When interpreting some names of rocks, caves, peaks, and waterfalls, equivalent nouns which reflect their shapes can be used.
			(3) When interpreting Chinese-four-character structures of GF, existing equivalent descriptive words in English can be used.
		Transliteration and Free Interpretation (TFI)	When interpreting some names of rocks, caves, peaks, and waterfalls, direct interpretation cannot reflect their name/s meaningfully. So, the former part (cultural function characters) can be used with transliteration and the latter part interpreted by free interpretation.
		Addition	When interpreting GF jargon in which there is cultural difference that hinders comprehension from literal interpretation, approximate descriptive terms can be added.
		Official Name Used by UNESCO	When GFs have official names given by the UNESCO Global Geoparks, these recognised names are used.
		Shift	When literal translation of Chinese verbs and nouns do not conform to intelligible English grammar, a shift in part of speech is performed.
		Foreignisation	When there are no existing English counterparts, the interpreter chose to interpret the GF that may contain foreign words or cultural references that preserves the uniqueness of the original Chinese texts. *The Foreignisation strategy occurred once only in the Chinese-to-English parallel geotourism corpus (Chapter 4).
	Geological process (GP)	Division and Shift strategy (DS)	When GPs are described in long Chinese sentences, they were interpreted into several simple and short English sentences. When passive structure is embedded into the Chinese GP expressions, passive voice is to be used in the target interpretation.
		Literal Interpretation (LI)	(1) When GP jargons exist in English, Chinese GP jargons are interpreted literally.
			(2) Interpreting short Chinese GPs that are written in active voice directly into active-voice English sentences of similar length. *using and interpreting of passive voice is categorised as 'Shift', which is explained below.
		Shift	When the Chinese GPs are simple short sentences that contain either explicit or implicit passive voice structures, passive voice was used in the English interpretations.
		Division	When GPs are complex long sentences and do not contain explicit or implicit passive structures, the original long sentences are divided into simple clauses, and active voice is used in the clause.
		Combination	When there is a close logical relationship between two consecutive Chinese sentences describing GPs (often involving shared subject agreement), the sentences can be combined into one.
Biotic (B) element (BE)	Common biotic (flora and fauna) names (CPN, CAN)	**Common biotic names appear as the title or stand alone on the interpretative boards.**	
		Latin and English strategy (LE)	**Latin part:** Use the scientific names for flora and fauna provided by latest International Code of Nomenclature for algae, fungi, and plants (ICN 2018) and the International Code of Zoological Nomenclature (ICZN 2022).
			English part: **(1) Literal interpretation:** Use the English equivalents if common flora and fauna names can be found in English. **(2) Creative interpretation:** **a.** When there is no English equivalent for endemic Chinese flora and fauna, English names are interpreted according to their features or connotations. **b.** When the native flora and fauna of China lack an English equivalent, borrow the English meaning of their Latin scientific names (genus and species epithet).

		Foreignisation	If a species originates from China and its scientific name contains affixes indicating foreign countries rather than China, or foreigners who discovered the species, English will be used exclusively.
		Common biotic names in the main text of interpretative boards.	
		Literal Interpretation (LI)/ Creative Interpretation (CI)	These two interpretation strategies correspond to the English part of the Latin and English strategy.
	Local Chinese biotic (flora and fauna) terms (CCPN, CCAN)	The interpretation strategies of local Chinese biotic names can adopt the broader taxonomy of interpretation strategies of common biotic names above.	
	Ecological processes (FLP, FAP)	Literal Interpretation (LI)	Interpreting short Chinese ecological processes that are written in active voice directly into active-voice English sentences of similar length. *using and interpreting of passive voice is categorised as 'Shift', which is explained below.
		Division	When the Chinese ecological processes are described in active, complex sentences, these sentences are broken down into shorter active sentences in English.
		Combination	When there is a close logical relationship between two consecutive Chinese sentences describing ecological processes (e.g., the subject of the two sentences is the same), the use of conjunctions or adjoint adverbials can be used to make them into one complex English sentence that retains all the information in the Chinese sentences.
		Shift	When the ecological processes are described using passive structures in the Chinese sentence, passive voice was used in interpreting ecological processes into English.
		Division and Shift strategy (DS)	When ecological processes are described in long Chinese sentences, they were interpreted into several simple and short English sentences. When passive structure is embedded into ecological processes, passive voice is to be used in the target interpretation.
		Restructuring the Word Order (RWO)	Important information, such as a category or generality of ecological processes, should be placed first in the sentence, followed by supporting details when interpreting ecological processes.
Cultural (C) element (CE)	People's lifestyle (PL)	Literal Interpretation (LI)	(1) When the C elements in Chinese have existing English counterparts, the counterparts are used directly.
			(2) When the poems do not have specific cultural images, the poems can be interpreted literally.
		Transliteration and Free Interpretation (TFI)	Interpreting the C element which consisted of two parts: the former part is a proper noun, and the latter is a common noun. The former part use transliteration and the latter part use free interpretation (explained below).
		Free Interpretation (FI)	(1) When highly concentrated Chinese cultural elements contain rich cultural connotations, the target English interpretation focuses on communicating the sense and cultural connotations rather than word-to-word meanings.
			(2) When interpreting poems with cultural images which include strong cultural connotations including allusions and personal names, the target interpretation adheres more to the sense and meaning rather than the original wording.
		Addition	When interpreting C elements with implicit cultural meanings or with no English equivalence, additional explanation is added.