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ORIGINAL ARTICLE

Whale-listening research tours in the Southeast Pacific region: a case study of scientific tourism in Ecuador

Viajes de investigación para escuchar ballenas en la región del Pacífico
Sudeste: un estudio de caso del turismo científico en Ecuador

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ABSTRACT

Scientific tourism is an emerging but poorly studied field in the Southeast Pacific region. We conducted a literature review to assess the current state of scientific tourism and included a case study of humpback whale-listening research tours off the coast of Esmeraldas in northern Ecuador. Additionally, we conducted online interviews to examine changes in people's perception of whale-observation tours (comparing visual and auditory experiences). The literature review revealed more published articles related to whale-watching aided research than to scientific tourism. Still, we found that humpback whale-listening research tours operate in the region. Human facial expressions showing emotions such as happiness and surprise were the most frequently recorded reactions when

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people listened to humpback whale songs. Online respondents mostly expressed high satisfaction when listening to whale songs or seeing whales up close (< 5 m). However, after respondents read about the impact of tour boats on whales' well-being, most respondents preferred to watch and listen to whales at a distance of 100 m. Whale-listening tours generate emotional well-being in people who participate, and we consider that the whale-watching industry could implement this activity to promote compliance with distance guidelines for observing humpback whales in their breeding grounds.

Keywords: Satisfaction, preferences, facial expressions, tourism, *Megaptera novaeangliae*, whale-listening research tours.

RESUMEN

El turismo científico es un campo emergente y poco estudiado en la región del Pacífico sudeste. Realizamos una revisión bibliográfica para evaluar el estado del turismo científico e incluimos un estudio de caso sobre los viajes de investigación para escuchar ballenas jorobadas en la costa de Esmeraldas, norte de Ecuador. Realizamos entrevistas para conocer los cambios en la percepción de las personas sobre el avistamiento de ballenas (visual frente a auditiva). La evaluación de la revisión bibliográfica arrojó más artículos publicados relacionados con el avistamiento de ballenas asistidas por la investigación que literatura de turismo científico. Aun así, constatamos que en la región se realizan viajes de investigación para escuchar a las ballenas jorobadas. Las expresiones faciales humanas de emoción, como felicidad y sorpresa, fueron las más frecuentes cuando la gente escuchaba el canto de las jorobadas. Además, los encuestados expresaron una mayor satisfacción al escuchar el canto de las ballenas o verlas de cerca (< 5 m). Sin embargo, después de que los encuestados leyeron sobre el impacto de los barcos turísticos en el bienestar de las ballenas, la mayoría prefirió escuchar y observarlas a una distancia de 100 m. Los viajes de escucha de ballenas generan bienestar emocional en las personas que viven esta experiencia, por lo que la industria de avistamiento de ballenas podría adoptar este tipo de experiencias para promover el cumplimiento de las directrices de distancia para su observación en sus zonas de reproducción.

Palabras clave: Satisfacción, preferencia, expresión facial, *Megaptera novaeangliae*, turismo, viaje de investigación sobre la escucha de ballenas.

INTRODUCTION

The presence of humpback whales (*Megaptera novaeangliae*) along the coast of Ecuador and the Southeast Pacific region represents a valuable opportunity for economic development through whale-watching tourism (Cárdenas et al., 2021; García-Cegarra & Pacheco, 2017; Pacheco et al., 2011). In Latin America, the whale-watching industry focused on humpback whales is one of the most popular tourist activities and represents an important source of income in coastal areas (Cisneros-Montemayor et al., 2010; Hoyt & Íñiguez, 2008). During the last decade, in some Central and South American countries, whale-watching tourism has experienced unprecedented economic growth (Amrein et al., 2020; Ávila et al., 2021; Cárdenas et al., 2021).

The rapid expansion of whale-watching tourism in the region has not only improved the local economy but has also provided a valuable

opportunity to educate tourists and promote environmental awareness and marine conservation in the local population (Ávila et al., 2021; Hoyt & Íñiguez, 2008; Zapetis et al., 2017). However, along with its socioeconomic benefits and educational potential, the growth of whale-watching tourism has intensified pressure on the whales through increased marine traffic and harassment, especially for humpback whales (Ávila et al., 2021). For instance, changes in humpback whale behavior have been documented, mainly in mother-calf groups (Amrein et al., 2020; Ávila et al., 2015; García-Cegarra et al., 2019; Villagra et al., 2021), involving a high risk of collisions (Ransome et al., 2021), changes in energy budget (Amrein et al., 2020; Ávila et al., 2015; García-Cegarra et al., 2019; Villagra et al., 2021), and habitat disturbances by direct acoustic masking of their vocalizations caused by boat noise (Rey-Baquero et al., 2021).

Guidelines have been developed to minimize the impact on whales during whale-watching

activities (Lewis & Walker, 2018). For example, when approaching whales, it is recommended that the boat maintains a distance of 100–300 m from the animals. Additionally, the recommended speed during an approach is four knots (approx. 7 km/h), and the number of boats near whales is limited to three for a single whale or a group of whales. Observation time should be limited to a maximum of 25 minutes for whale groups and reduced to 15 minutes when calves are present (Félix, 2015). But these recommendations are not always applied by boat captains, due to inadequate training, insufficient control and enforcement (Sitar et al., 2016), and the pressure to satisfy tourists' demands to be as close to the whales as possible.

In their breeding grounds, humpback whales prefer shallow water (Denkinger et al., 2023), which makes this charismatic species even more attractive and easier to access. Furthermore, humpback whales are famous for producing complex, melodic songs, which has increased both humpback whale bioacoustics research and whale-watching interest in the Southeast Pacific region (Ávila et al., 2021; Chávez-Andrade et al., 2023). The number of humpback whale-watching operators has increased in certain breeding areas, such as Ecuador and Colombia (Ávila et al., 2021; Castro et al., 2022), which could augment the pressure to provide views of whales up close. However, harassment of whales has begun to cause concern among some tourists who are worried about their conservation (García-Cegarra & Pacheco, 2017; Sitar et al., 2016).

Despite the potential adverse effects of whale watching, the industry has also contributed to humpback whale research. For instance, research groups from Panama, Colombia, Ecuador, Peru, and Chile have collaborated with the whale-watching industry to collect behavioral, acoustic, and population density information (e.g., Acevedo et al., 2017; Barragán, 2019; Félix & Botero-Acosta, 2011; Félix et al., 2001a; Félix et al., 2006; Pacheco et al., 2011; Pacheco et al., 2021; Valdivia et al., 2017). This type of collaboration has facilitated important advances in research about the ecology and distribution not only of humpback whales (e.g., Amrein et

al., 2020; Guidino et al., 2014) but also of other species occasionally observed, such as fin whales (*Balaenoptera physalus*), blue whales (*Balaenoptera musculus*) (Catalan et al., 2011; Sepúlveda et al., 2017), and coastal dolphin species (e.g., Félix et al., 2019).

While cooperation between research groups and tourist operations provides a unique opportunity for data collection (whale-watching aided research), researchers depend on the itinerary organized for tourists. In whale research tours (science tourism), however, tourists adapt to the research schedule of scientists according to the focus of these trips and actively participate in scientific observations for behavior analyses, photo-identification studies, and acoustic surveys. In this case, tourists can participate as observers and data collectors (e.g., taking pictures of humpback whale flukes for photo-identification) while financially supporting the activity (Parsons et al., 2006).

A recent study recommended the implementation of acoustic whale tourism in the Southeast Pacific region (Ávila et al., 2021). Specifically, whale-listening research tours can be considered a form of scientific tourism because they integrate recreative (exploration) and educational (interpretation) activities (Bosak, 2015) while simultaneously providing scientific data and supporting research initiatives (Dionisio et al., 2022; Molokáčová & Molokáč, 2011). Scientific tourism can also provide a platform for sharing environmental and cultural knowledge acquired at the study area with tourists and members of the local community who are employed by whale-watching operations (Boldt, 2016; Bourslon & Mao, 2011; Hoyt, 1999).

Whale-listening research tours provide an alternative activity that reduces the negative impacts of the whale-watching industry on whales' well-being (Ávila et al., 2021; Hoyt, 1999). But it is also essential to study the social aspects of this activity to understand which experiences contribute to tourist satisfaction. So far, most studies have focused on the economic aspects of whale watching (Dalfo et al., 2017; Guidino et al., 2020; Herrera & Lasso, 2014; Torres-Matovelle & Molina-Molina, 2018; Zapetis et al., 2017). Only a few studies have aimed to under-

stand the perceptions and emotions of tourists during whale-watching operations (e.g., Cárdenas et al., 2021; Cornejo-Ortega et al., 2018; García-Cegarra & Pacheco, 2017).

Finally, scientific tourism in the form of whale-listening research tours could evoke empathy from tourists towards whales and their environment, thus promoting changes in attitude towards conservation (e.g., Cárdenas et al., 2021; García-Cegarra & Pacheco, 2017; Wilson & Tisdell, 2003; Zeppel, 2008). Most whale-watching activities are focused on the visual experience; the effects of listening to humpback whale songs on people's perceptions and emotions are poorly understood. Specifically, social studies about human emotional responses to hearing the songs of humpback whales in real-time during whale-listening research tours have not been conducted.

In this study, we aimed to 1) assess the current state of scientific tourism focused on humpback whales in the Southeast Pacific region, 2) determine the emotions (based on facial expressions) of tourists during whale-listening research tours, and 3) document human perspectives in terms of tourists' preferences during whale-watching tours off the coast of Ecuador.

METHODS

LITERATURE REVIEW

We conducted a literature review during June 2022, following search steps adapted from PRISMA (Urrutia & Bonfill, 2010). We used Google Scholar and Web of Science to search for scholarly literature and academic resources (Meho & Yang, 2007). We used the following search keywords in both English and Spanish: "whale-listening research tour," OR "whale-watching aided research," OR "whale tourism," OR "scientific whale tourism" ("viajes de investigación sobre la escucha de ballenas," "investigación asistida por avistamiento de ballenas", "turismo de ballenas", "turismo científico de ballenas") combined alternately with each of the countries of the Southeast Pacific region (AND Panama, AND Colombia, AND Ecuador, AND Peru, AND Chile).

We searched for these terms in titles and abstracts with at least two keywords referring to scientific tourism, whale-watching aided research, or whale-listening research tour. Two of us manually screened the titles and abstracts of the resulting articles. In addition, we complemented the review using "snowball sampling," which consisted of subsequently inspecting literature cited in articles found on whale-watching aided research (Naderifar et al., 2017). We omitted articles, workshops, or conference proceedings that contained incomplete or repetitive data.

Finally, via email, we contacted research program leaders conducting whale research tours or whale-watching aided research in the Southeast Pacific region. Some program leaders were personal contacts of the authors, and others were recommended by colleagues who work with cetaceans. Reaching out to these leaders allowed us to complement our findings with unpublished information regarding ongoing research-tourism operations in the region.

HUMAN FACIAL EXPRESSIONS OF EMOTION

To analyze the emotional reactions of tourists listening to humpback whale songs *in situ*, we collected 60 photos of facial expressions during 25 whale-listening research tours conducted between July and August in 2014, 2018, and 2019. The whale research trips were primarily conducted in shallow waters in the province of Esmeraldas, on the northern coast of Ecuador (Figure 1). The scientific tourism activities included observations of whale behavior and listening to whale songs and were conducted offshore while no other boats were near the whales.

We took photographs of tourists' facial reactions with their prior verbal consent to use the data exclusively for educational and research purposes, following the guidelines of the CETACEA Ecuador project and Universidad San Francisco de Quito. To listen to humpback whale songs in real-time, tourists were given semi-professional headphones (Sony ZX110) connected to a Tascam DR-40 digital recorder and an H2aXLR or DolphinEar/PRO omnidirectional hydrophone submerged up to 10 m

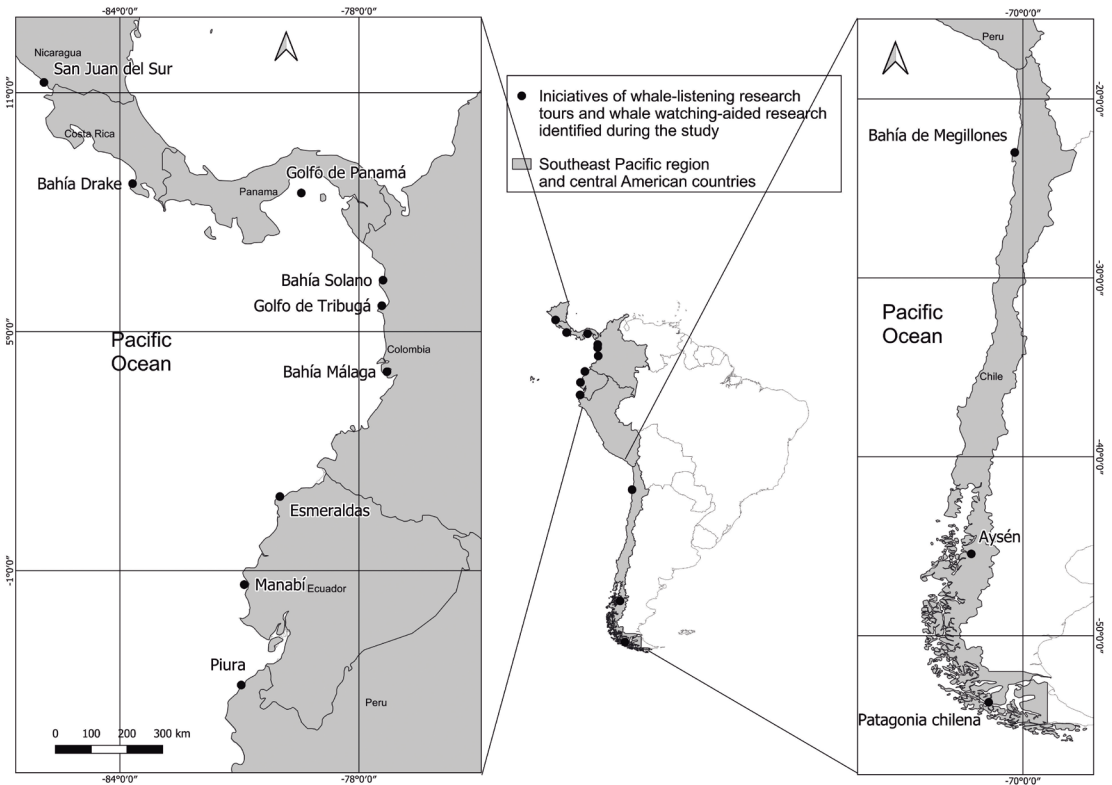


FIGURE 1. Location of whale-listening research tour operations and whale-watching aided research operations in the Southeast Pacific region (Panama, Colombia, Ecuador, Peru, and Chile) and some Central American countries (Nicaragua and Costa Rica).

depth. Tourists heard mainly the well-known, repetitive sounds of humpback whales known as “songs” (Cholewiak et al., 2013; Roger & McVay, 1971).

We photographed facial expressions of emotion when tourists began listening to the humpback whales’ song for the first time. To determine the emotion most associated with each tourist’s facial expression, we asked 20 volunteers to match each facial expression to emotions used in cognitive studies (Du et al., 2014). The options included happiness, surprise, sadness, fear, disgust, anger, intrigue, curiosity, tranquility, concentration, confusion, anguish, neutral, or unclear. Following established practices of identifying emotional facial expressions, we considered the emotions most frequently identified by volunteers for further analyses (Bandyopadhyay et al., 2020).

TOURIST PERSPECTIVES

To assess satisfaction and preferred experiences during whale-watching tours in Ecuador, we designed an online questionnaire in Spanish using the JOTFORM platform (accessible through <https://form.jotform.com/201055469743053>). The respondents were asked to rate their satisfaction and preferences for different scenarios during a simulated whale-watching tour on a 5-point Likert scale (Cornejo-Ortega et al., 2018).

Scenarios included different sighting distances and the option to listen to humpback whale songs in situ. Respondents were also asked to read information regarding the impact of irresponsible whale watching on whale welfare and then choose between the previously provided scenarios again.

This allowed us to determine whether knowledge about the effects of irresponsible whale watching influences the preferences reported in the questionnaire. The survey also included general sociodemographic questions (e.g., gender, age, education, and previous participation in whale-watching tours). To recruit volunteers to complete the surveys, we published the online survey in the Facebook group Proyecto CETA-CEA (<https://www.facebook.com/proyectoceta-ceaecuador>), managed by some of the authors of this paper; we promoted the survey through Facebook advertisements.

RESULTS

LITERATURE REVIEW

The literature search initially generated 321 documents. Of these, 31 documents were full-text articles that met the original criteria, and 17 papers were about either whale-watching aided research on humpback whales or scientific tourism (Table 1). Most of these articles represented research projects in which whale-watching operations were used as a platform for collecting acoustic, distribution, and behavioral data of humpback whales ($N = 14$). Of these articles, 79% were peer-reviewed scientific articles, and 21% were short notes, academic reports, or dissertations. Only three publications were associated with scientific tourism (Table 1). By contacting colleagues in the field, we gathered additional information on scientific tourism through locating whale-listening research tours. We thus established the presence of scientific tourism, primarily characterized by whale-listening research tours, as well as whale-watching aided research along the coast of the Southeast Pacific region and some Central American countries, such as Nicaragua and Costa Rica (Figure 1).

HUMAN FACIAL EXPRESSIONS OF EMOTION

Volunteers could consistently identify the emotions associated with 60 photographs of facial expressions of tourists listening to live whales. The most frequently identified emotions were happi-

ness (55%, $n = 33$) and surprise (28%, $n = 17$). Conversely, neutral, curiosity, fear, and tranquility were identified less frequently (Figure 2; see examples of facial expressions of emotion in Figure 3).

HUMAN PERCEPTIONS

Sample characteristics

Surveys were completed by 100 participants, of whom 91% were Ecuadorian and 9% were non-Ecuadorian (European, North American, and South American tourists). Seventy-six participants indicated that they had previously participated in whale-watching tours in Esmeraldas (50%), Manabí (39%), Guayas (7%), and Galápagos (5%). Participants were between 18 and 60 years old and responded from Esmeraldas, Manabí, Santa Elena, Guayas, and El Oro, coastal provinces that offer whale-watching services in Ecuador. Forty-one percent of respondents were male, while 59% were female. Most participants reported having postgraduate-level education (50%), while 38% of respondents had a third-level education (undergraduate), and 12% had a basic education (primary and secondary, including technical degrees).

Satisfaction and preferences

Of the respondents who had previously participated in whale-watching tours, the majority (75%) expressed that hearing whale songs would provide them with a very satisfying experience. Meanwhile, 46% of respondents felt that seeing the whales up close (< 5 m) would offer a very satisfying experience. This proportion was slightly higher than that of respondents who characterized seeing the whales more than 100 m away from the boat as a very satisfying experience (42%). Only 9% of respondents said seeing the whales close to the boat would fail to satisfy them (Figure 4). But after participants read about the impact that irresponsible whale watching can have on whales, 65% of respondents expressed that they would prefer to listen to and observe humpback whales at a distance of 100 m rather than being close to the animals (Figure 5).

TABLE 1. Publications reviewed as part of the literature search about whale-watching aided research and scientific tourism, considering the Southeast Pacific country of origin.

Southeast Pacific countries	Publication type	References	Tourism type	Principal data collection or research context
Ecuador	Article	Félix & Haase (1998)	Whale-watching aided research	Distribution and photo-ID data aboard tour vessels
Ecuador	Article	Félix & Haase (2001a, b)	Whale-watching aided research	Distribution and photo-ID data aboard tour vessels
Ecuador	Academic report	Woods (2007)	Whale-watching aided research	Distribution and photo-ID data aboard tour vessels
Ecuador	Article	Félix et al. (2011)	Whale-watching aided research	Distribution and photo-ID data aboard tour vessels
Ecuador	Article	Félix & Botero-Acosta (2011)	Whale-watching aided research	Distribution and photo-ID data aboard tour vessels
Ecuador	BSc Thesis	Barragán (2019)	Whale-watching aided research	Acoustic data aboard tour vessels
Peru	Short note	Pacheco et al. (2011)	Whale-watching aided research	Distribution data aboard tour vessels
Peru	Article	Pacheco et al. (2013)	Whale-watching aided research	Behavior and distribution data aboard tour vessels
Peru	Article	Guidino et al. (2014)	Whale-watching aided research	Distribution data on aboard tour vessels
Peru	Article	Pacheco et al. (2021)	Whale-watching aided research	Distribution and photo-ID data aboard tour vessels
Colombia	Article	Zapetis et al. (2017)	Whale-watching aided research	Behavior and distribution data aboard ecotourism vessels
Chile	Article	Bourlon & Mao (2011)	Scientific tourism	Cetacean studies permitted the creation of a scientific tourism product
Chile	Article	Boldt (2016)	Scientific tourism	Tourist participation in the development of cetacean-focused scientific tourism
Chile	Article	Rovira-Pinto & Quintana-Becerra (2019)	Scientific tourism	Knowledge base for the development of cetacean-focused scientific tourism
Ecuador, Chile	Article	García Cegarra et al. (2021)	Whale-watching aided research	Opportunistic behavior observations aboard tour vessels
Panama, Colombia, Ecuador, Peru	Article	Valdivia et al. (2017)	Whale-watching aided research	Photo-ID data aboard tour vessels
Panama, Colombia, Ecuador, Peru, Chile	Article	Acevedo et al. (2017)	Whale-watching aided research	Photo-ID data aboard tour vessels

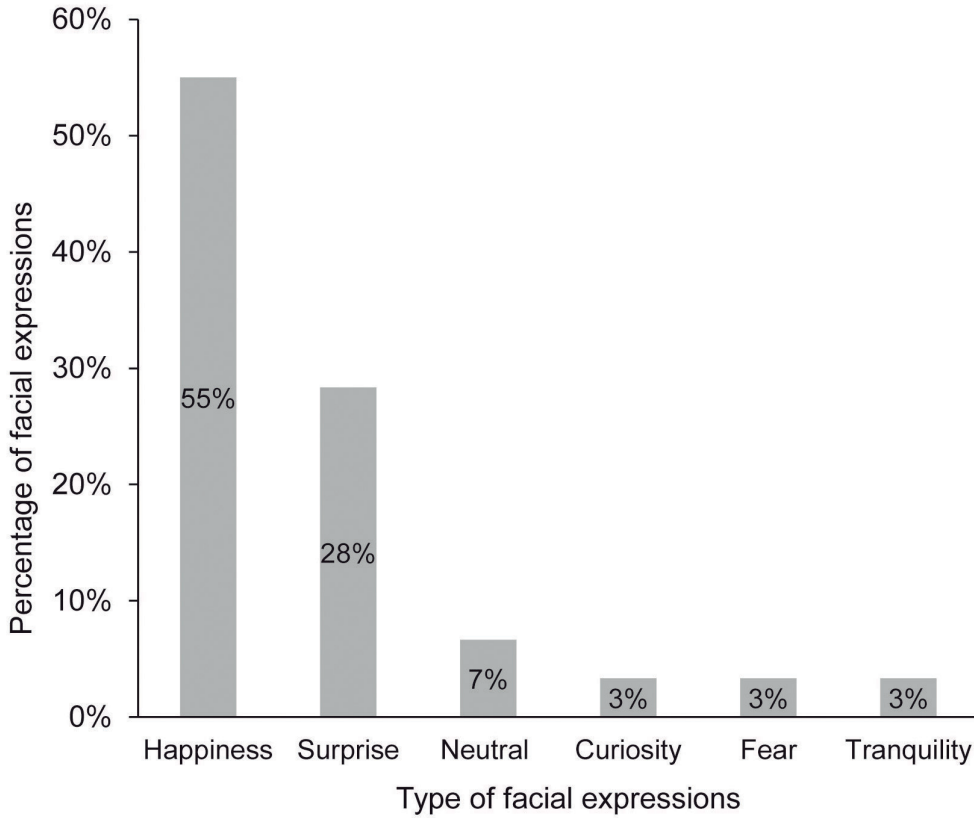


FIGURE 2. Percentages of human facial expressions according to emotion identified during whale-listening research tours off the coast of Esmeraldas in northern Ecuador.

DISCUSSION

The term “scientific tourism” has not been used frequently by the whale-watching industry nor mentioned in scientific publications from the Southeast Pacific region. Scientific tourism has often been associated with voluntarism and ecotourism, which support education, management, and conservation efforts (Bosak, 2015). Our literature search showed that most published research-tourism collaborations took the form of whale-watching aided research rather than scientific tourism.

We found three studies that mentioned scientific tourism activities associated with cetacean research. These research projects are located along the coast of Chile and involve tourist participation in expeditions dedicated to studying small

dolphins, such as the bottlenose dolphin (*Tursiops truncatus*), Peale’s dolphin (*Lagenorhynchus australis*), and the Chilean dolphin (*Cephalorhynchus eutropia*) (Boldt, 2016; Bourlon & Mao, 2011; Rovira & Quintana, 2019). Conversely, in Ecuador and Peru, we found studies mainly related to whale-watching aided research that highlight the essential logistical contribution of tour operators to humpback whale researchers. This collaboration is especially valuable due to the high costs of monitoring cetaceans and collecting relevant ecological and environmental information, especially in underdeveloped countries (Boldt, 2016; Pacheco et al., 2011).

Scientific tourism initiatives associated with whale research in the region have not yet resulted in scientific production. On the other hand, citizen science and long-term research programs



FIGURE 3. Examples of facial expressions of emotion recognized during whale-listening research tours: A–B. Happiness; C–D. Surprise; E–F. Tranquility; G–H. Neutral; I. Fear; J. Curiosity; K. Whale-listening research tour off the coast of Esmeraldas in northern Ecuador.

have generated crucial scientific information and promoted some local scientific tourism initiatives in coastal and remote areas of the region. For instance, in Nuquí, Colombia, training local people in a citizen science program has not only allowed them to monitor cetaceans and generate scientific articles (e.g., Vallejo et al., 2022a, b) but has also provided workshops

and promoted better whale-watching practices for local operators (Ann Carole Vallejo, pers. comm.). Likewise, in Chilean Patagonia, whale monitoring has been carried out with the help of tourists, taking advantage of cetacean research programs that study dolphins, especially in the northern fjords of Aysén (Boldt, 2016; Bourlon & Torres, 2016).

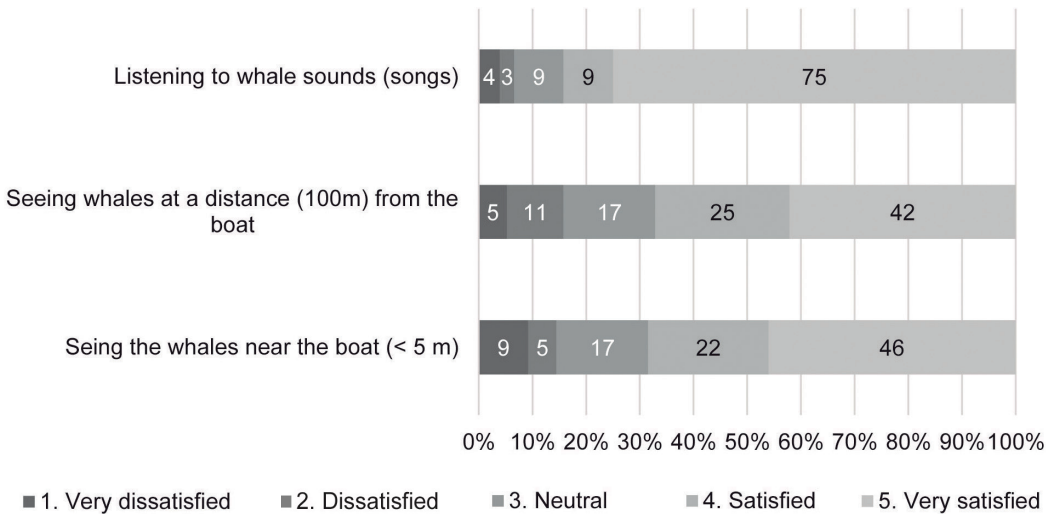


FIGURE 4. Levels of satisfaction expressed (percentages on the bars) under three different scenarios during a potential whale-watching tour in Esmeraldas, northern Ecuador.

Compared to participants in the traditional whale-watching industry, tourists participating in whale monitoring and research are more likely to follow conservation guidelines and maintain a respectful distance from the animals under observation (Juan Capella, pers. comm.). In addition, whale-listening research tours and social, cultural, and environmental projects promoting humpback whale songs have been implemented in areas such as Bahía Málaga, Colombia (Isabel Ávila, pers. comm.). Thus, scientific tourism guided by trained local residents or conducted by scientists in collaboration with tourist companies can guarantee a satisfactory experience and decrease the risks of harassment of whales.

Additionally, we found that listening to whales in situ had an immediate emotional impact on participants. The most frequently detected emotional responses to hearing humpback whale songs were happiness and surprise. These emotions were also observed during a recent study about whale-watching aided research integrating whale-listening research tours on the Pacific coast of Colombia (Ocean Conservation Community Foundation, unpublished data). The emotional experiences of hearing whale songs can be diverse due to different individual reactions and interpretations. Nevertheless, positive emotions experienced by tourists during

whale-watching expeditions can contribute to an increased desire to support conservation actions for marine species (e.g., feelings of responsibility for their protection; Jacobs & Harms, 2014). Additionally, understanding the natural soundscape and its impact on human emotive perceptions can contribute to the development of activities that contribute to human well-being (Moscoso et al., 2018), a current focus of the Sustainable Development Goals (SDGs) of the United Nations (UN, 2021).

Our analyses of tourist perceptions on whale-watching tours showed high levels of satisfaction and preference associated with listening to humpback whale songs while observing the animals at a regulated distance (up to 100 m). However, the growing whale-watching industry may require more stringent control of its operations (e.g., Amrein et al., 2020; Ávila et al., 2015, 2021). With the increased popularity of whale watching and the growing number of whale-watching boats, scientists have suggested increasing the minimum observation distance to 200 m in the region (Ávila et al., 2015, 2021; Cárdenas et al., 2021; Castro et al., 2022).

Competition among tourist boats for close-up sightings of humpback whales can instigate noncompliance with the distance regulations (Amrein et al., 2020). While some studies report

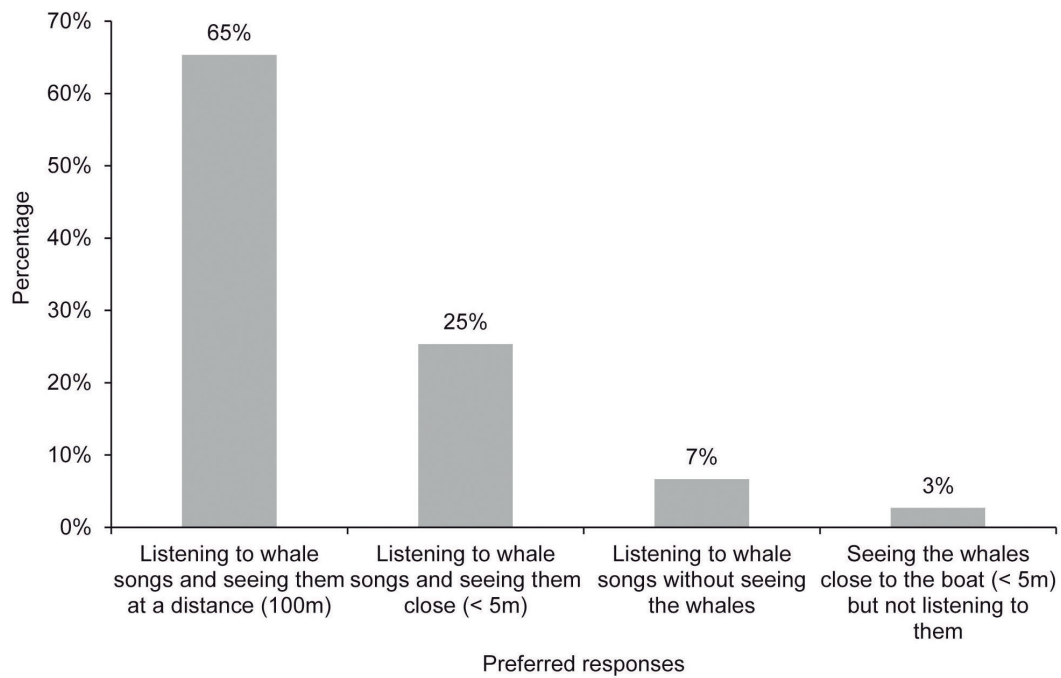


FIGURE 5. Preferences expressed after respondents read about the impact that irresponsible whale watching can have on whale behavior.

a strong tourist preference for being as close as possible to the whales, others indicate that distance is not a limiting factor (Hoyt & Parsons, 2014; Orams, 2000). These findings are consistent with our results, showing that much of this variability depends on the individual choice of whale-watchers; we found similar proportions of respondents who preferred to be either very close (< 5 m) or far away (100 m) from whales before reading about the impacts of irresponsible whale-watching.

Likewise, a recent human perception study in Golfo de Tribugá, Colombia, showed a preference for listening to whales while maintaining the regulated distance over not listening to the songs and seeing the whales up close (Ocean Conservation Community Foundation, unpublished data). Therefore, we encourage the implementation of scientific tourism that incorporates acoustic experiences; not only do these experiences serve as tourist attractions and opportunities to collect data, but they also promote more responsibility among whale-watching tour operators, encouraging

them to follow up-to-date recommendations to ensure animal welfare and support respectful wildlife tourism (Ávila et al., 2021).

We also found that access to conservation information influences tourist satisfaction and encourages respectful whale-watching activities. At the same time, the lack of both surveillance and compliance with regulations can lead to concern and dissatisfaction among tourists (Ávila et al., 2021; García-Cegarra & Pacheco, 2017). For example, a study conducted in Sri Lanka reported that the factors that most contributed to tourist dissatisfaction were the lack of information about the species, the violation of sustainable whale-watching practices, seasickness, and stormy weather during the whale-watching tours (Buultjens et al., 2016).

A study in Australia reported that 35% of participants were satisfied with whale-watching tours that included adequate information about the whales, despite not observing humpback whales (Orams, 2000). On the other hand, according to a study conducted in Bahía de Banderas, Mexico, at least one whale sighting can

be more important than species information as regards tourist satisfaction (Cornejo-Ortega et al., 2018). Nonetheless, an effective way to generate a satisfactory experience includes raising awareness about the environment and the species of concern before, during, and after the trips (De la Cruz-Modino & Cosentino, 2022; García-Cegarra & Pacheco, 2017). Therefore, humpback whale-watching operations do not need to provide close-up observations (violating regulations and disturbing individual whales), but can instead focus on delivering enriching experiences through providing relevant information about the biology and ecology of the species, incorporating local knowledge and opportunities to listen to humpback whale songs in their breeding areas (e.g., Ávila et al., 2021; Oña et al., 2017, 2019; Perazio et al., 2018).

CONCLUSIONS

We found few peer-reviewed articles related to scientific tourism compared to studies based on cooperation between the whale-watching industry and researchers. Despite this, we established that whale-listening research tour initiatives in the region are facilitating the collection of crucial information about humpback whale ecology while promoting a sustainable tourism experience. Our work highlights the importance of implementing more scientific activities in the whale-watching industry, such as whale-listening and recording, to provide environmental education and enhance tourist welfare. Our findings on tourist perceptions and emotions when observing and hearing humpback whales establish a promising path towards implementing a sustainable model that both meets the expectations of tourists and mitigates harassment of whales. Scientific tourism opportunities will contribute to tourists' emotional well-being and promote positive attitudes toward ocean conservation, especially as regards the spatial needs of humpback whales in their reproductive areas along the coasts of Ecuador and the Southeast Pacific region.

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