frontiers | Frontiers in Conservation Science

TYPE Original Research
PUBLISHED 20 March 2025
DOI 10.3389/fcosc.2025.1539683

OPEN ACCESS

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RECEIVED 04 December 2024
ACCEPTED 26 February 2025
PUBLISHED 20 March 2025

CITATION
Marcías ML, Salvadeo C, Salgado-Beltrán L and García-Castañeda O (2025) Charisma is not enough: measuring short- and long-term environmental consciousness in wildlife tourism activities.
Front. Conserv. Sci. 6:1539683.
doi: 10.3389/fcosc.2025.1539683

Charisma is not enough: measuring short- and long-term environmental consciousness in wildlife tourism activities

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Nature-based tourism, such as whale watching and swimming with whale sharks, is rapidly growing worldwide. Although there is no clear classification, whale watching is often referred to as ecotourism or sustainable tourism. However, one of the key principles of true ecotourism is that it promotes, among other things, the generation of environmental education and awareness. The purpose of this research was to evaluate the effect of tourism activities with charismatic species in tourists' environmental consciousness. The study was carried out in three stages via surveys to participants of two main activities (snorkeling with whale sharks and gray whale watching) in Baja California Sur, Mexico: 1) one before the activity where socio-demographic, circumstantial variables, and initial environmental awareness and pro-environmental behavior were measured; 2) one immediately after, evaluating aspects of the experience and awareness in the short term, and, 3) Four months later via e-mail to evaluate environmental consciousness in the long term. A total of 542 surveys were obtained in the first two stages, and 200 surveys in the third stage. A Structural Equation Model analysis was performed to test causal relationships between the activities and environmental consciousness. Our results show that the experience with a charismatic species had a significant and positive effect on short-term environmental awareness. However, there was no significant effect of the experience on their long-term environmental consciousness. Implications for the actors involved in nature-based tourism activities are discussed, highlighting the need to implement globally used strategies but applying them in the local context.

KEYWORDS

environmental awareness, ecotourism, gray whale watching, snorkeling with whale sharks, nature based tourism, structural equation model, pro-environmental behavior

Introduction

Ecotourism is a form of tourism that was born as a counter movement to massive tourism impacts to nature and local communities (Sullivan, 2018). In the prevalent mindset, people associate "eco" with friendly to the environment, but this label has started to be purposely misused as a marketing and selling strategy (McGahey, 2012). However, ecotourism should imply minimizing impact, as well as direct and indirect conservation benefits, both in the site visited and promoting changes in the lifestyle of tourists when they return home (Orams, 1995).

True ecotourism should promote environmental consciousness (EC) in people given that the interaction with nature is not only thrilling for them, but also increases their knowledge of species, and this could lead to awareness of the importance of conservation and the adoption of environmentally friendly behaviors (Ballantyne and Packer, 2011). Even so, very few times this has been empirically tested. Environmental consciousness is a broad concept that includes awareness as well as emotional, attitudinal, and behavioral components, driving a more integrated pro-environmental mindset and actions, while environmental awareness (EA) typically refers to an individual's understanding or knowledge of environmental issues (Wang et al., 2022). However, a gap has been identified between two fundamental aspects of environmental consciousness; environmental awareness does not necessarily lead to pro-environmental behavior (Kollmuss and Agyeman, 2002) because of several extrinsic (e.g., institutions, economic, social, and cultural) and intrinsic barriers (motivation, knowledge, values, attitude, emotions, responsibilities, and priorities) (Orams, 1997; Stern, 2000; Kollmuss and Agyeman, 2002), so to generate and maintain the positive effects of an ecotourism activity is a real challenge for the tourist operators.

When these tourist activities are analyzed as complex socio-ecological systems, where various subsystems—social, economic, political, and ecological—interact, it becomes possible to understand how changes in one subsystem affect the others (Biggs et al., 2012). Whale watching has already been examined as a socio-ecological system, and the complex relationships between its variables have been explained (Rodríguez-Izquierdo et al., 2019; Sousa et al., 2023; García-Castañeda et al., 2024). It is essential to consider these intricate relationships to achieve positive effects on tourists' perceptions (García-Castañeda et al., 2024). Even more, environmental consciousness is a complex, multidimensional concept that cannot be measured directly, as it occurs with intelligence. Instead, a set of variables of a similar nature (scales) is used to measure it indirectly. On one hand, a pragmatic definition of the EC concept is "an individual's perception of concern for the environment combined with the desire to protect nature" (Kollmuss and Agyeman, 2002). Other authors consider it the dispositional component of pro-environmental behavior (PEB) (Sánchez and Lafuente, 2010). For the latter, EC involves at least four dimensions: affective (beliefs), cognitive (knowledge), dispositional (attitude), and active (PEB) (Sánchez and Lafuente, 2010). A high load of research has been performed in environmental sociology and psychology to achieve an analytical measure of EC and its conceptual comprehension. Of these, Dunlap's New Environmental Paradigm Scale is the most used worldwide to measure a person's environmental degree (Dunlap, 2008; Sánchez and Lafuente, 2010). Moreover, the Wisconsin Environmental Literacy Survey (Kibert, 2000), studies the correlations between the attitude, behavior, and knowledge components of environmental literacy of a person. However, the reported gap between EA and PEB (Kollmuss and Agyeman, 2002) addresses the necessity of measuring these two dimensions of EC (awareness and behavior) separately.

The process of generating the EC in a tourist activity can be visualized as a three-stage approach. First, people arrive at a location and have an emotional and cognitively engaging experience with nature or a charismatic species. This first experience, enhanced by the interpretation given by the guide, generates in the second stage empathy, interest, or reflection for the species, and in the third stage, this new knowledge or experience leads them to an increased EC and friendly behaviors toward the environment or increased pro-environmental behaviors (Bamberg and Möser, 2007; Kollmuss and Agyeman, 2002; Sánchez and Lafuente, 2010). Including subjective aspects such as experiences and beliefs has been considered, and not only the traditional socioeconomic factors (Dunlap et al., 2000; Sánchez and Lafuente, 2010; Van Liere and Dunlap, 1981). In this context, ecotourism activities have the unique potential to influence peoples' EC (Ballantyne et al., 2009; Orams, 1995; Senko et al., 2011), especially nature activities that involve charismatic species (Skibins et al., 2013).

Baja California Sur (BCS) has had a robust touristic component from its foundation. Testing fundamental changes in environmental consciousness is a rare aspect considered, while positive economic impact or negative impact on the sites and species visited are more frequent research approaches (Lozano, 2018; Ramírez-Macías and Saad, 2016; Schwoerer et al., 2016). Australia is a leader in such aspects (Ballantyne et al., 2009, 2011; Packer et al., 2018). Developing regions such as Latin America and Asia are considered areas of greatest concern regarding the development of this type of tourism (Cisneros-Montemayor et al., 2010; Rodger et al., 2011; Mustika et al., 2013), and few studies have been done in Mexico. In BCS the main tourism centers are La Paz, Los Cabos, and Loreto, where several coastal communities coexist in close connection with the natural environment (Ibañez, 2014). Even more, BCS has very high biodiversity, including a lot of species considered charismatic such as whales, dolphins, sea lions, and the whale shark, among others (Alam et al., 2014; Albert et al., 2018; Read et al., 2017). Combined with a variety of landscapes and ecosystems, it makes this relatively small region attractive for different types of tourism, both mass tourism and nature-based tourism. These factors could allow the arrival of casual tourists to activities customarily reserved for the "true eco-tourist" (Sandoval and Ewaldo, 2006), giving the tour operators a unique opportunity of avoiding the "preaching to the converted" dilemma (Beaumont, 2001).

Species considered charismatic are those that attract the attention and empathy of the general due to their large size,

appealing aesthetic patterns, striking behaviors, or similarities to humans, as seen in the case of cetaceans and primates. As a result, they are often used as umbrella species for conservation by different institutions and organizations (Isasi-Catalá, 2011; Skibins et al., 2013; Walpole and Leader-Williams, 1998). Two of the main activities at BCS that involve charismatic species are snorkeling with the whale shark (Alam et al., 2014; Read et al., 2017) and gray whale watching (SEMARNAT, 2024). Although some work has been done that evaluate the ecotourism activity of BCS (López-Espinosa de los Monteros, 2002; Fierro Bandala, 2014; Lozano, 2018; Troyo Vega et al., 2018), so far, none of them have evaluated environmental awareness and pro-environmental behavior of visitors, nor there has been a follow up of tourists through time, to test the effectiveness of these types of experiences in generating and maintaining environmental consciousness over time.

Considering this, there is a need to empirically assess whether tourism activities in Baja California Sur, particularly those involving iconic species like whale sharks and gray whales, truly foster long-term environmental awareness and pro-environmental behaviors among tourists (Ballantyne and Packer, 2011; Kollmuss and Agyeman, 2002). This study aims to fill that gap by not only evaluating the immediate effects of these experiences on tourists' environmental consciousness but also by exploring whether these experiences lead to sustained behavioral changes beyond the duration of the visit. By understanding the complex socio-ecological interactions involved in these activities, this research will provide critical insights for tour operators and policymakers, offering evidence-based strategies to enhance tourism's positive impacts on conservation efforts and local communities.

Based on these arguments, the purpose of our research was to measure the effect of the experience with a charismatic species in tourists' environmental consciousness, testing these causal relationships over time. We formulated the following hypotheses to verify that the tourist's initial environmental awareness and pro-environmental behavior would influence their experience, and that the activity would have a significant and positive effect on environmental awareness in the short and long term (Figure 1):

Hypothesis ad hoc (H0): EA and PEB will be positively correlated.

H1: initial EA and PEB have a significant and positive effect on the experience with a charismatic species

H2: the experience with a charismatic species will have a significant and positive effect in the short-term EC.

H3: the experience with a charismatic species will have a significant and positive effect in long-term EC.

Materials and methods

Area of study

This study was conducted in Baja California Sur, a state with a territorial area of 73,922.47 km², representing 3.8% of the Mexican territory. It occupies the southern half of a long and narrow peninsula, bordered to the north by the state of Baja California, to the east by the Gulf of California, and the west by the Pacific Ocean. The state is divided into five municipalities: Comondú, Mulegé, La Paz, Los Cabos, and Loreto. Its coastline extends for 2,131 km, accounting for 19.2% of Mexico's total coastline (SECTUR, 2024).

We selected three locations for gray whale watching—Gerrero (GN), also known as Laguna Ojo de Liebre or Scammon's Lagoon,

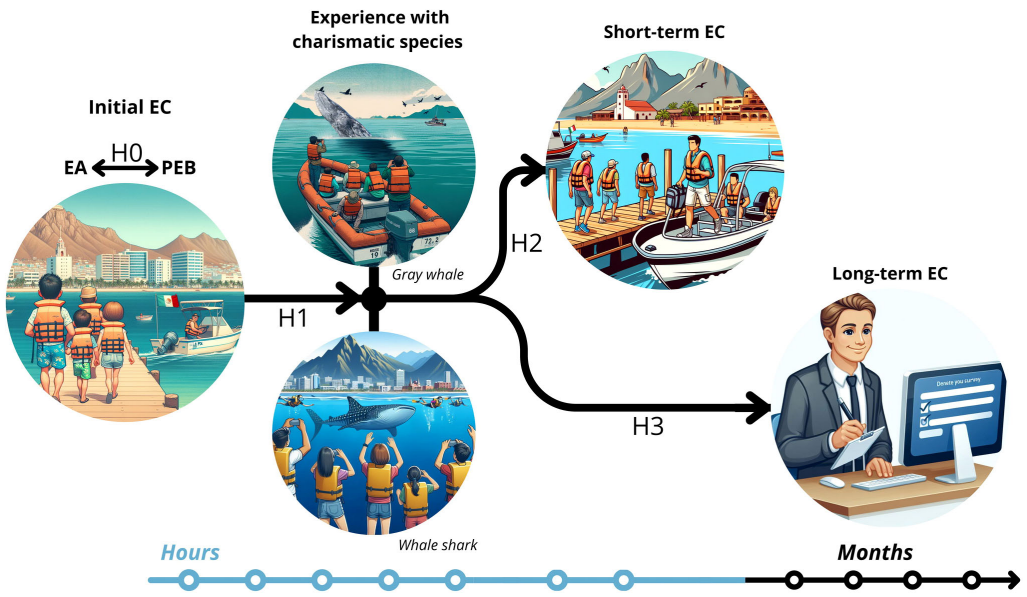

FIGURE 1
Hypothesized model of inter-relationships among the variable sets. Environmental awareness (EA), pro-environmental behavior (PEB), and environmental consciousness (EC) in the different stages of tourist interaction are initial (H1: the state the tourist arrives with), short-term (H2: immediately after the tour), and long-term (H3: four months after the tour). (Images generated with the assistance of ChatGPT, powered by OpenAI).

Puerto Adolfo López Mateos (PALM) and Puerto San Carlos (PSC) within the Bahía Magdalena–Bahía Almejas complex - and La Paz for whale shark swimming activities (Figure 2). Guerrero Negro is located within the Vizcaíno Biosphere Reserve (REBIVI) and has an estimated population of 13,000 inhabitants (INEGI, M, 2010). Puerto Adolfo López Mateos, situated on the Pacific coast of Baja California Sur, has a population of 2,212 people, with fishing and winter whale watching as its primary activities (INEGI, M, 2010). Similarly, Puerto San Carlos, another locality on the Pacific coast, has just over 2,000 inhabitants, with fishing and whale watching being its central activities during the winter season (INEGI, M, 2010). Finally, La Paz, the state capital, has a population of 162,954 inhabitants. Its main economic activities include fishing, aquaculture, and tourism (Ivanova et al., 2002).

Research design

This research is non-experimental and longitudinal. We performed semi-structured surveys following Murillo (2006), which included expert validation, a pilot sample to adjust for timing and phrasing, and validation of the scales using Cronbach's alpha. Cronbach's alpha is a measure of internal consistency that indicates how well the items in a scale measure the same underlying construct. Values above 0.60 are generally considered acceptable, suggesting the items are sufficiently correlated to justify their use in the final survey. The sample size for the pilot survey consisted of 32 questionnaires from the first and second stages. All Cronbach alpha indexes were acceptable or good (α >0.6), the NEP scale increased slightly in the post-visit survey

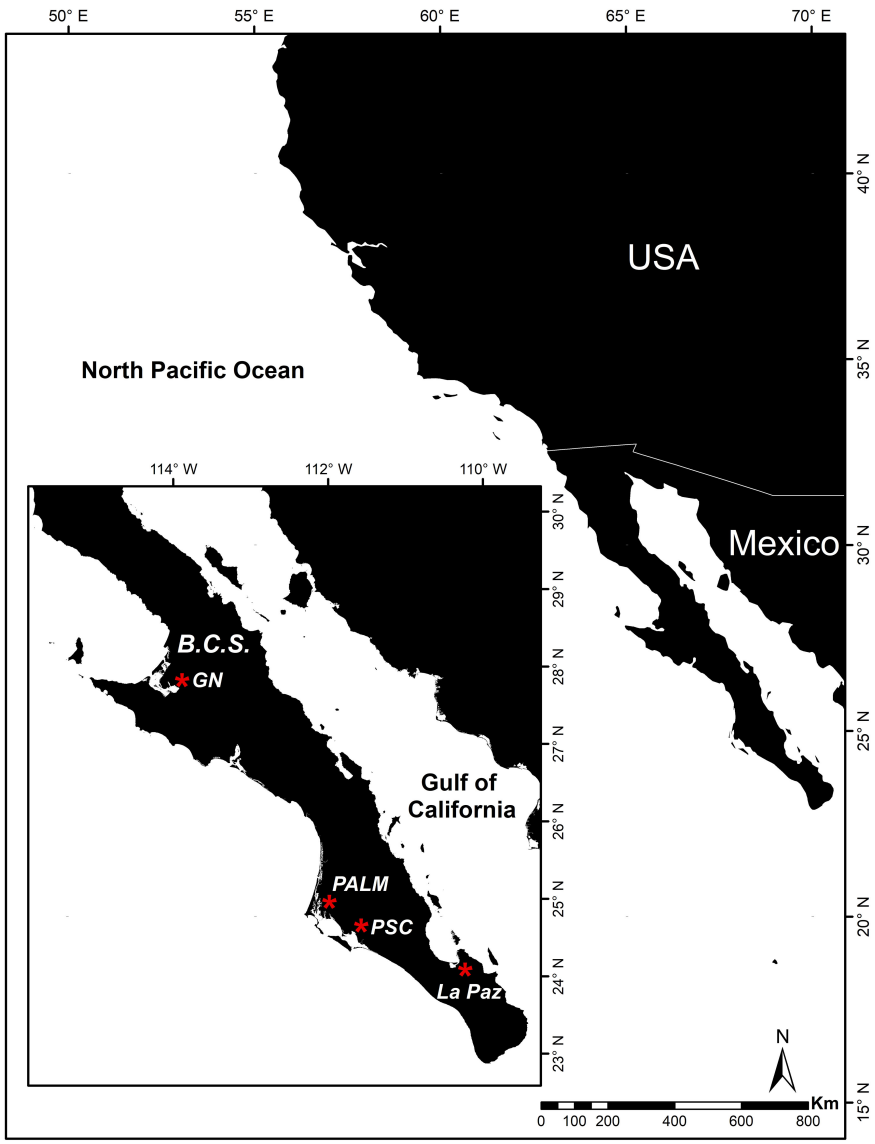

FIGURE 2
Study sites in Baja California Sur, Mexico. Gray whale watching sites include Guerrero Negro (GN), also known as Laguna Ojo de Liebre or Scammon's Lagoon, Puerto Adolfo López Mateos (PALM) and Puerto San Carlos (PSC) within the Bahía Magdalena–Bahía Almejas complex. The whale shark snorkeling site is located in La Paz.

(α=0.7) (George and Mallery, 2019). For both pilot and definitive samples, we interviewed national and foreign tourists over eighteen years old. Given that the scales were initially written in English, for the Spanish surveys, the items were translated to carry out the pilot test, in which some items were adjusted for their better understanding (Supplementary Material Table S1). For control, surveys that were not consistent in their answers were discarded. Based on these steps, we developed the final version of the surveys.

The study included three surveyed stages: 1) One before the activity (initial) where socio-demographic variables, circumstantial variables, and their initial environmental awareness and behavior were collected. 2) One immediately after the tour, to evaluate changes in their environmental awareness (short term). 3) A survey four months later via e-mail to evaluate the effect of the experience on their long-term environmental awareness and behavior (long term) (Figure 1). To measure the affective dimension of environmental consciousness (EC), we chose the New Ecological Paradigm (NEP) scale, which is a widely used tool to measure individuals' environmental attitudes, developed by Dunlap and Van Liere (1978) and updated in 2000 (Table 1). It consists of 15 items that explore various dimensions of environmental concern, including human impact on nature, beliefs about the balance of nature, and views on human dominance over the environment. This scale measures the degree of people's environmental awareness (EA hereon) based on their adhesion to this paradigm (environmental beliefs) (Dunlap, 2008). This scale was included in all three stages. To answer this section, the respondent indicates how much they agree with each item using a Likert scale.

TABLE 1 New Environmental Paradigm (NEP) scale items.

1. We are reaching the limit of the number of people the earth can support.
2. People have the right to modify the environment to adapt it to their needs.
3. When humans interfere with nature it often produces disastrous consequences.
4. Human ingenuity will ensure that we do NOT make the Earthunlivable.
5. Humans are severely abusing the environment.
6. The earth has plenty of natural resources if we just learn how to develop them.
7. Plants and animals have the same right that humans have to exist.
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
9. Despite our special abilities, people are still subject to the laws of nature.
10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.
11. The earth is like a spaceship with very limited environment and resources.
12. Human beings were destined to rule over the rest of nature.
13. The balance of nature is very delicate and easily upset.
14. Humans will eventually learn enough about how nature works to be able to control it.
15. If things run their course, we will soon experience an ecological catastrophe.

Items in cursive were eliminated after the internal consistency analysis. Source: Dunlap et al. (2000).

To measure the active dimension of environmental consciousness (pro-environmental behavior-PEB, behavior as the frequency of environmentally friendly habits), we adapted and used the environmental behavior subsection of the Wisconsin Environmental Literacy Survey Scale modified for adults (Kibert, 2000). The 10 items assess a range of daily behaviors and broader social actions reflecting environmental responsibility. One item was too extended, and the other referred to American political aspects, so they were excluded. Another item was updated from "sending a letter to newspapers" to "participating in web campaigns." Two extra items were included that refer to high energy cost environmental behavior according to (Sánchez and Lafuente, 2010): "I do volunteer work in Non-Governmental Organizations or civil organizations" and "I donate money to Non-Governmental Organizations or civil organizations" (Table 2). The changes in behavior cannot be measured immediately post-experience, so this scale was not included in stage 2. As in the previous table, to answer this section, the respondent indicates how much they agree with each item using a Likert scale.

We collected socio-demographic factors such as age, gender, state, country of residence, profession, marital status, level of studies, and level of income. The circumstantial variables measured were: "Is this the first time you are doing the activity?"; "What is the primary purpose of your visit to BCS?"; "Who are you doing the activity with?"; "What is your level of interest in the activity you are about to undertake?"

We calculated the minimum number required for a representative population subset using the formula from Daniel (2006). Based on previous studies of these tourist activities in BCS, we considered a population of 50,000 and 20,000 visitors for whale shark and gray whale activities, respectively (Brenner et al., 2016; Schwoerer et al., 2016; Gutiérrez, 2019). The sample sizes were 244 for the shark and 242 for the whale (Table 3).

We provided surveys pre- and post-visit to tourists at four sites where the tourism activities; one site at La Paz for swimming with

TABLE 2 Pro-environmental behavior scale items.

1. I turn off lights and devices when not in use to save electricity.
2. I walk, take public transport, or ride a bike instead of a car to help protect the environment
3. I make an effort to reduce the goods I consume
4. I recycle paper, plastic and/or glass at home or at school
5. I talk to my family and friends about what they can do to help solve environmental problems
6. I participate in web campaigns about environmental problems or write to politicians about them
7. I avoid buying products that harm the environment
8. I do volunteer work in Non-Governmental Organizations or civil organizations
9. I donate money to Non-Governmental Organizations or civil organizations
10. *I buy organic or local made products*

Items in cursive were eliminated after the internal consistency analysis. Source: Kibert (2000); Sánchez and Lafuente (2010).

whale sharks and three sites for gray whale watching: Guerrero Negro, Puerto Adolfo López Mateos and Puerto San Carlos, all in Baja California Sur, Mexico. Whale shark swimming involves departing from a pier in La Paz and taking a boat trip of approximately 30 minutes to the area where the whale shark is spotted. Once located, tourists enter the water and snorkel for 30 minutes. The entire tour lasts approximately three hours and includes a tour guide who ensures the safety of tourists, monitors their practices, and provides information about the shark and the area. Whale watching must follow the NOM-131-SEMARNAT-2010 standard (de la Federacion, 2011); however, the duration of the tour, the number of whales sighted, and the presence or absence of a guide vary depending on the location. We selected these experiences to represent a "life-changing experience" with a charismatic species. Also, both activities have a similar duration (two to four hours) and focus on interacting with one main species. The data collection procedures for each site were slightly different due to logistics, either intercepting tourists at the pier or at the office of different companies that agreed to support our research. We always stated that the surveys were voluntary and confidential. We only collected their e-mails for the long-term surveys.

To evaluate the effect of the experience on tourists' EC, we employed a Structural Equation Model (SEM). SEM is a statistical technique that analyzes complex relationships between observed and latent variables, incorporating both direct and indirect effects (Blunch, 2012). The SEM comprises two sub-models: the structural model and the measurement model, which studies the relationship between the construct, which is environmental consciousness, with its respective indicators, EA and PEB Scale (Figure 1). The experience with a charismatic species was treated as a latent construct, mediated by the measurement of EC in three different time points: initial, short-term, and long-term. We followed the stages of building the SEM according to (Batista-Foguet et al., 2001), which included selecting variables, identifying models, estimating parameters, evaluating model fit, model re-specifying the model, and interpreting the results. All analyses were done with IBM software SPSS 20 (SPSS, 2010). The SEM was developed using the statistic package SPSS-AMOS (IBM Corp, N, 2013).

TABLE 3 Data sheet.

	Whale Shark	Gray Whale
Data sample	Jan-April 2019	February-March 2019
Population	National and international tourists visiting Baja California Sur	
Universe	50,000 (Gutiérrez, 2019; pers. comm. CONANP)	20,000 (Brenner et al., 2016; Schwoerer et al., 2016)
Confidence level	95 x 100	
Margin error	± 5.91 x 100	
Sample	244	242
Sampling method	Simple aleatory	

Source: own elaboration. CONANP, Comisión Nacional de Áreas Naturales Protegidas (National Comission for Natural Protected Areas).

Results

Socio-demographic and circumstantial factors

We obtained a total of 542 surveys: 307 from gray whale watching and 235 from swimming with whale sharks. Considering the low response rate on long term surveys, this number allowed us to obtain 202 tourists that completed all three stages (105 from swimming with whale sharks and 97 from gray whale watching), from the initial stage prior to interaction with the charismatic species to the long-term stage. Tourists were male (47%) and females (53%), mostly from México (43%), the United States (35%) and Canada (8%); all ages were represented, mostly were professionals, married or single with high levels of education and income. In both activities, a higher proportion of foreign tourists reported having a bachelor's degree as their highest level of education. This same level of education was significantly more common among national tourists engaged in whale watching, followed by high school graduates and postgraduates (Figure 3A). The occupational background of foreign tourists participating in swimming with whale sharks was primarily composed of employees, while those engaged in whale watching were mostly professionals and retirees. A similar pattern was observed among national tourists, who were predominantly represented by professionals and employees (Figure 3B). Foreign tourists appeared to be clearly segregated by age: older individuals (>65 years) preferred whale watching, whereas younger tourists (ages 25-44) were more inclined to participate in swimming with whale sharks. In contrast, Mexican tourists between the ages of 25 and 34 were the most likely to engage in both activities (Figure 3D). Most foreign tourists had high incomes, exceeding three thousand dollars, while Mexican tourists had monthly incomes ranging between one and two thousand dollars (Figure 3C). Their primary purpose for visiting was ecotourism (39.9%) and rest. Most did the activity for the first time (74%) with family, friends, or their partners.

Environmental consciousness scales: factorial analysis

The results of the factor analysis for environmental awareness (NEP) and pro-environmental behavior (PEB) scales reveal three main factors. We present the factors loadings of each item in relation to the factor to which it belongs at the three analyzed time points (initial, short-term, and long-term) (Table 4). A higher factor loading indicates a stronger association between the item and the corresponding factor. Overall, these factors explain an acceptable percentage of the total variance in each of the evaluated periods.

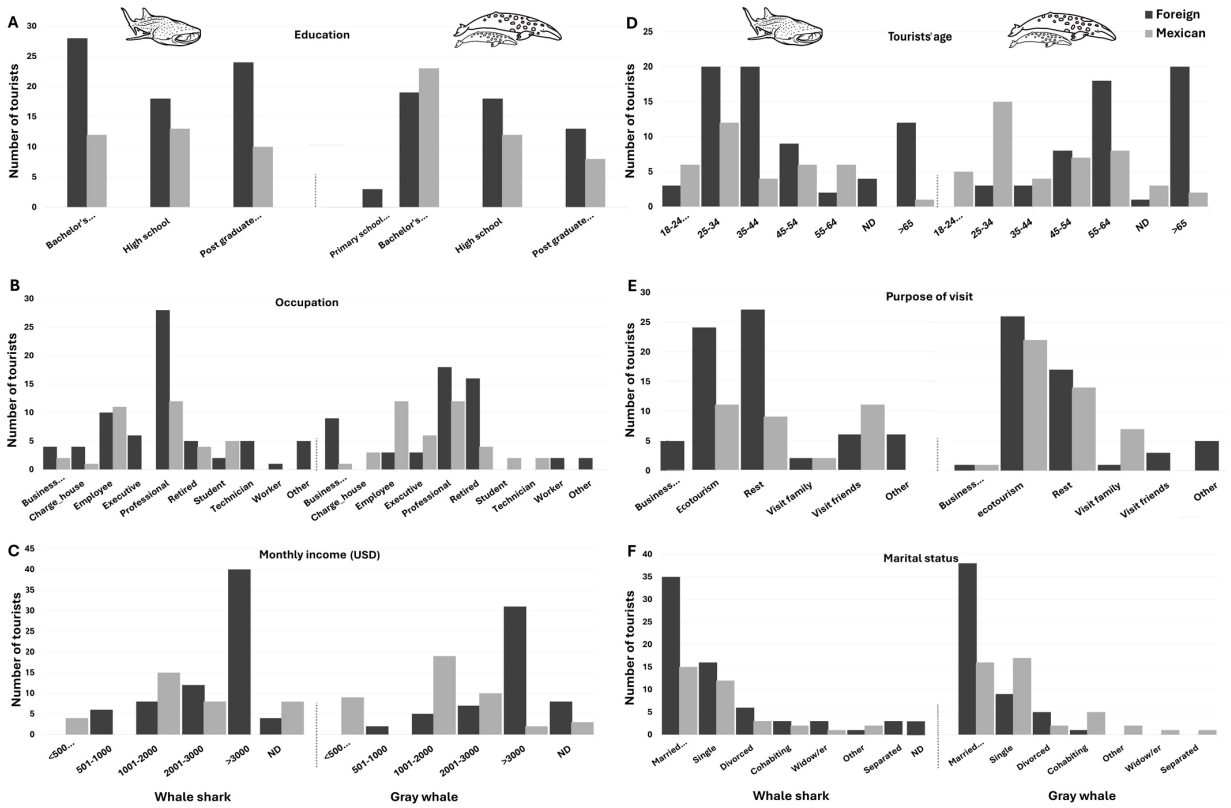

FIGURE 3
Socio-demographic and circumstantial profile of the tourists in each activity and separated by nationality. Education **(A)**, Occupation **(B)**, Monthly income **(C)**, Tourists' age **(D)**, Purpose of visit **(E)** and marital status **(F)**.

F1. Sustainable coexistence: This factor includes five items and reflects the belief in human capacity to manage natural resources and overcome environmental crises through ingenuity and development. The factor loadings' for the different items range between 0.65 and 0.73 across the three analyzed periods, indicating a moderate relationship with this factor. The variance explained by this factor is 25.53% in the initial measurement, 26.27% in the short term, and 23.92% in the long-term.

F2. Ecological concern: This factor consists of three items and represents concern about environmental degradation caused by human activity. The factor loadings' range from 0.67 to 0.86, reflecting a stronger association compared to F1. The variance explained by this factor is 20.98% in the initial measurement, 20.84% in the short-term, and increases to 32.89% in the long-term, suggesting a growing importance of environmental concern over time.

F3. Earth's fragility: This factor includes three items that emphasize the planet's vulnerability and the Earth's limited capacity to sustain human activity. The factor loadings range from 0.73 to 0.87, being the highest in the analysis, indicating a strong alignment of these items with the concept of environmental fragility. The variance explained by this factor is 13.10% in the initial measurement, 10.89% in the short term, and 12.81% in the long-term.

To ensure the validity of the factor analysis, the Kaiser-Meyer-Olkin (KMO) statistic was calculated, showing that the sample adequacy values were 0.64 in the initial measurement, 0.735 in the short-term, and 0.694 in the long-term, indicating an acceptable adequacy of the factorial model. Additionally, Bartlett's sphericity test yielded significant values in all measurements (524.22 in the initial, 1045.97 in the short-term, and 420.79 in the long-term), confirming that the correlation matrix is suitable for factor analysis. Overall, the results show a stable factorial structure over time, with a clear differentiation between the factors. Sustainable coexistence experienced a slight increase in the short term, followed by a decline lower than the initially explained variance. Ecological concern and Earth's fragility showed a somewhat similar value in explained variance in the short term after exposure to charismatic species but interestingly increased in the long term.

The exploratory factor analysis with Varimax rotation identified two distinct factors, confirming that the PEB scale is not unidimensional. The first component explains 44.7% of the total variance, while the second component accounts for 22.25%, resulting in a total explained variance of 66.9%. To assess the suitability of the dataset for factor analysis, Bartlett's sphericity test was significant (X^2 (389) = 733.654, $p < 0.001$), indicating that the correlation matrix is appropriate for factor extraction. Additionally, the Kaiser-Meyer-Olkin (KMO) measure of

TABLE 4 Rotated factor matrix– Initial environmental awareness (NEP) and Pro-environmental behavior Scale (PEB). Source: Own elaboration. Items with a load less than 0.60 were eliminated. I=inverted items, *p<0.01.

	Factor NEP Scale									Factors PEB Scale		Factor Variance			
	F1. Sustainable coexistence			F2. Ecological concern			F3. Earth's fragility			F1. Activism	F2. Sustainable habits	Initial		Short-term	Long-term
	Initial	Short-term	Long-term	Initial	Short-term	Long-term	Initial	Short-term	Long-term	Initial	Initial	NEP	PEB	NEP	NEP
Human ingenuity will ensure that we do NOT make the Earth unlivable.	0.69	0.70	0.70	–	–	–	–	–	–	–	–	25.53	–	26.27	23.92
The earth has plenty of natural resources if we just learn how to develop them.	0.67	0.65	0.65	–	–	–	–	–	–	–	–				
The balance of nature is strong enough to cope with the impacts of modern industrial nations.	0.67	0.73	0.73	–	–	–	–	–	–	–	–				
The so-called "ecological crisis" facing humankind has been greatly exaggerated.	0.65	0.69	0.69	–	–	–	–	–	–	–	–				
Humans will eventually learn enough about how nature works to be able to control it.	–	0.66	–	–	–	–	–	–	–	–	–				
Humans are severely abusing the environment.	–	–	–	0.82	0.81	0.86	–	–	–	–	–	20.98	–	20.84	32.89
When humans interfere with nature it often produces disastrous consequences.	–	–	–	0.77	0.67	0.67	–	–	–	–	–				
Despite our special abilities, people are still subject to the laws of nature.	–	–	–	–	0.68	0.68	–	–	–	–	–				
We are reaching the limit of the number of people the earth can support.	–	–	–	–	–	–	–	0.73	0.73	–	–	13.10	–	10.89	12.81
The earth is like a spaceship with very limited environment and resources.	–	–	–	–	–	–	0.87	0.82	0.82	–	–				
The balance of nature is very delicate and easily upset.	–	–	–	–	–	–	0.77	–	–	–	–				
I do volunteer work in Non-Governmental Organizations or civil organizations.	–	–	–	–	–	–	–	–	–	0.842	–	–	44.65	–	–
I donate money to Non-Governmental Organizations or civil organizations.	–	–	–	–	–	–	–	–	–	0.793	–				
I participate in web campaigns about environmental problems or write to politicians about them.	–	–	–	–	–	–	–	–	–	0.744	–				

(Continued)

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TABLE 4 Continued

	Factor NEP Scale									Factors PEB Scale			Factor Variance					
	F1. Sustainable coexistence			F2. Ecological concern			F3. Earth's fragility			F1. Activism	F2. Sustainable habits		Initial			Short-term	Long-term	
	Initial	Short-term	Long-term	Initial	Short-term	Long-term	Initial	Short-term	Long-term	Initial	Initial		NEP	PEB	NEP	NEP	NEP	
I turn off lights and devices when not in use to save electricity.	–	–	–	–	–	–	–	–	–	–	0.865		–	22.25	–	–	–	
I make an effort to reduce the goods I consume	–	–	–	–	–	–	–	–	–	–	0.731							
										Total Variance			59.61	66.901	58.00	69.61		
										Kaiser-Meyer-Olkin (KMO) sample adequacy measure			0.64	0.703	0.735	0.694		
										Bartlett's sphericity test			524.22*	489.90*	1045.97*	420.79*		

sampling adequacy was 0.703, suggesting an acceptable level of correlation among variables.

F1. Activism: This factor includes three items with relatively high and similar factor loadings (ranging from 0.74 to 0.84). The items describe behaviors associated with active environmental engagement, such as: Volunteering for environmental or civil organizations, donating money to NGOs or civil organizations. Participating in web campaigns about environmental problems or writing to politicians. These actions represent a proactive and advocacy-oriented approach to environmentalism, focusing on public and collective efforts to drive change.

F2. Sustainable habits: This factor includes two items with factor loadings of 0.731 and 0.865, reflecting daily behaviors aimed at reducing personal environmental impact, such as: Turning off lights and devices when not in use, reducing the consumption of goods. These behaviors represent a routine, individual commitment to sustainability, emphasizing personal responsibility in minimizing environmental footprints.

These findings confirm that the PEB scale captures two distinct dimensions of pro-environmental behavior: activism and sustainable habits, providing a useful framework for understanding the multifaceted nature of environmental engagement.

Structural equation model

Scale items were refined to improve factor loadings through confirmatory factor analysis. This aimed to enhance the validity of each construct, minimize measurement errors, and improve the overall model fit. With the factorial analysis of the scales, we now have all the significant variables needed to test the hypothesis of the research by designing a structural equation model that reflects the relations between the scales and the experience with a charismatic species (Figure 1). As to the parameters estimated, the input chosen were all the variables whose mean, median, mode, standard deviation, asymmetric coefficient, and kurtosis values were adjusted to established criteria (Supplementary Material Table S2). For example, when communality (λ^2) was estimated, part of the variance explained by the construct, variable Fragile1 has a load of $\lambda^2 = 0.767$, which means that 77% of the variance is associated with the construct Earth's fragility. Almost all the model's variables have at least 0,5 commonalities (Supplementary Material Tables S3–S5).

The model demonstrated strong overall fit, supported by key statistics and indicators, as summarized in Table 5. The chi-square test for the structural model showed a significant result (X^2 (389) = 733.65, $p < 0.001$), indicating a statistically significant discrepancy between the model and the observed data. However, the Chi-square/Degree of Freedom ratio (1.886) falls within the acceptable range (≤ 3), which can be interpreted as an indicator of a good model fit. Moreover, the model displayed a high Comparative Fitness Index (CFI = .967), a solid Goodness of Fit Index (GFI = 0.910), and a borderline fit regarding the Root Mean Square Error of Approximation (RMSEA = .090). These results suggest that the model effectively captures the relationships between variables, confirming its suitability for examining the factors influencing environmental consciousness and pro-environmental behavior, in line with previous factorial analyses (Table 5).

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TABLE 5 Fitted measures of the SEM model. Only two parameters are out of the acceptable range (*).

Statistic	Values
Absolute Fitness	
Chi-square (p value)	0.001
Chi-square/Degree of freedom	1.886
Degrees of freedom	389
Comparative Fitness	
Comparative Fitness Index	CFI.967
Tucker-Lewis Index	TLI.903
Normalized Fitness Index	NFI.920
Parsimonious fitness	
Parsimony-Adjusted Measures Index*	PNFI.322
Others	
Goodness of Fit Index	GFI 0.910
Root Mean Square Error of Approximation*	RMSEA.090

The structural model is shown in Figure 4. This has been modified to improve the understanding of the original model obtained from the software (Supplementary Material Figure Sl), highlighting the relationships between observed and latent variables, which are significant and positively correlated. The correlation between initial EA and PEB is moderate ($\beta = 0.34$), confirming the *ad hoc* Hypothesis (H0). Together, these factors explain 42% of the variance in Environmental Consciousness ($\beta = 0.42$, $p < 0.05$), corresponding with Hypothesis 1. Once interaction with species such as gray whales or whale sharks occurs, it significantly influences short-term environmental consciousness (EC), explaining a large portion of the variance ($\beta = 0.60$, $p < 0.05$), thus confirming Hypothesis 2. However, the model shows a weaker effect on long-term EC, with a path coefficient of $\beta = 0.23$, indicating an influence almost two-thirds lower than in the short term. Although the experience does have some effect on long-term EC, the relationship is not strong enough to explain sustained environmental consciousness beyond the short-term impact. Consequently, Hypothesis 3 is not supported. These results suggest that while short-term EC is significantly influenced following nature-based experiences, their impact diminishes over

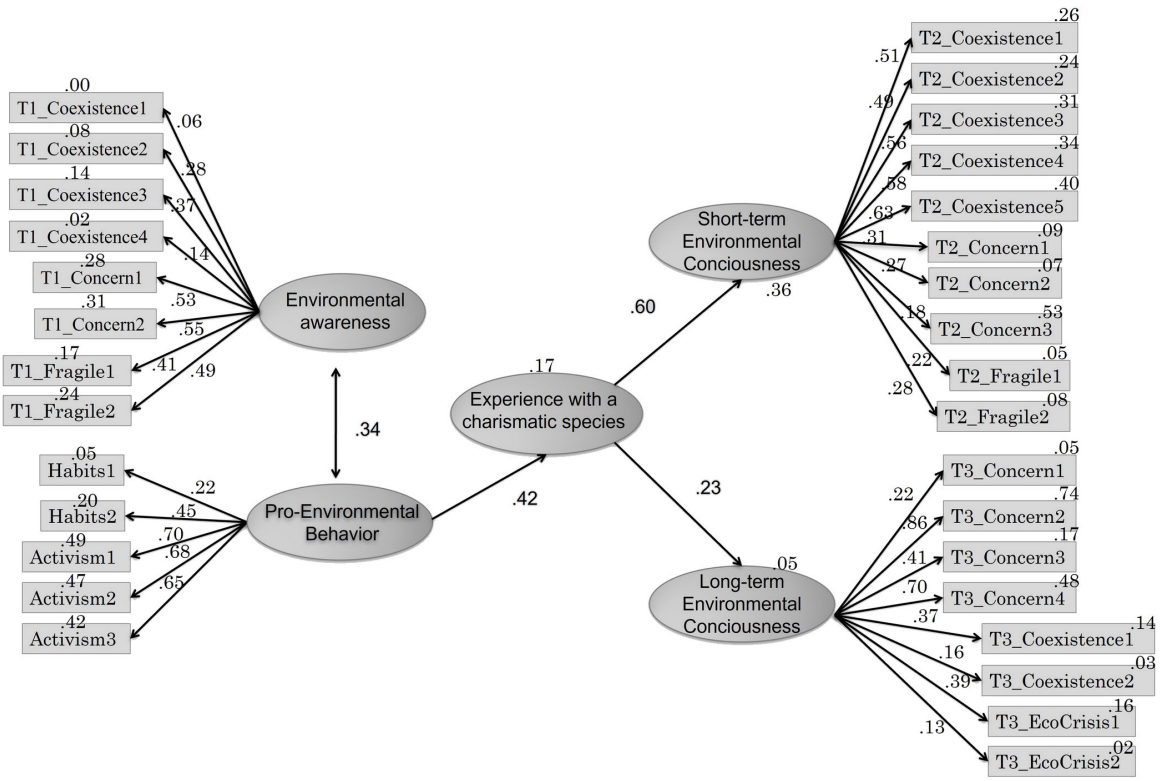

FIGURE 4
Path Diagram of inter-relationships among the variable sets with results of Structural Equation Model predicting changes in environmental consciousness. Environmental awareness and environmental consciousness in the different stages of tourist interaction are initial (the state the tourist arrives with), short-term (immediately after the tour), and long-term (four months after the tour). The values in the arrows between the ovals (EA, PEB and Exp are endogenous; short and long term EC are exogenous variables) represent path coefficients, indicating the strength of the relationships. The values in the gray boxes next to the arrows represent path coefficients, indicating the strength of the relationships (factorial loading) between the variable and their respective construct. The numbers above the boxes or above the ovals represent residual errors of each variable or construct, respectively. Number of variables in our model: 35, Number of observed variables: 31, Number of unobserved variables: 4, Number of exogenous variables: 15, Number of endogenous variables: 20, Number of distinct sample moments: 496. Number of distinct parameters to be estimated: 107. Degrees of freedom (496 - 107): 389.

time, reducing their ability to influence in the long-term. These findings have significant practical implications. They highlight the importance of reinforcing the experience with educational interventions to maintain long-term pro-environmental awareness and behavior (Figure 4).

Discussion

This study provides relevant research on the sociodemographic profiles and environmental attitudes of tourists participating in wildlife tourism focused on charismatic species, particularly interactions such as gray whale watching and swimming with whale sharks. The results reveal significant sociodemographic differences and highlight the influence of nature-based tourism on short-term environmental consciousness, although its long-term effects appear limited. These findings underscore the need to strengthen environmental education and interventions to sustain environmental awareness and pro-environmental behaviors over time.

Tourist service providers must know their visitors' profiles, interests, and motivations to design ecological marketing strategies (Salgado-Beltrán, 2009) and interpretation programs according to their audience (Brochu and Merriman, 2015). In this study, the socioeconomic level of international or foreign tourists was significantly higher than the Mexican tourist, but starting from a high level, which reflects the general profile of eco-tourists in Mexico and globally (CESTUR: Centro de Estudios Superiores de Turismo, 2006; Leal Londoño, 2017). Most Mexican tourists were shown to have medium and high incomes according to the scale used. This socioeconomic level can be seen as a positive characteristic in the attempt to increase people's environmental consciousness (EC), given that their basic needs are already met, according to the Hierarchical Maslow's Pyramid of Needs (Brochu and Merriman, 2015). The experience with a charismatic species reinforces self-sense of auto-realization (the last stage of Maslow's pyramid), which could generate changes in people's lifestyles favoring the environment (Skibins et al., 2013). Regarding nationalities, most were Mexican, American, or Canadian, as occurs in other tourism destinations of Mexico (CESTUR: Centro de Estudios Superiores de Turismo, 2006). In some localities like Puerto Adolfo López Mateos, the nationals' proportion has always been high (Pérez et al., 2019), whereas in other localities like Guerrero Negro, service providers mention an increase in national tourism because of public policies of encouragement. More than 75% of the tourists were doing the activities for the first time, which differs from other ecotourism activities in the country (CESTUR: Centro de Estudios Superiores de Turismo, 2006) and was useful to measure the effect of a "lifechanging experience".

Mexican tourists participating in nature-based tourism activities were around 30 years old for both activities. In contrast, younger foreign tourists preferred swimming with whale sharks, and older tourists participated in whale watching. This latter trend aligns with tourists who have previously engaged in whale watching or activities that do not directly involve physical exertion, such as swimming with whale sharks (Ballantyne et al., 2011). This is also related to a high proportion of retired tourists participating in whale watching, whereas swimming with whale sharks is dominated by professionals, followed by employees.

The educational level pattern was very similar between Mexican and foreign tourists, especially in whale watching. Most mentioned having a bachelor's degree as their highest level of education, with the number of tourists decreasing as the level of education increased. These profiles are consistent with people interested in learning and taking something away from the experience, emphasizing learning outcomes and reflective engagement opportunities (Ballantyne et al., 2011).

Regarding the factorial analysis, the apparent increase in the total variance explained of the NEP Scale could be explained by considering that the 202 people that were so interested in the activities and the research project, decided to answer the third stage four months later. However, the descriptive analysis and the SEM model performed show no significant changes in the overall EC of the population studied, highlighting the strong need for long term actions in maintaining the short term positive but fleeting effect of the experience. This is in line with previous authors mentioning the "preaching to the converted" (Beaumont, 2001) that our study tried to avoid by surveying several different companies.

Our sample size of 202 is slightly larger than the maximum recommended size of 200 (Stone, 2021) for the normed chi-square. However, Hoelter (1983) suggests that the critical N is the sample size required to accept the fit of a given model on a statistical basis and recommend values of at least 200 for this index. This N value is also due to our response rate. Response rates in follow-up surveys tend to be very low (Murillo, 2006). For example, in Ballantyne 2011, the average response rate is 14% (10-25%). Our response rate was 36.9% in two wildlife nature activities at four different sites that have considerably more significant logistic challenges than a controlled environment facility such as a zoo or a marine park, so our critical sample size and the general response rate in the follow-up survey are considered very high for our study and for the Latin American context, highlighting the importance of continuing this line of investigation in the future.

Considering this, and the good fit of the other indexes, the model can now be interpreted. Although the consciousness levels of the sampled population varied, initial environmental awareness (EA) and pro-environmental behavior (PEB) influenced the experience with a charismatic species (initial EA-PEB1—>Exp, β=0.42, $p<0.05$, SEM. Only about 40% of the variation in EC was explained by the tourists at the beginning, prior to interacting with a charismatic species, even though most mentioned that their main purpose for visiting was to engage in ecotourism. This result supports the idea that the entering attributes of visitors influence their environmental learning (Ballantyne et al., 2018, 2011) and highlights the importance of designing interpretation programs according to the visitors' characteristics. Moreover, the experience had a positive and significant effect on tourists' short-term EC (Exp—>short term EC, β=0.6 $p<0.05$), as indicated by previous

studies in other countries (Orams, 1997; Ballantyne et al., 2011; Skibins et al., 2013), therefore Mexico is not an exception. However, in this study, there was no significant effect in the long-term EC mediated by awareness and behavior (Exp—>long term EC, $p>0.05$, SEM), rejecting the third hypothesis and differing from (Ballantyne et al., 2011), where they report positive and significant outcomes in environmental learning, although low effects of the experience on the long-term EA. One possible explanation is that the web survey reported in their work measures self-reported changes in environmental learning due to their visit, whereas our study used Dunlap's NEP Scale at three different times to see changes in environmental consciousness. Beliefs and values are built throughout a person's life after many experiences, lessons, and situations so a single experience needs to be too strong ("life-changing") to modify people's beliefs (Ballantyne and Packer, 2011; Kollmuss and Agyeman, 2002; Powell and Ham, 2008; Salgado-Beltrán, 2019; Sánchez and Lafuente, 2010). Whereas this is what is commonly advertised about wildlife experiences (Ballantyne et al., 2011), the reality is much more complex, and there are too many variables that need to be considered underneath the marketing slogan.

This study contributes to that theory framework. Interestingly, López-Espinosa de los Monteros (2002) evaluated ecotourism in Natural Protected Areas in BCS reporting the compliance with the ecotourism indicators and principles. However, the methodology in this work includes interviews with service providers, while the present study is focused on the results measured in tourists' EC, and consequently not achieving all national ecotourism principles (SECTUR, 2024). On the other hand, the present work supports Sánchez and Lafuente (2010), who indicate that the relationship between EA and PEB is positive but weak (EA-PEB, $\beta=0.34$, $p<0.05$, SEM, Figure 4), therefore highlighting the continuous need of evaluating these two constructs of EC separately. Tourist satisfaction is related to compliance with the regulations, number of boats present, and the information provided (García-Castañeda et al., 2024). We surveyed the activity in BCS and multiple companies instead of a particular company known to have high standards or some type of eco-label certification, providing a baseline for the state of success in generating and maintaining long term EC by service providers. There is a need for stakeholders and companies to account for these results to meet the international standards expected of these types of activities towards true ecotourism and to capture the true potential value of these activities (Hoyt and Iñíguez, 2008).

Given that the experience is positively related to short-term EC but not long-term EC, the results suggest that the effect of charismatic species by themselves is not strong enough to make long-lasting changes in people's EA and PEB, which has important practical implications for nature-based tourism and the actors involved and for México and BCS, these results are relevant in the view that these activities are growing exponentially (CESTUR: Centro de Estudios Superiores de Turismo, 2006; Urciaga et al., 2008; SECTUR, 2024).

Marketing strategies emphasizing conservation and learning opportunities could generate increased value in the tourist experience, which can also generate a snowball effect and attract more visitors to the destination (Ballantyne et al., 2009) and generate a worldwide network that fosters and maintains EC, considering that a high percentage of tourist revisit or visit new destinations with the same purpose. Some companies are already applying these kinds of tools in Baja California Sur: they have social benefit programs at which the same tourists can donate to help vulnerable sectors of society access ecotourism activity, and others have a part of the profit directly designated to conservation programs and research, etc (López-Espinosa de los Monteros, 2002, this study), so this type of post-visit action resources needs to be continuously encouraged.

The results of this study suggest that these activities cannot be considered true eco-tourism by themselves, given that the positive short-term effect fades with time, which contrasts with the Blueprint for Whale Watching Development (Hoyt, 2007). This difference could be addressed with courses about the species observed for captains and guides, the display of bilingual signs at the piers, and especially with environmental interpretation techniques. The results of this research should support governmental institutions to establish management plans that align with the educational and conservation objectives (Orams, 1996; SECTUR, 2024), and service providers must incorporate the information presented; e.g., incorporating into the guides' "briefing" a more direct connection between the animals and their conservation problems and how can it be addressed by the tourists, emphasizing their individual capacity to make a change in favor of the environment (Orams, 1997).

As limitations of the research, when measuring a complex and multidimensional construct such as environmental consciousness, the proper choice of scales is critical to capturing the phenomena. The use of the NEP Scale depends on the population studied (Dunlap et al., 2000), and its adjustment has proven difficult in Mexico (Salgado-Beltrán, 2019). It is necessary to find a balance between a worldwide used scale such as Dunlap's NEP Scale and other scales more specific to the local context and the effect that is trying to be measured (the experience with a charismatic species as a trigger for EC), and it could be further improved. The structural equation model enabled us to determine the effects and causal relationships between experiences with a charismatic species and changes in people's environmental consciousness. While some indices fell slightly outside the ideal ranges, others indicated a good model fit. The global constructs typically used in this type of research presented challenges when applied to this specific locality. However, the model effectively captured the complexity of tourists' beliefs and behaviors, serving as a valuable tool for understanding the phenomenon.

Given that the intention of this research was to gather baseline information on ecotourism with charismatic species at Baja California Sur and therefore included a variety of companies and approaches, it is needed to evaluate the effect of one directed

interpretation program applied by one particularly chosen company to measure effectiveness percentages (Powell and Ham, 2008) so that it could act as a role model for sustainability as it occurs with places such as Cabo Pulmo (Aburto-Oropeza et al., 2011; Gámez, 2008; Pérez et al., 2019).

Conclusion

Tourism activities with wildlife are growing exponentially worldwide. Consequently, a lot of effort is being made to comply with ecotourism principles, and generating EC is a powerful tool towards the sustainability of these types of activities. This study is the first to evaluate the generation of EC in short and long term in BCS and, apparently, in Mexico. It creates a baseline for further action. The fact that the positive effect of interacting with a charismatic species is not sustained in long term EC, proves the need of continuing research to improve and implement strategies that are used globally but that need to be grounded locally.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary Material. Further inquiries can be directed to the corresponding author.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

MM: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing, Software, Visualization. CS: Conceptualization, Funding acquisition, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing, Investigation, Validation. LS-B: Conceptualization, Formal Analysis, Funding acquisition, Investigation, Methodology, Resources, Software, Supervision, Writing – original draft, Writing – review & editing, Validation. OG-C: Visualization, Writing – review & editing, Conceptualization, Investigation, Software.

Funding

The author(s) declare that financial support was received for the research and/or publication of this article. This work was supported by the CONACYT National (Traditional) under scholarship number 714809 and the CIMACO Post-graduate Students' Program under Internal project number 03092018 (CIMACO-UABCS) Grant.

Acknowledgments

We are grateful to the University of Sonora for additional support and to the service providers for allowing us to survey their tourists. We are also grateful for the two revisors comments' that helped improve this manuscript considerably.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declare that Generative AI was used in the creation of this manuscript. The diagrams are developed by the authors. However, individual images in the diagram were generated with the assistance of ChatGPT, powered by OpenAI.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fcosc.2025.1539683/full#supplementary-material

References

Aburto-Oropeza, O., Erisman, B., Galland, G. R., Mascareñas-Osorio, I., Sala, E., and Ezcurra, E. (2011). Large recovery of fish biomass in a no-take marine reserve. *PloS One* 6, e23601. doi: 10.1371/journal.pone.0023601

Alam, M. T., Petit, R. A., Read, T. D., and Dove, A. D. M. (2014). The complete mitochondrial genome sequence of the world's largest fish, the whale shark (*Rhincodon typus*), and its comparison with those of related shark species. *Gene* 539, 44–49. doi: 10.1016/j.gene.2014.01.064

Albert, C., Luque, G. M., and Courchamp, F. (2018). The twenty most charismatic species. *PloS One* 13, 1–12. doi: 10.1371/journal.pone.0199149

Ballantyne, R., Hughes, K., Lee, J., Packer, J., and Sneddon, J. (2018). Visitors' values and environmental learning outcomes at wildlife attractions: Implications for interpretive practice. *Tourism Manage.* 64, 190–201. doi: 10.1016/j.tourman.2017.07.015

Ballantyne, R., and Packer, J. (2011). Using tourism free-choice learning experiences to promote environmentally sustainable behaviour: The role of post-visit "action resources. *Environ. Educ. Res.* 17, 201–215. doi: 10.1080/13504622.2010.530645

Ballantyne, R., Packer, J., and Falk, J. (2011). Visitors' learning for environmental sustainability: Testing short- and long-term impacts of wildlife tourism experiences using structural equation modelling. *Tourism Manage.* 32, 1243–1252. doi: 10.1016/j.tourman.2010.11.003

Ballantyne, R., Packer, J., and Hughes, K. (2009). Tourists' support for conservation messages and sustainable management practices in wildlife tourism experiences. *Tourism Manage.* 30, 658–664. doi: 10.1016/j.tourman.2008.11.003

Bamberg, S., and Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *J. Environ. Psychol.* 27, 14–25. doi: 10.1016/j.jenvp.2006.12.002

Batista-Foguet, J. M., Coenders, G., and Arts Ferragud, M. (2001). Using structural equation models to evaluate the magnitude of measurement error in blood pressure. *Stat Med.* 20, 2351–2368. doi: 10.1002/sim.836

Beaumont, N. (2001). Ecotourism and the conservation ethic: Recruiting the uninitiated or preaching to the converted? *J. Sustain. Tourism* 9, 317–341. doi: 10.1080/09669580108667405

Biggs, R., Schlüter, M., Biggs, D., Bohensky, E. L., BurnSilver, S., Cundill, G., et al. (2012). Toward principles for enhancing the resilience of ecosystem services. *Annu. Rev. Environ. resources. Annu. Rev.* 37, 421–448. doi: 10.1146/annurev-environ-051211-123836

Blunch, N. J. (2012). *Introduction to structural equation modeling using IBM SPSS statistics and AMOS*' (*2nd* ed.). (Thousand Oaks, CA: Sage Publications).

Brenner, L., Mayer, M., and Stadler, C. (2016). The economic benefits of whale watching in El Vizcaíno Biosphere Reserve, Mexico. *Economía Sociedad y Territorio* 16, 429–457. Available online at: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-84212016000200429&lng=es&tlng=en (Accessed March 6, 2025).

Brochu, L., and Merriman, T. (2015). *Personal interpretation: Connecting your audience to heritage resources* (*3rd* ed.). (Fort Collins, CO: National Association for Interpretation).

CESTUR: Centro de Estudios Superiores de Turismo (2006). *Perfil y Grado de Satisfacción del Turista que viaja en México por motivos de Ecoturismo*. (México D.F. México), 1–36 pp.

Cisneros-Montemayor, A. M., Sumaila, U. R., Kaschner, K., and Pauly, D. (2010). The global potential for whale watching. *Mar. Policy. Elsevier* 34, 1273–1278. doi: 10.1016/j.marpol.2010.05.005

Daniel, W. W. (2006). *Bioestadística: base para el análisis de las ciencias de la salud*. (Ciudad de México, México: Limusa Wiley), 775 pp.

de la Federacion, D. O. (2011). *Norma Oficial Mexicana NOM-131-SEMARNAT-2010, Que establece lineamientos y especificaciones para el desarrollo de actividades de observación de ballenas, relativas a su protección y la conservación de su hábitat*. (México: Secretaria de Medio Ambiente y Recursos Naturales).

Dunlap, R. (2008). The new environmental paradigm scale: From marginality to worldwide use. *J. Environ. Educ.* 40, 3–18. doi: 10.3200/JOEE.40.1.3-18

Dunlap, R. E., Liere, K. D., Mertig, A. G., and Jones, R. E. (2000). Measuring endorsement of the new ecological paradigm: A revised NEP scale. *J. Soc. Issues* 56, 425–442. doi: 10.1111/josi.2000.56.issue-3

Dunlap, R. E., and Van Liere, K. D. (1978). The "new environmental paradigm. *J. Environ. Educ.* 9, 10–19. doi: 10.1080/00958964.1978.10801875

Fierro Bandala, E. H. R. (2014). *Éxito diferencial de las actividades de Turismo de Naturaleza de observación de la Ballena Gris en dos comunidades costeras de Bahía Magdalena: causas y lecciones*. (La Paz, BCS, México: Doctoral dissertation, Universidad Autónoma de Baja California Sur). 227.

Gámez, A. E. (2008). *Turismo y sustentabilidad en Cabo Pulmo* (B.C.S., California: San Diego State University, Universidad Auto California Sur, Consejo Nacional de Ciencia y Tecnología), 314 p. Edited by Rosa María Chávez D. Edmundo Andrade romo Rodrigo Espinoza Sánchez Miguel Navarro Gamboa. Universidad de Guadalajara. Available online at: https://www.researchgate.net/profile/Mario-Monteforte/publication/290851989_La_creacion_del_area_natural_protegida_actores_procesos_y_retos/links/60f8b99b2bf3553b2902a373/La-creacion-del-area-natural-protegida-actores-procesos-y-retos.pdf#page=11 (Accessed March 6, 2025).

García-Castañeda, O., Viloria-Gómora, L., Avila-Foucat, S. V., Vega-Peña, E. V., Quintero-Venegas, G. J., Urbán Ramírez, J., et al. (2024). Climate change stands as the new challenge for whale watching and North Pacific gray whales (*Eschrichtius robustus*) in Bahia Magdalena, Mexico, after their recovery from overexploitation. *Front. Conserv. Science. Front.* 5 p, 1397204. doi: 10.3389/fcosc.2024.1397204

George, D., and Mallery, M. (2019). IBM SPSS statistics 26 step by step: A simple guide and reference. *Routledge*, 402. doi: 10.4324/9780429056765

Gutiérrez, M. M. (2019). *Valoración Económica del Avistamiento de Tiburón Ballena en la Bahía de la Paz, México* (La Paz, BCS, México: Doctoral dissertation, Universidad Autónoma de Baja California Sur).

Hoelter, J. W. (1983). The analysis of covariance structures: Goodness-of-fit indices. *Sociological Methods Res.* 11, 325–344. doi: 10.1177/0049124183011003O

Hoyt, E. (2007). *A blueprint for dolphin and whale watching development*. (Washington, DC: Humane Society International), 32.

Hoyt, E., and Iñíguez, M. (2008). *The state of whale watching in Latin America* (Chippenham, UK: WDCS).

Ibañez, R. (2014). Turismo y sustentabilidad en pequeñas localidades costeras. *El Periplo Sustentable* 36, 67–101. Toluca, Estado de México, México.

IBM Corp. (2013). *IBM SPSS statistics for windows*. (Version 22.0). (Armonk, NY: IBM Corp).

INEGI, M. (2010). *México en cifras*. México. Available online at: https://www.inegi.org.mx/ (Accessed May 2, 2020).

Isasi-Catalá, E. (2011). Los conceptos de especies indicadoras, paraguas, banderas y claves: Su uso y abuso en Ecología de la Conservación. *Interciencia* 36, 31–38. Available online at: https://www.redalyc.org/articulo.oa?id=33917727005 (Accessed March 6, 2025).

Ivanova, A., Cariño, M., and Ramírez, O. (2002). *Comercio y Desarrollo Sustentable en SudCalifornia (siglos XIX y XX)* (La Paz, Mexico: UABCS, SEP y CONACYT), 216–244.

Kibert, N. C. (2000). *An analysis of the correlations between the attitude, behavior, and knowledge components of environmental literacy in undergraduate university students*, [electronic resource] (Master's thesis, University of Florida).

Kollmuss, A., and Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ. Educ. Res.* 8, 239–260. doi: 10.1080/13504620220145401

Leal Londoño, M.d. P. (2017). *Turismo ecológico y sostenible: perfiles y tendencias* (Barcelona, Spain: Grupo de Investigación Interdisciplinar GRIT-OSTELEA), 1–45. Available at: http://www.aept.org/archivos/documentos/Informe_TurismoEcologico.pdf (Accessed May 2, 2020).

López-Espinosa de los Monteros, R. (2002). Evaluating ecotourism in natural protected areas of La Paz Bay, Baja California Sur, Mexico: ecotourism or nature-based tourism? *Biodiversity Conserv.* 11, 1539–1550. doi: 10.1023/A:1016887417263

Lozano, L. P. (2018). *Análisis integral del uso de la ballena gris con fines turísticos en Puerto Adolfo Lòpez Mateos, BCS*. La Paz, BCS, México.

McGahey, S. (2012). The ethics, obligations, and stakeholders of ecotourism marketing. *Intelektinė ekonomika* 6, 75–88. Available online at: https://ojs-dev.mruni.eu/ojs/intellectual-economics/article/viewFile/565/526 (Accessed March 06, 2025).

Murillo, F. J. (2006). *Cuestionarios y escalas de actitudes*. Madrid: Universidad Autónoma de Madrid, 2–16. Available online at: https://www.studocu.com/es/document/uned/teoria-de-la-educacion/cuestionarios-y-escalas-de-actitudes-en-investigacion-social-f-javier-murillo/117925614 (Accessed March 06, 2025).

Mustika, P. L. K., Birtles, A., Everingham, Y., and Marsh, H. (2013). The human dimensions of wildlife tourism in a developing country: watching spinner dolphins at Lovina, Bali, Indonesia. *J. Sustain. Tourism. Taylor \& Francis* 21, 229–251. doi: 10.1080/09669582.2012.692881

Orams, M. B. (1995). Towards a more desirable form of ecotourism. *Tourism Manage.* 16, 3–8. doi: 10.1016/0261-5177(94)00001-Q

Orams, M. B. (1996). A conceptual model of tourist-wildlife interaction: The case for education as a management strategy. *Aust. Geographer* 27, 39–51. doi: 10.1080/00049189608703156

Orams, M. B. (1997). The effectiveness of environmental education: can we turn tourists into "Greenies"? *Prog. Tourism Hospitality Res.* 3, 295–306. doi: 10.1002/(SICI)1099-1603(199712)3:4<295::AID-PTH85>3.0.CO;2-D

Packer, J., Ballantyne, R., and Bond, N. (2018). Developing an instrument to capture multifaceted visitor experiences: the doVE adjective checklist. *Visitor Stud.* 21, 211–231. doi: 10.1080/10645578.2018.1553925

Pérez, R. M. I., Pérez, K., and Olmos-Martínez, E. (2019). *Perfil del visitante y características del prestador de servicios en un destino ecoturístico de Baja California Sur*. (Ciudad de México, México: ESTUDIOS RECIENTES SOBRE ECONOMÍA AMBIENTAL Y AGRÍCOLA EN MÉXICO), 415.

Powell, R. B., and Ham, S. H. (2008). Can ecotourism interpretation really lead to pro-conservation knowledge, attitudes and behaviour? Evidence from the Galapagos Islands. *J. Sustain. Tourism* 16, 467–489. doi: 10.2167/jost797.0

Ramírez-Macías, D., and Saad, G. (2016). "Key elements for managing whale shark tourism in the Gulf of California." in *Qscience Proceedings* (Doha, Qatar: Bloomsbury Qatar Foundation Journals), 2015–2016.

Read, T. D., Petit, R. A., Joseph, S. J., Alam, M. T., Weil, M. R., Ahmad, M., et al. (2017). Draft sequencing and assembly of the genome of the world's largest fish, the whale shark: *Rhincodon typus* Smith 1828. *BMC Genomics* 18, 532. doi: 10.1186/s12864-017-3926-9

Rodger, K., Smith, A., Newsome, D., and Moore, S. A. (2011). Developing and testing an assessment framework to guide the sustainability of the marine wildlife tourism industry. *J. Ecotourism* 10, 149–164. doi: 10.1080/14724049.2011.571692

Rodríguez-Izquierdo, E., Miquelajauregui, Y., Padilla, P., and Bojórquez-Tapia, L. A. (2019). Modelling approach for crafting environmental regulations under deep uncertainty: Whale watching in Ojo de Liebre, Mexico. *Ecol. Model.* 408, 108731. doi: 10.1016/j.ecolmodel.2019.108731

Salgado-Beltrán, L. (2009). *Instrumentos de marketing aplicados a la compra de productos ecológicos: un caso de estudio entre Barcelona* (España y La Paz, México: Universitat de Barcelona).

Salgado-Beltrán, L. (2019). Segmentación de los consumidores de alimentos orgánicos según sus actitudes, valores y creencias ambientales. *Contaduría y Administración* 64, 1–28. Available online at: https://www.redalyc.org/articulo.oa?id=39571725008 (Accessed March 6, 2025).

Sánchez, M. J., and Lafuente, R. (2010). Defining and measuring environmental consciousness. *Rev. Internacional Sociología* 68, 731–755. doi: 10.3989/ris.2008.11.03

Sandoval, S., and Ewaldo, R. (2006). *Ecoturismo: Operación técnica y gestión ambiental*. (Ciudad de México, México).

Schwoerer, T., Knowler, D., and Garcia-Martinez, S. (2016). The value of whale watching to local communities in Baja, Mexico: A case study using applied economic rent theory. *Ecol. Economics* 127, 90–101. doi: 10.1016/j.ecolecon.2016.03.004

SECTUR. (2024). *Información Estratégica B.C.S.* (México: Comisión Nacional de Áreas Naturales Protegidas (CONANP)), 48 pp. Available online at: https://biblioteca.setuesbcs.gob.mx/ficha/?id_pub=423 (Accessed March 6, 2025).

SEMARNAT. (2024). Turismo de Naturaleza. Available online at: http://dgeiawf.semarnat.gob.mx:8080/ibi_apps/WFServlet?IBIF_ex=D2_R_TURISMO02_04&IBIC_user=dgeia_mce&IBIC_pass=dgeia_mce (Accessed March 06, 2025).

Senko, J., Schneller, A. J., Solis, J., Ollervides, F., and Nichols, W. J. (2011). People helping turtles, turtles helping people: Understanding resident attitudes towards sea turtle conservation and opportunities for enhanced community participation in Bahia Magdalena, Mexico. *Ocean Coast. Manage.* 54, 148–157. doi: 10.1016/j.ocecoaman.2010.10.030

Skibins, J. C., Powell, R. B., and Hallo, J. C. (2013). Charisma and conservation: Charismatic megafauna's influence on safari and zoo tourists' pro-conservation behaviors. *Biodiversity Conserv.* 22, 959–982. doi: 10.1007/s10531-013-0462-z

Sousa, A., Coelho, R. E., Costa, H., Lourenço, T. C., Azevedo, J. M.N., and Santos, C. F. (2023). Integrated climate, ecological and socioeconomic scenarios for the whale watching sector. *Sci. Total Environ.* 857, 159589. doi: 10.1016/j.scitotenv.2022.159589

SPSS, S. (2010). *SPSS for windows*, Vol. 11, *Release*. Available online at: https://www.ibm.com/mx-es/spss (Accessed August 2, 2019).

Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Soc. psychol. Study Soc. Issues* 56, 407–424. doi: 10.1007/BF00640994

Stone, B. M. (2021). The ethical use of fit indices in structural equation modeling: recommendations for psychologists. *Front. Psychol.* 12, 783226. doi: 10.3389/fpsyg.2021.783226

Sullivan, F. A. (2018). Assessment of vessel disturbance to gray whales to inform sustainable ecotourism. *J. Wildlife Manage.* 82, 896–905. doi: 10.1002/jwmg.21462

Troyo Vega, B., Franco, G. A., Tessaro, P. G., Ramírez, J. U., Swartz, S., and Rubio, A. O. (2018). Evaluación del servicio turístico en el avistamiento de la ballena gris: Baja California Sur, México. *Economía, Sociedad y Territorio* 18, 853–880. doi: 10.22136/est01248

Urciaga, G. J., Micheline, C., and Zariñán, J. (2008). "El Turismo Alternativo o de Naturaleza un Excelente Complemento para fortalecer el sector turístico en BCS," in *Del Saqueo a la Conservación: Historia Ambiental Contemporánea de Baja California Sur 1940-2003* (SEMARNAT/U.A.B.C.S., México D.F.), 602–604.

Van Liere, K. D., and Dunlap, R. E. (1981). Environmental concern: Does it make a difference how it's measured? *Environ. Behav.* 13, 651–676. doi: 10.1177/0013916581136001

Walpole, M. J., and Leader-Williams, N. (1998). Tourism and flagship species in conservation. *Biodiversity Conserv.* 11, 543–547. doi: 10.1023/A:1014864708777

Wang, S., Zhou, Z., and Tian, K. (2022). Environmental awareness and environmental information disclosure: An empirical study based on energy industry. *Front. Psychol.* 13, 1038040. doi: 10.3389/fpsyg.2022.1038040