Scientia Marina 83(2)
June 2019, 177-185, Barcelona (Spain)
ISSN-L: 0214-8358
https://doi.org/10.3989/scimar.04880.14A

Marine ecotourism in the Gulf of California and the Baja California Peninsula: Research trends and information gaps

Andrew F. Johnson [1], Claire Gonzales [1,2], Amanda Townsel [1,3], Andrés M. Cisneros-Montemayor [4]

[1] MarFishEco Fisheries Consultants, USA / UK.
(AJ) (Corresponding author) E-mail: andrew@marfisheco.com. ORCID iD: https://orcid.org/0000-0003-3365-8768
(CG) E-mail: clairematiasgonzales@gmail.com. ORCID iD: https://orcid.org/0000-0002-0436-6531
(AT) E-mail: amanda@katuvi.com. ORCID iD: https://orcid.org/0000-0002-9892-8637
[2] Blue Latitudes, La Jolla, CA, 92038, USA.
[3] Katuvi, San Diego, CA, 92067, USA.
[4] Nippon Foundation Nereus Program, Institute for the Oceans and Fisheries, University of British Columbia, Vancouver, V6T 1Z4, Canada.
(AMC-M) E-mail: a.cisneros@oceans.ubc.ca. ORCID iD: https://orcid.org/0000-0002-4132-5317

Summary: Achieving equitable and sustainable ecotourism requires a wide range of multidisciplinary and cross-scale information, particularly given the growing scale of ecotourism operations and continuing governance and climate challenges. Ecosystems in Mexico's Gulf of California and Baja California Peninsula support a thriving ecotourism industry that has quickly expanded over the last few decades, potentially outpacing research into current performance and future sustainable development opportunities. We develop and apply a formal literature review approach to characterize academic marine ecotourism literature, highlight key insights and identify research strengths and gaps, and thus analyse almost 50 publications for the region from 1994 to 2014. There has been a significant increase in the number of various types of publications; most (68%) focus on ecological themes, 25% on economics, and 7% on social aspects of human wellbeing. There are also trends towards research on specific species (e.g. mammals, fish and sharks) and in specific areas. A common theme in publication conclusions is the need for collaboration from all stakeholder groups. We discuss these findings, and address potential limitations of our method, with a view to informing sound policies to ensure that ecotourism can provide equitable benefits to local communities while incentivizing sustainable practices and nature conservation.

Keywords: coastal ecosystem; conservation; literature; recreation; revenue; tourism.

Ecoturismo marino en el golfo de California y península de Baja California: tendencias de investigación y vacíos de información

Resumen: El desarrollo equitativo y sostenible del ecoturismo debe considerar una amplia gama de información multidisciplinaria y a varias escalas, particularmente dada la creciente magnitud de las operaciones de ecoturismo y los retos de gobernanza y climáticos. Los ecosistemas en el golfo de California y península de Baja California en México mantienen a una próspera industria de ecoturismo que se ha expandido rápidamente a lo largo de las últimas décadas, posiblemente dejando atrás a la investigación respecto a sus operaciones actuales y las oportunidades para el desarrollo sostenible a futuro. Desarrollamos y aplicamos una revisión formal de literatura para caracterizar a las publicaciones académicas respecto al ecoturismo, señalar tendencias clave e identificar fortalezas y vacíos de investigación, analizando casi 50 publicaciones para la región desde 1994 al 2014. Ha habido un incremento significativo en la cantidad de publicaciones de varios tipos; la mayoría (68%) se enfocan en temas ecológicos, 25% en economía y 7% en aspectos sociales del bienestar humano. También existe una tendencia hacia investigación de ciertas especies (e.g. mamíferos, peces, tiburones) y en regiones específicas. Un tema común en las conclusiones de las publicaciones analizadas es la necesidad de colaboración por todos los grupos de actores. Discutimos estos resultados, y las posibles limitaciones de nuestro método, en el contexto de informar políticas adecuadas para asegurar que el ecoturismo pueda proveer beneficios equitativos a comunidades locales al mismo tiempo que se incentivan las prácticas sostenibles y la conservación de la naturaleza.

Palabras clave: ecosistema costero; conservación; literatura; recreación; ingresos; turismo.

Citation/Como citar este artículo: Johnson A.F., Gonzales C., Townsel A., Cisneros-Montemayor A.M. 2019. Marine ecotourism in the Gulf of California and the Baja California Peninsula: Research trends and information gaps. Sci. Mar. 83(2): 177-185. https://doi.org/10.3989/scimar.04880.14A

Editor: J. Lloret.

Received: October 15, 2018. **Accepted:** February 20, 2019. **Published:** April 1, 2019.

INTRODUCTION

Ecotourism can be defined as any recreational activity that explicitly involves the viewing and/or extraction of other living beings in the wild that incorporates some form of environmental education, has low environmental impacts, is intended to be sustainable and in some cases supports local conservation efforts. Ecotourism is one of the fastest growing industries globally (Das 2011, Das and Chatterjee 2015, Honey and Krantz 2007). Recreational enjoyment and associated economic and social benefits are therefore inherently and inextricably linked to nature conservation (Das and Chatterjee 2015, Gallagher and Hammerschlag 2011, Zeppel 2008). Marine ecotourism developed relatively recently compared with other forms of ecotourism that are historically tied to social traditions in Europe and North America, such as hunting, camping and freshwater fishing (Miller 1993). However, marine ecotourism activities such as whale and shark watching, snorkelling, scuba diving and recreational fishing attract over 120 million participants per year globally, generating more than 50 billion USD per annum and supporting over one million jobs (Cisneros-Montemayor and Sumaila 2010).

As ecotourism operations have expanded throughout the world, there have been several key lines of research into its establishment, performance and outcomes. Perhaps the most straighforward of these has been the valuation of economic benefits from ecotourism (e.g. Cisneros-Montemayor and Sumaila 2010, Spalding et al. 2017). This has developed into estimates of per-species or individual animal contributions that more directly connect ecotourism benefits with conservation strategies (e.g. Farr et al. 2014, Gallagher and Hammerschlag 2011, Vianna et al. 2012) and/or analyses of the distribution of benefits among local communities (Johnston 2000, Young 2016). With the growth in scale of local ecotourism industries, there are also efforts to consider negative impacts of ecotourism on marine species and ecosystems. This can include clear harm, for example by novice divers breaking coral reefs (Rouphael and Hanafy 2007, Zakai and Chadwick-Furman 2002) or tour vessel collisions with whales and whale sharks (Carrillo and Fritter 2010, Neilson et al. 2012), but also more subtle, yet potentially significant impacts such as behavioural changes in response to ecotourism operations that may decrease individual fitness or risk aggressive encounters with humans (Hammerschlag et al. 2012, Neumann and Orams 2006, Ziegler et al. 2012). Another fundamental question that is being addressed is whether ecotourism ventures truly lead to improved environmental state. There are many examples of local improvements and increased awareness of conservation among ecotourists (Hausmann et al. 2017, Mieras et al. 2017), but long-term and large-scale outcomes remain unclear (Das 2011, Das and Chatterjee 2015).

All of the ecotourism research themes and questions raised above are important for establishing truly successful ecotourism industries with a view to providing equitable and sustainable benefits in regional contexts. This is particularly important for ecotourism, given the evidence that ecotourism operations that operate without regard for the welfare of marine life or local residents can lead to outcomes including net negative impacts on ecosystems, poor relations with local communities, and negative perceptions of ecosystems and wild animals by tourists (Archer et al. 2012, Isaacs 2000, Higginbottom and Scott 2016). The first step in designing strategies for sustainable ecotourism establishment is therefore to identify existing conditions and challenges, including available information to inform new policies that are suitable for local environmental and socioeconomic conditions.

In México, over 16 billion USD per year are spent by 29 million tourists in general, sustaining over two million jobs across the country (Banxico 2016). There are highly successful ecotourism ventures in Mexico, including whale and shark watching, recreational fishing, diving and kayaking. The most important area for marine ecotourism is the Gulf of California region, including the states of Baja California, Baja California Sur, Sonora, Sinaloa, Nayarit and Jalisco. The extensive coastline of this area includes rocky reefs, mangroves, sea grass and kelp beds, a number of small and large islands, and large and productive upwelling zones. These diverse habitats support highly productive marine ecosystems, including iconic whale nurseries (Heckel et al. 2001, Salvadeo et al. 2013), aggregations of sharks and other fishes (Sievanen 2014), and exceptionally high marine and terrestrial species diversity (Arizpe and Covarrubias 2010, Grismer 2002, Howell et al. 2001). For example, shark watching revenue in the region (12 million USD) already represents more than half the landed value from shark fisheries in the country (21 million USD) (Cisneros-Montemayor et al. 2013). Consequently, the vibrant marine ecosystems in the Gulf of California and Pacific coast of the Baja California Peninsula produce a thriving ecotourism industry that has quickly expanded over the last few decades (López-Espinosa de los Monteros 2002). Sport fishing and diving are key year-round activities, though whale and whale shark watching have become essential seasonal components of ecotourism in the state (Cisneros-Montemayor and Sumaila 2010, Hoyt and Iñíguez 2008). As Mexico's coastal industries face increasing threats from warming ocean temperatures (Peterson et al. 2002, Vilchis et al. 2005), increasing unpredictable extreme weather events (UNFCCC 2007), market competition and declining fish stocks (Sievanen 2014), ecotourism has become a much-needed source of employment in the Gulf of California and in many coastal regions globally (López-Espinosa de los Monteros 2002, Rossing 2006).

Suitable policies to ensure equitable and sustainable ecotourism operations must consider all available information about current performance, and operations in the Gulf of California are not without their challenges. Although fishers in the region often note a preference to continue fishing instead of switching to ecotourism operations, opinions related to such changes have been positive overall based on recent declines in fisheries revenues (Dagostino et al. 2009). Many

authors, however, note that the economic changes that will come with moves towards ecotourism development must also come hand in hand with environmental sustainability if such growth is to be sustainable (Wall 1997). Inadequate development plans in the Los Cabos region already exemplify problems of rapid development, which without sufficient environmental management poses a significant threat to local ecosystems in the south of the Baja California Peninsula (Arizpe and Gámez 2011). Such problems include freshwater scarcity, groundwater contamination and habitat degradation. Uncontrolled development of tourism in Baja California presents a clear threat to ecosystems in the area, and future management must consider the environment in addition to industry development (Gámez and Ganster 2012).

Overcrowding in ecotourism operations is of additional concern as ecotourism operations become more important for revenue across the Baja California Peninsula. Overcrowding has been shown to negatively impact return rates of tourists (Ávila-Foucat et al. 2013) and the behaviour of sea lions (Labrada-Martagón 2005), and is suggested to negatively impact whale shark behaviour (Cárdenas-Torres 2007). If left unmanaged, such impacts will limit the long-term viability of what should be an environmentally sustainable industry. The key to the success of ecotourism operations will be the engagement of local communities. Acevedo (2012) note that local communities must be engaged in sustainable development and clearly define development goals which in many cases will be facilitated through collaboration with local NGO partners.

Although many ecotourism operations in Baja California indeed benefit local conservation (Aburto-Oropeza et al. 2011, Brenner et al. 2016, Mayer et al. 2018), they must be suitably managed to avoid environmental impacts (Cisneros-Montemayor 2012); a clear understanding of ecotourism research in the region will help collate past and direct future research efforts. We carried out a systematic literature review to characterize academic literature related to marine ecotourism, highlight key insights, and identify research strengths and gaps. This method was applied to ecotourism in the Baja California and the Gulf of California region of northwest Mexico. We discuss the findings of the review, consider the role of marine ecotourism operations in the future sustainability of the region and highlight areas in which we believe further study will benefit the conservation of the region.

METHODS

Search criteria

We conducted a literature search for peer-reviewed publications, books and university theses, including factors related to marine ecotourism in Baja California and the states neighbouring the Gulf of California down to Puerto Vallarta, northwest Mexico. A factor 'related' to marine ecotourism is any measure which the authors of an article specifically link to the ecotourism industry, such as employment, economic metrics, tourism infrastructure, environmental status and variations thereof. We therefore define an 'article' as a published paper and a 'study' as an investigation of marine ecotourism or factors or variables related to marine ecotourism within a published paper. An article may therefore have more than one study within it if it addresses multiple ecotourism-related variables.

The literature search was undertaken using the commercial search engine Google Scholar, which indexes the full text of scholarly literature across an array of publishing formats. Combinations of the following general search terms were used: 'marine', 'ecotourism', 'tourism', 'industry', 'holiday', 'vacation', 'recreation', 'economy', 'infrastructure', 'employment', 'environment', 'eco', 'nature', along with a secondary search using terms related specifically to marine ecotourism activities in Mexico, including 'diving', 'snorkelling', 'whale watching', 'shark watching', 'beach', 'kayak', 'sailing', 'cruise', 'fishing', 'angling', 'wildlife', 'national park' and 'protected area'. For a list of search combinations used and resultant internet 'hits' and numbers of peer-review journals for each, see Supplementary material Table S1. Google Scholar was chosen over Web of Science and Scopus as it gives a higher number of results per general search term (on average), covers non-ISI listed journals (a wider search base) and gives lower citation noise [lower citation variation (85% unique entries compared with ISI's 60%)], which means that there are fewer replicated citations per search (Pauly and Stergiou 2005, Meho and Yang 2007).

The first one hundred search results from each keyword combination were examined, so a total of 2300 hits were evaluated for inclusion in the review (23 searches × 100 hits of each). From each article highlighted in the literature search, eight data variables were extracted and entered into a database (see Table 1 for details). In addition to categorical variables, brief one-sentence summaries of each article were made to allow discussion of more general, non-quantifiable patterns post-analysis and to increase the utility of the database resulting from the literature review.

Statistical analyses and graphical outputs

We used ordinary least squares regression to investigate trends in the number of publications over time as well as the methods used within each and how the research focus has changed. It must be noted that the statistics described herein for each are casual tendencies as in all cases normality is violated but the data were not transformed in order to reduce the tendency to inflate type I error. The geographic distribution of the studies, years of publication, the subject organisms of the studies (if applicable) and the topic of focus (ecology vs economy vs social wellbeing) across Baja California was visualized using the Tableau 9.1 software. Finally, in order to elucidate the financial investments being made in marine ecotourism research in Baja California, we noted the agency types from which funding came for each publication reviewed (where specified).

Table 1. – List of data variables extracted (where possible) from each publication selected by the literature review.

Data variable extracted	Description of variable	Categories (if applicable)
Year	Year in which the article was published	1994-2014 (20 years)
Publication	Type of publication in which the article appears	Book, conference paper, peer-reviewed paper, thesis
Location of Study	Latitude and Longitude (if not clearly stated a middle point of the general study area was recorded)	Groups also given (Baja California general, North, South and Pacific coast of Baja California)
Species studied	Which species were the focal point of the discussions (highest taxonomicresolution possible was recorded)	
Study method	The way in which data were gathered/ recorded within the article	Literature review, survey/ interview, qualitative discussion, quantitative observation, modelling approach, GIS-specific study
Study topic	Main study topic area on which the article focuses its discussion	Ecology, economy, social wellbeing (note that one study can have more than one study topic focus)
Funding	If noted, a description of where the funding for the article came from	International, international organization within Mexico, Mexican organization, funding not specified

RESULTS

The literature search identified 47 publications that directly (quantitative analysis) or indirectly (discussion) addressed marine ecotourism in the Gulf of California and Baja California Peninsula, Mexico (see Supplementary Table S2). There was a significant increase over time in the number of all publications (n=47), peer-reviewed articles (n=25) and books (n=7) from 1994 to 2014 (R^2=0.43, P <0.01; R^2=0.25, P=0.02; R^2=0.25, P=0.02, respectively) (Fig. 1). The number of theses (n=15) studying marine ecotourism in Baja California also increased over time, although the increase was not statistically significant (R^2=0.17, P=0.065). The majority of studies were concentrated around Baja California Sur, with only four representing the eastern coast of the Gulf of California (Supplementary material Table S2).

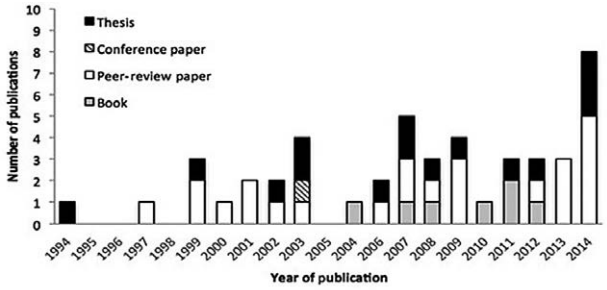

Fig. 1. – Numbers of publications highlighted in the literature search per year, separated by publication type. Note: one publication from 1976 was not included in the figure or analyses.

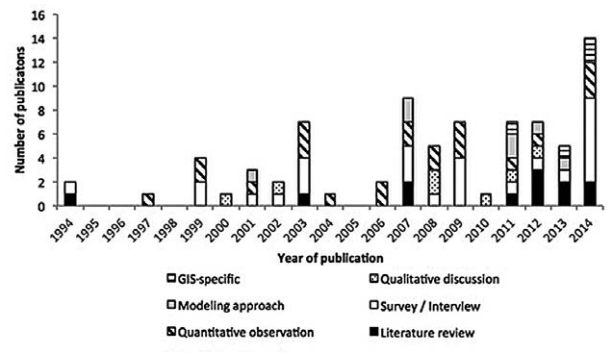

Fig. 2. – Numbers of publications highlighted in the literature search per year, separated by study type. Note: one publication from 1976 was not included in the figure.

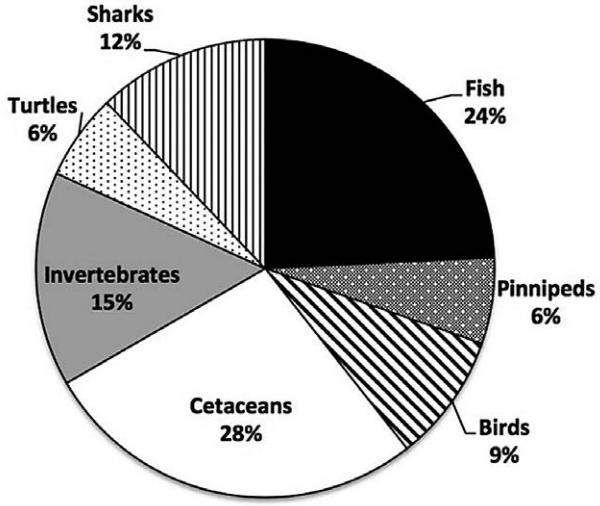

Fig. 3. – Pie chart showing the percentages of publications discussing the different animal groups noted in the review (note: total number of species-specific studies=33).

There was also a significant tendency for the number of studies using survey interview techniques (n=26) to increase over the 20-year study period (Fig. 2; R^2=0.31, P=0.039). Similar linear increases were seen for literature review techniques (n=12) and studies compiling observed data for quantitative analysis (n=22), although the increases were not statistically significant (R^2=0.31, P=0.087, R^2=0.16 P=0.075 respectively). There were no tendencies noted for study methods using qualitative discussions (n=7), modelling approaches (n=7) or GIS-specific studies (n=4).

Of the publications reviewed, 70% focused on a species or species group, including formal quantitative analyses (Figs 3 and 4A). Cetaceans (*Eschrichtius robustus* and *Megaptera novaeangliae*) and fishes (Istiophoridae spp., *Rhyncodon typus* and *Makaira nigricans*) were the most common groups studied, while turtles and pinnipeds were the least studied. Although one species of bird (*Charadius alexandrinus*) was noted, this was from a study undertaken in 1976 (Anderson et al. 1976) that only mentions development potential in Baja California and therefore does not compare well with the more rigorous discussions of marine tourism in Baja California over the last 20 years. The majority (68%) of publications focused

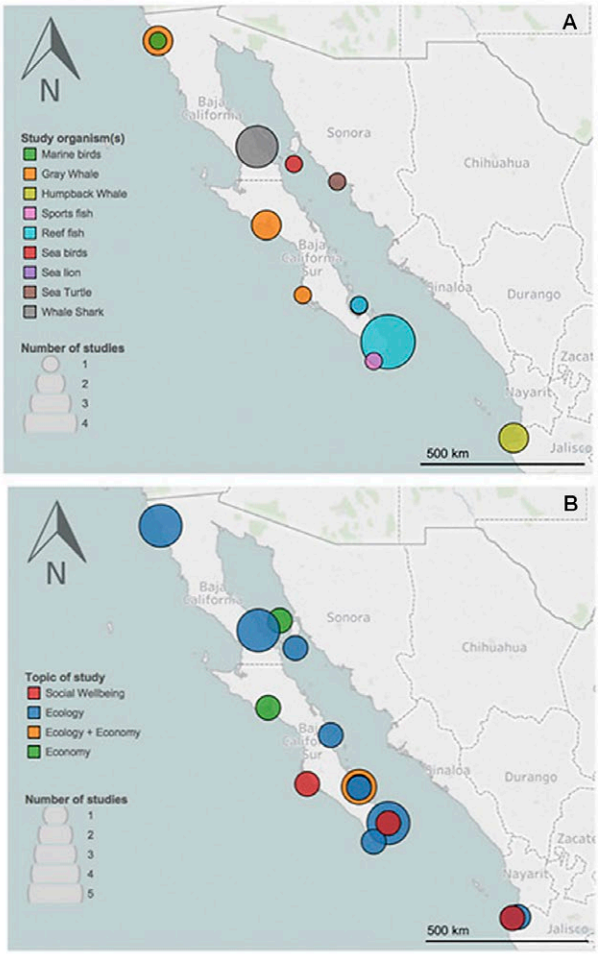

Fig. 4. – Approximate locations of studies on (A) species-specific studies and (B) studies that focus on ecology, economy or human social wellbeing for the Gulf of California and Baja California region. The size of the bubbles represents the number of studies at each location.

on ecological goals or discussions, 25% focused on economics, and the remaining 7% focused on human social wellbeing (Fig. 4B).

Funding for marine ecotourism studies of the Gulf of California came primarily (23%) from Mexico-only sources, and equal proportions (15% each) came from Mexican sources with foreign collaborators and from only foreign sources. Almost half (48%) of the publications did not describe the source of the financial support for the project, study or article, so drawing firm conclusions regarding funding patterns is difficult in this instance.

DISCUSSION

Ecotourism is a rapidly expanding industry throughout the world, and certainly in the Gulf of California and Baja California Peninsula region of northwest Mexico. Our review summarizes key research insights, trends, and gaps and highlights in particular information that is unevenly available for specific regions, themes and species. We discuss each of these trends and their implications below, address potential limitations of this study, and offer considerations for future ecotourism research and policies in the region and elsewhere.

Trends over time

Increased research effort over the 20 years reviewed is a promising trend, which, considering the potential of the Baja California Peninsula for ecotourism operations, the authors hope will continue. In particular, we believe that a continued effort to increase the amount of peer-reviewed output in the field will benefit the development of the marine ecotourism industry in a sustainable way, as it already has done, for example, in the formation of strict rules governing sighting programmes for whales (Heckel et al. 2003) and whale sharks (Cárdenas-Torres et al. 2007). Although theses made up approximately one third of all published materials reviewed, very few showed a similar publication rate for peer-reviewed articles. This could indicate a wasted research effort if, for example, NGOs or government agencies rely only on robust, peer-reviewed scientific output rather than student theses, whose rigour can be questioned more easily.

In terms of the study methodologies within the peer-reviewed publications, the increasing number of quantitative studies is also promising. Quantitative surveys likely give more strength to conclusions drawn from them than qualitative-only studies. They are also likely to be more directly usable in management applications, which often rely on numeric thresholds, such as carrying capacities of an area or the potential revenue of a given activity. The low numbers of studies employing modelling and GIS techniques is understandable as these are much newer analytical techniques than the other methods reviewed.

Locations of focus in Baja California

It is interesting to note that few studies on the Sonoran and Sinaloan coast were uncovered by our literature search. This paucity could be caused by a lack of research investment in these areas, a low number of marine ecotourism operations along these stretches of coast, or the fact that our literature search did not select these areas well using "Baja California" as a geographic search term. The south of the Baja Peninsula was comparatively well studied, with the majority of recent studies occurring in Cabo Pulmo and La Paz. This is likely due to the age of marine ecotourism operations in these areas based on the infrastructure (airports, road networks etc.) that has allowed rapid local growth. The spread of study type (ecology, economy and social wellbeing) across Baja California showed no distinct pattern, although it is clear that ecological publications dominate across the peninsula. Much of coastal Baja California and its surrounding waters are understudied, which is evident from the large stretches of coast for which no publications were found and the grouping of publications mainly around established towns and cities. This finding highlights a tendency for studies of marine ecotourism to be reports on extant operations rather than projections or predictions on the

future potential of areas yet to be developed. This is something that would be beneficial to address, particularly in areas of ecological importance. In instances in which data already exist, development will be able to account for more than just potential revenue gains if information is freely available to stakeholders from the outset of a development proposal (e.g. Vanderplank et al. 2014).

Species of interest

The large number of publications studying or discussing whale sightseeing tourism were focused on the Pacific coast of the Baja California Peninsula, including the well-established ecotourism destination Laguna San Ignacio (Chong 2008, Rossing 2006). Being the most charismatic of the species noted, it is not surprising that whales (Gray and Humpback) were the largest of the organismal groups noted. The large number of studies concentrating on reef fish species are centred around the rocky reefs of the Cabo Pulmo National Park, as were the studies noting invertebrate species (Arizpe 2004). A 20-year closure to fishing has led to a 463% increase in fish biomass (Aburto-Oropeza et al. 2011) at Cabo Pulmo, which is now an important model system of successful ecotourism and marine conservation globally (Leslie et al. 2013). Surprisingly, only one of the studies highlighted in the literature search looked specifically at sports fishing in Baja California. Considering the general declining state of the Gulf of California's fishing industry (Sala et al. 2004, Lluch-Cota et al. 2007) and the large number of sports fishing operators working from Baja California (Sievanen 2014), we expected more publications to detail the sports fishing industry as an economically viable alternative to traditional fishing (Barnett et al. 2015).

Ecology, economy, social wellbeing

As mentioned above, we decided a priori that each study could be categorized into either ecological, economic or social wellbeing studies, or any combination of the three. Overall, a tendency towards ecology over economy over social wellbeing was clear. This pattern was also clear within papers that discussed a combination of two or all three of the study topic types, discussions of ecology taking precedence over economy and few analyses or conclusions regarding human social wellbeing. The lack of social wellbeing may, however, be a result of the relatively new industry of marine ecotourism in Baja California, which in some cases may mean that little social change has yet taken place since new operations were set up in certain areas. This, however, does not appear to be true for the more developed areas such as Cabo Pulmo, Cabo San Lucas and Ensenada, the locations of all of the social studies reviewed. The prevalence of ecological publications related to marine ecotourism in Baja California may well be attributed to the research objectives of the main funding bodies, all of which are ecology-based rather than economic or social science institutes / agencies [CONACYT (Consejo Nacional De Ciencia Y Tecnología), CICIMAR (Centro Interdisciplinario de Ciencias Marinas) and CICESE (Centro de Investigación Científica y Educación Superior de Ensenada)]. Mexican agencies have been the most prevalent funders of the publications highlighted in our review, most notably CONACYT.

Limitations and considerations

Our comprehensive literature search allowed us to highlight some important trends and patterns in the field of marine ecotourism research in the Gulf of California and Baja California Peninsula, Mexico. It is, however, important to discuss possible limitations of our approach and the bearing they may have on our conclusions. This quantitative, systematic analysis included theses, books and conference papers. Although these three publication types do undergo some sort of peer-review process, it could be argued that it is not as stringent as that of peer-reviewed journal articles, which might invalidate some of the findings within the publications presented. Our analyses, however, are concerned with patterns in a field of research rather than scientific rigour.

Although the time period of publications we reviewed does not include anything earlier than 1994, this time period suitably captures regional research patterns; indeed, the literature search only highlighted one paper outside of this time frame (Anderson et al. 1976). Work by López-Espinosa de los Monteros (2002) also indicates that ecotourism in the southern Baja California Peninsula began following this period. Although we used a comprehensive, quantitative approach to select relevant publications, it is impossible to say that the literature search is exhaustive. There are likely to be articles that were missed by the search term combinations we chose or have never made it into mainstream search-engine territory. Finally, it must be noted what truly classifies "marine" in our review. One fifth of all of the publications included in the review actually discuss what may be classified as terrestrial ecotourism instead of marine-based activities. Such publications were, however, kept in the analysis if they linked strongly with marine systems (e.g. coastal wetlands or sea cliffs) or the main discussion in the publication also drew conclusions relating directly to marine systems (e.g. effluent from hotels running into marine systems).

It is also important to mention the robustness of our analysis of trends using ordinary least squares regressions. Although the method is appropriate for the analysis of linear trends, a lack of data in some instances means that our interpretations must be taken with caution. For example, the statistical significance of regressions that were run with few (e.g. less than 10) points is based on a small sample size and may therefore not be wholly representative of the existence or absence of real-world trends. Unfortunately, because of the lack of data for some of the regressions run, this problem cannot be overcome. The lack of data does, however, highlight the fact that, for example, there have been

few GIS studies of ecotourism in Baja California for the time period analysed. Overall, however, we believe that our literature review methodology captures the field of research publications relating to marine ecotourism in Baja California well, and provides important information relating to patterns in the field and future areas for development.

Future perspectives

Our review highlights some interesting patterns in the research effort relating to marine ecotourism in Baja California and the Gulf of California. However, there are multiple research areas in this field that could be bolstered to provide a more complete analysis of this industry. For example, theses form an important part of the total literature yet few have been published in peer-reviewed journals. Promoting the publication of theses in peer-reviewed publications may give their findings more weight in potential management decisions and a wider audience in general. In addition, there are few current modelling and GIS-specific studies of marine ecotourism in Baja California. Investing more research effort in predictive modelling studies and GIS outputs for use by resource managers (predicted, future quantities and map layers) will likely yield beneficial results.

A common theme in publication conclusions is the need for collaboration and involvement from all stakeholder groups. Collaborations between stakeholders and the research community will be strengthened if research actively incorporates stakeholders into research and reports findings back to those groups affected by the industries under study. For instance, sport fishing is under-represented in the literature as an ecotourism activity, yet makes up an important part of Baja California's ecotourism (Cisneros-Montemayor et al. 2012). More research outputs relating to the commercial and recreational fishing sector from the ecological, economic and social wellbeing perspectives would inform both the tourists taking part in such activities and the commercial fishers in these regions, who may consider converting to sports fishing operations if commercial catches in the Gulf continue to show signs of overexploitation (Sala et al. 2004).

Finally, there are many coastal areas in Baja California and the Gulf of California that appear never to have been studied. As tourism and human populations throughout the region continue to grow (Agersted 2006, Center for Responsible Travel 2017), it is important to have information, data and opinions ready for development committees wishing to transform areas of Baja California into holiday hotspots. Pre-development studies will be hugely beneficial in informing stakeholders but must be directed at areas of promise that are likely to be subject to development in the coming years. While overall ecology dominates the literature over economy and social studies, future studies that incorporate the fields of economy and human social wellbeing would provide managers with a more complete suite of information relating to Baja California's marine ecotourism development.

ACKNOWLEDGEMENTS

The authors would like to thank The Nature Conservancy Mexico for funding the work (contract number: CNOMEX-111715) and in particular Diana Bermudez and Mariana Walther Mendoza and the anonymous reviewers for commenting on earlier versions of this draft. AMC-M acknowledges support from the Nippon Foundation Nereus Program.

REFERENCES

Aburto-Oropeza O., Erisman B., Galland G.R., et al. 2011. Large recovery of fish biomass in a no-take marine reserve. PLoS ONE 6: e23601. https://doi.org/10.1371/journal.pone.0023601

Acevedo A.L.M. 2012. Diagnóstico y Perspectivas del Turismo Alternativo en Todos Santos, Ph.D. thesis, Univ. Autónoma Baja California Sur.

Agersted P.R. 2006. Evaluating ecotourism in Mexico's Biosphere Reserves – Whale watching activities in the World Heritage Site of Laguna San Ignacio, Baja California Sur, Mexico, 1994-2002. MSc thesis, University of British Columbia, 168 pp.

Anderson D.W., Mendoza J.E., Keith J.O. 1976. Seabirds in the Gulf of California: a vulnerable, international resource. Nat. Resour. 16: 483-505.

Archer B., Cooper C., Ruhanen L. 2012. The positive and negative impacts of tourism. In: Theobald W. (ed.), Global Tourism, Routledge, Nueva York, pp. 79-102.

Arizpe O. 2004. El turismo como alternativa a la pesca en el manejo de un arrecife coralino. Caso Cabo Pulmo, Golfo de California. Manejo Costero en México 42: 573-588. http://etzna.uacam.mx/epomex/pdf/mancos/cap42.pdf

Arizpe O, Covarrubias M. 2010. Sustainable tourism planning for the only coral reef in the Gulf of California: Cabo Plumo national park. WIT Trans. Ecol. Environ. 139: 263-273.

Arizpe O., Gámez A. 2011. An alternative tourism model for sustainable development in Los Cabos, Baja California Sur, Mexico. WIT Trans. Ecol. Environ. 144: 191-198. https://doi.org/10.2495/ECO110171

Ávila-Foucata V.S., Sánchez Vargasa A., Frisch Jordan A., et al. 2013. The impact of vessel crowding on the probability of tourists returning to whale watching in Banderas Bay, Mexico. Ocean Coast. Manage. 28. 12-17. https://doi.org/10.1016/j.ocecoaman.2013.03.002

Barnett A., Abrantes K.G., Baker R., et al. 2015. Sportfisheries, conservation and sustainable livelihoods: a multidisciplinary guide to developing best practice. Fish Fish. 17: 696-713. https://doi.org/10.1111/faf.12140

BANXICO. 2016. Viajeros internacionales, gasto y número de viaje. Banco de México.

Brenner L., Mayer M., Claudia S. 2016. The economic benefits of whale watching in El Vizcaíno Biosphere. Econ. Soc. Territ. XVI: 429-457. https://doi.org/10.22136/est002016637

Cárdenas-Torres N., Enríquez-Andrade R., Rodríguez-Dowdell N. 2007. Community-based management through ecotourism in Bahia de Los Angeles, Mexico. Fish. Res. 84: 114-118. https://doi.org/10.1016/j.fishres.2006.11.019

Carrillo M.A., Ritter F.A. 2010. Increasing numbers of ship strikes in the Canary Islands: proposals for immediate action to reduce risk of vessel-whale collisions. J. Cetacean Res. Manage. 11: 131-138.

Center for Responsible Travel. 2017. The Case for responsible travel : Trends and statistics. 2016. Center for Responsible Travel, Washington, 15 pp. Available online at: https://www.responsibletravel.org/whatWeDo/The_Case_for_Responsible_Travel_2016_Final.pdf

Chong S. 2008. Sustainability and balanced ecotourism management: Lessons from whale watching in Laguna San Ignacio, Baja California sur, Mexico. Ph. D. thesis, Queen's University, Kingston, 78 pp.

Cisneros-Montemayor A.M., Sumaila U.R. 2010. A global estimate of benefits from ecosystem based marine recreation: Potential impacts and implications for management. J. Bioecon. 12: 245-268. https://doi.org/10.1007/s10818-010-9092-7

Cisneros-Montemayor A.M., Christensen V., Arreguín-Sánchez F., et al. 2012. Ecosystem models for management advice: An

analysis of recreational and commercial fisheries policies in Baja California Sur, Mexico. Ecol. Model. 228: 8-16. https://doi.org/10.1016/j.ecolmodel.2011.12.021
Cisneros-Montemayor A.M., Barnes-Mauthe M., Al-Abdulrazzak D., et al. 2013. Global economic value of shark ecotourism: implications for conservation. Oryx 47: 381-388. https://doi.org/10.1017/S0030605312001718
Dagostino R.M.C., Lemus J.L.C., Romo E.A., et al. 2009. Impactos del turismo en las comunidades pesqueras de la Bahía de Banderas, Nayarit-Jalisco. Acta Pesq. 2: 23-40.
Das S. 2011. Ecotourism, Sustainable Development and the Indian State. Econ. Polit. Wkly. 46: 60-67.
Das M., Chatterjee B. 2015. Ecotourism: A panacea or a predicament? Tourism Manage. Persp. 14: 3-16. https://doi.org/10.1016/j.tmp.2015.01.002
Farr M., Stoeckl N., Alam Beg R. 2014. The non-consumptive (tourism) "value" of marine species in the Northern section of the Great Barrier Reef. Mar. Policy 43: 89-103. https://doi.org/10.1016/j.marpol.2013.05.002
Gallagher A.J., Hammerschlag N. 2011. Global shark currency: The distribution frequency and economic value of shark ecotourism. Curr. Issues Tourism 14: 797-812. https://doi.org/10.1080/13683500.2011.585227
Gámez A.E, Ganster P. 2012. Traditional tourism in Los Cabos: Opportunities and limitations of economic growth. Los Cabos: Prospective of a Natural and Touristic Paradise. In: Ganster A., Ivanova A., Arizpe O. (eds), Sustainable Tourism, San Diego State Univ. Press. San Diego.
Grismer L.L. 2002. Amphibians and Reptiles of Baja California, Including Its Pacific Islands and the Islands in the Sea of Cortés. Univ. California Press Ed. 413 pp. https://doi.org/10.1525/california/9780520224179.001.0001
Hammerschlag N., Gallagher A.J., Wester J., et al. 2012. Don't bite the hand that feeds: Assessing ecological impacts of provisioning ecotourism on an apex marine predator. Funct. Ecol. 26: 567-576. https://doi.org/10.1111/j.1365-2435.2012.01973.x
Hausmann A., Slotow R., Fraser I., et al. 2017. Ecotourism marketing alternative to charismatic megafauna can also support biodiversity conservation. Anim. Conserv. 20: 91-100. https://doi.org/10.1111/acv.12292
Heckel G., Reilly S.B., Sumich J.L, et al. 2001. The influence of whalewatching on the behaviour of migrating gray whales (*Eschrichtius robustus*) in Todos Santos Bay and surrounding waters, Baja California, Mexico. J. Cetacean Res. Manage. 3: 227-237.
Heckel G., Espejel I., Fischer D.W. 2003. Issue Definition and Planning for Whalewatching Management Strategies in Ensenada, Mexico. Coast. Manage. 31: 277-296. https://doi.org/10.1080/08920750390198504
Higginbottom K., Scott N. 2016. Wildlife Tourism: a strategic destination analysis, In: Higginbottom K. (ed.) Wildlife Tourism, Impacts, Management and Planning, Univ. Press, 275 pp.
Honey M., Krantz D. 2007. Global Trends in Coastal Tourism. Center on Ecotourism and Sustainable Development, Washington DC. 140 pp. https://www.responsibletravel.org/docs/Global_Trends_in_Coastal_Tourism_by_CESD_Jan_08.pdf
Howell S.N.G., Erickson R.A., Hamilton R.A., et al. 2001. An annotated checklist of the birds of Baja California and Baja California Sur. In: Erickson R.A., Howell S.N.G. (eds) Birds of the Baja California Peninsula: status, distribution and taxonomy, Monog. Field Ornithol. 3: 171-203.
Hoyt E., Iñíguez M. 2008. The State of Whale Watching in Latin America. WDCS, IFAW, Global Ocean, Chippenham, UK; Yarmouth Port, USA; London, 60 pp. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.231.9844&rep=rep1&type=pdf
Isaacs J.C. 2000. The limited potential of ecotourism to contribute to wildlife conservation. Wildl. Soc. Bull. 28: 61-69. http://www.globalforestcoalition.org/wp-content/uploads/2010/12/Ecotourism-Isaacs.pdf
Johnston A. 2000. Indigenous peoples and ecotourism: Bringing indigenous knowledge and rights into the sustainability equation. Tourism Recr. Res. 25: 89-96. https://doi.org/10.1080/02508281.2000.11014914
Labrada-Martagón V., Aurioles-Gamboa D., Martínez-Díaz S.F. 2005. Natural and human disturbance in a rookery of the California sea lion (*Zalophus californianus californianus*) in the Gulf of California, Mexico. LAJAM 4: 175-185. https://doi.org/10.5597/lajam00080
Leslie H.M., Goldman E., McLeod K.L. et al. 2013. How good science and stories can go hand-in-hand. Conserv. Biol. 27: 1126-1129. https://doi.org/10.1111/cobi.12080
Lluch-Cota S.E., Aragón-Noriega E.A., Arreguín-Sánchez F., et al. 2007. The Gulf of California: Review of ecosystem status and sustainability challenges. Progr. Oceanogr. 73: 1-26. https://doi.org/10.1016/j.pocean.2007.01.013
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? Biodiv. Conserv. 11: 1539-1550. https://doi.org/10.1023/A:1016887417263
Mayer M., Brenner L., Schauss B., et al. 2018. The nexus between governance and the economic impact of whale-watching. The case of the coastal lagoons in the El Vizcaíno Biosphere Reserve, Baja California, Mexico. Ocean Coast. Manage. 162: 46-59. https://doi.org/10.1016/j.ocecoaman.2018.04.016
Meho L.I., Yang K. 2007. Impact of data sources on citation counts and rankings of LIS faculty: Web of science versus scopus and google scholar. J. Am. Soc. Sci. Tech. 58: 2105-2125. https://doi.org/10.1002/asi.20677
Mieras P.A., Harvey-Clark C., Bear M., et al. 2017. The Economy of Shark Conservation in the Northeast Pacific: The Role of Ecotourism and Citizen Science. Adv. Mar. Biol. 78: 121-153. https://doi.org/10.1016/bs.amb.2017.08.003
Miller M.L. 1993. The rise of coastal and marine tourism. Ocean Coast. Manage. 20: 181-199. https://doi.org/10.1016/0964-5691(93)90066-8
Neilson J.L., Gabriele C.M., Jensen A.S., et al. 2012. Summary of reported whale-vessel collisions in Alaskan waters. J. Mar. Biol. Art. ID 106282 https://doi.org/10.1155/2012/106282
Neumann D.R., Orams M.B. 2006. Impacts of Ecotourism on Short-Beaked Common Dolphins (*Delphinus delphis*) in Mercury Bay, New Zealand. Aquat. Mamm. 32: 1-9. https://doi.org/10.1578/AM.32.1.2006.1
Pauly D., Stergiou K.I. 2005. Equivalence of results from two citation analyses: Thomson ISI's citation index and Google's Scholar service. ESEP 2005: 33-35. https://doi.org/10.3354/esep005033
Peterson A.T., Ortega-Huerta M.A., Bartley J., et al. 2002. Future projections for Mexican faunas under global climate change scenarios. Nature 416: 626-629. https://doi.org/10.1038/416626a
Rossing P. 2006. Evaluating Ecotourism in Mexico's Biosphere Reserves–Whale Watching Activities in the World Heritage Site of Laguna San Ignacio, Baja California Sur, Mexico, 1994-2002. Ph.D. thesis, Univ. Ottawa. https://circle.ubc.ca/handle/2429/51
Rouphael A.B., Hanafy M. 2007. An alternative management framework to limit the impact of SCUBA divers on coral assemblages. J. Sustain. Tourism 15: 91-103. https://doi.org/10.2167/jost611.0
Sala E., Aburto-Oropeza O., Reza M., et al. 2004. Fishing down coastal food webs in the Gulf of California. Fisheries 29: 19-25. https://doi.org/10.1577/1548-8446(2004)29[19:fdcfwi]2.0.co;2
Salvadeo C.J., Lluch-Cota S.E., Maravilla-Chávez M.O., et al. 2013. Impact of climate change on sustainable management of gray whale (*Eschrichtius robustus*) populations: Whale-watching and conservation. Arch. Biol. Sci. 65: 997-1005. https://doi.org/10.2298/ABS1303997S
Sievanen L. 2014. How do small-scale fishers adapt to environmental variability? Lessons from Baja California, Sur, Mexico. Marit. Stud. 13: 1-19. https://doi.org/10.1186/s40152-014-0009-2
Spalding M., Burke L., Wood S.A., et al. 2017. Mapping the global value and distribution of coral reef tourism. Mar. Policy 82: 104-113. https://doi.org/10.1016/j.marpol.2017.05.014
United Nations Framework Convention on Climate Change (UNFCCC). 2007. Uniting on climate. 44 pp. https://unfccc.int/resource/docs/publications/unitingonclimate_eng.pdf
Vanderplank S., Wilder B.T., Ezcurra E. 2014. Uncovering the dryland biodiversity of the Cabo Pulmo region. Botanical Research Institute of Texas, Next Generation Sonoran Researchers and University of California Institute for Mexico and the United

States, USA, 122 pp.
Vianna G.M.S., Meekan M.G., Pannell D.J., et al. 2012. Socio-economic value and community benefits from shark-diving tourism in Palau: A sustainable use of reef shark populations. Biol. Conserv. 145: 267-277. https://doi.org/10.1016/j.biocon.2011.11.022
Vilchis L.I., Tegner M.J., Moore J.D., et al. 2005. Ocean warming effects on growth, reproduction, and survivorship of Southern California Abolone. Ecol. Appl. 15: 469-480. https://doi.org/10.1890/03-5326
Wall G. 1997. Is Ecotourism Sustainable? Environm. Manage. 21: 483-491. https://doi.org/10.1007/s002679900044
Young E.H. 2016. Balancing Conservation with Development in Small-Scale Fisheries: Is Ecotourism an Empty Promise? Hum. Ecol. 27: 581-620. https://www.jstor.org/stable/4603336
Zakai D., Chadwick-Furman N.E. 2002. Impacts of Intensive Recreational Diving on Reef Corals at Eilat, Northern Red Sea. Biol. Conserv. 105: 179-187. https://doi.org/10.1016/S0006-3207(01)00181-1
Zeppel H. 2008. Education and conservation benefits of marine wildlife tours: Developing free-choice learning experiences. J. Environ. Educ. 39: 3-18. https://doi.org/10.3200/JOEE.39.3.3-18
Ziegler J., Dearden P., Rollins R. 2012. But are tourists satisfied? Importance-performance analysis of the whale shark tourism industry on Isla Holbox, Mexico. Tourism Manage. 33: 692-701. https://doi.org/10.1016/j.tourman.2011.08.004

SUPPLEMENTARY MATERIAL

The following supplementary material is available through the online version of this article and at the following link:
http://scimar.icm.csic.es/scimar/supplm/sm04880esm.pdf

Table S1. – Search terms used to describe the published literature related to marine ecotourism in Baja California; x denotes use in the search.
Table S2. – Table of the 47 publications identified and reviewed.

Scientia Marina 83(2)
June 2019, S1-S5, Barcelona (Spain)
ISSN-L: 0214-8358

Marine ecotourism in the Gulf of California and the Baja California Peninsula: Research trends and information gaps

Andrew F. Johnson, Claire Gonzales, Amanda Townsel, Andrés M. Cisneros-Montemayor

Supplementary material

Table S1. – Search terms used to describe the published literature related to marine ecotourism in Baja California. x denotes use in the search.

	Number of search																						
Search term	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Marine	x	x	x	x			x		x	x													
Ecotourism		x	x		x																		
Tourism	x			x		x					x	x	x	x	x	x	x	x	x	x	x	x	x
Industry	x						x		x														
Baja California		x						x		x	x	x	x	x	x	x	x	x	x	x	x	x	x
Mexico	x	x	x	x	x	x	x		x		x	x											
Holiday				x																			
Vacation		x						x															
Recreation							x			x													
Economy					x				x														
Infrastructure							x																
Employment										x													
Environment			x						x														
Eco				x																			
Nature								x		x													
Diving											x												
Snorkelling												x											
Whale watching													x										
Shark watching														x									
Beach															x								
Kayak																x							
Sailing																	x						
Cruise																		x					
Fishing																			x				
Angling																				x			
Wildlife																					x		
National park																						x	
Protected area																							x
Total unique	7	2	1	0	0	2	1	1	0	7	0	2	4	1	2	5	0	1	1	2	1	3	3
For review	7	9	10	10	10	12	14	15	15	22	22	24	28	29	31	36	36	37	38	40	41	44	47

Table S2. – Table of the 47 publications identified and reviewed.

Year	Title	1st author	Publication	General result / conclusion
2012	Diagnostico y perspectivas del turismo alternativo en Todos Santos, Baja California Sur.	Acevedo	Auto. Uni. Baja California Sur	Development of the ecotourism sector must involve the inclusion of the local communities and all stakeholders must be involved with future management designs.
2014	Proyecto de sustentabilidad ecoturístico en el parque nacional Cabo Pulmo; análisis de los servicios ecosistémicos para la implementación de actividades económicas turísticas	Aguilar	Auto. Uni. Baja California Sur	Development of ecotourism in Cabo Pulmo must primarily be sustainable, giving priority to the environmental services of the local area, then the economy of the tourism industries in the area.
1999	Conservation and management-oriented ecological research in the coastal zone of Baja California, Mexico	Anamaria	J. of Coastal Conserv.	Destruction of dunes will have huge consequences for bird populations and use of this resource into the future.
1976	Seabirds in the Gulf of California: a vulnerable, international resource	Anderson	Nat. Res. J.	Conservation of birds needs prioritizing over development, as once populations are impacted it is hard to restore them to natural levels.
2004	El turismo como alternativa a la pesca en el manejo de un arrecife coralino. Caso Cabo Pulmo, Golfo de California.	Arizpe	Auto. Uni. Baja California Sur	The conversion from fishing to diving operations in Cabo Pulmo has actually afforded greater economic returns to the local population of the village.
2014	Geodiversidad y paisaje: un análisis de su potencial en Baja California, México	Ayala	Invest. Geograficas	The idea of geoparks and their scale means practical conservation units and the involvement of many sectors for their conservation and all ecosystem services within each area.
2009	Investigating the potential for marine resource protection through environmental service markets: an exploratory study from La Paz, Mexico	Barr	Ocean and Coast. Management	Compensation (60 USD per week) outweighed willingness to pay by tourism sector.
2000	Spatial journeys: eco-tourism in the lower delta region of the Colorado river and the upper Gulf of California.	Clement	Uni of Arizona	Preservation through tourism that involves locals is the key to management of the area.
2014	Educación ambiental para prestadores de servicios turísticos vinculados al avistamiento de cetáceos en Puerto Adolfo López Mateos, municipio de Comondú, Baja California Sur (BCS)	Colin	Auto. Uni. Baja California Sur	Tourists in general would benefit from more environmental information for the sightseeing they are undertaking. This will have wider-reaching benefits in terms of stakeholder education and environmental awareness.
2009	Impactos del turismo en las comunidades pesqueras de la Bahia de Banderas, Nayarit-Jalisco.	Dagostino	Acta Pesquera	Livelihood and satisfaction of fishermen was greater in years gone by but the opinion of ecotourism is good and fishermen expect that it will help low economic returns experienced in recent years in the fishing industry locally.
2002	The impact of international tourism on community-based development in Baja California Sur, Mexico.	Doloutskaia	Duke University	Communities need to clearly define their development goals, and in many cases it is beneficial to enlist the help of NGOs to study the present systems and provide recommendations for development.
2007	Property rights-based management: whale shark ecotourism in Bahia de Los Angeles, Mexico	Dowdell	Fisheries Research	The best option for the area is a concession in favour of the local users.
2003	Tourism-based revenue generation mechanisms	Drumm	World Parks Congress	Protected areas need income generation strategies including visitor fees.
2008	The imprints of tourism in Puerto Vallarta Jalisco, Mexico	Everitt	The Canadian Geographer	Economic change must come with environmental sustainability if the growth is to be sustainable.
2013	The impact of vessel crowding on the probability of tourists returning to whale watching in Banderas Bay, Mexico	Foucat	Ocean and Coast. Man.	Crowding in operations negatively affects the likelihood of returning to the area for tourists and most tourists agreed that a maximum number of boats for a trip was two.
2006	Some biological aspects of blue marlin (Makaira nigricans) in the recreational fishery at Cabo San Lucas, Baja California Sur, Mexico	Garcia	Bull. Mar. Sci.	Higher sea surface temperatures mean better catch for the sports fishers, and few reproductively active females were caught in the fishery.
2013	Economic analysis of the tourism and its impacts in the ecosystems services for the coastal area in Baja California Sur	Garcia	J. Bus. and Econ.	Housing and tourism developments have caused significant changes in ecosystem services in the area.
2001	Management priorities for Magdalena Bay, Baja California, Mexico	Hastings	J. Coast. Conserv.	Conflicts exist in Bahia Magdalena between stakeholder groups related to management priorities.

Table S2 (Cont.). – Table of the 47 publications identified and reviewed.

Year	Title	1st author	Publication	General result / conclusion
2001	The influence of whalewatching on the behaviour of migrating gray whales (*Eschrichtius robustus*) in Todos Santos bay and surrounding waters, Baja California, Mexico	Heckel	J. Cet. Res. and Man.	Whale behaviour did not change during the southbound migration but did alter during the northbound migration.
2003	Issue definition and planning for whale watching management strategies in Ensenada, Mexico	Heckel	Coast. Manag.	Mexican whale-watching law is insufficient and self-regulation and law enforcement needs addressing so that migration corridors are not pushed offshore in the long-term.
2008	Servicios turísticos – Bahia de Los Angeles: recursos naturales y comunidad;	Danneman	Línea base 2007	Environmental protection must come before the economic development of Bahia de Los Angeles.
2003	Influencia del turismo sobre la conducta del lobo marino de california *Zalophus californianus* en la lobera los islotes, BCS, México.	Martagon	Centro Interdisciplinario de Ciencias Marinas (CICMAR)	25% of disturbances to the sea lion colony are directly caused by human interaction with the sea lions. There are no signs of habituation of the sea lions to the humans visiting the area.
2014	Servicios ecosistémicos con potencial turístico del parque nacional archipiélago Espíritu Santo, México	Martinez	Teoría y Praxis	The same restrictions should apply to sport fishing as they do to artisanal fishing, and more policing of the local waters is needed to ensure rules are followed by all stakeholder groups.
2014	Ecosystem services and their impact on poverty and inequality in coastal communities of Baja California Sur	Monroy	Int. J. Sust. Dev. and Plan.	Smaller communities dependent on ecosystem services had a higher poverty level, while ecosystems had a positive effect on improving the distribution of wealth.
2007	The economic benefits of ecosystem-based marine recreation: implications for management and policy	Montemayor	Auto. Uni. Baja California Sur	The effects of ecosystem dynamics in an already overfished system must not be overlooked, as they can hinder or even reverse desired management outcomes.
2012	Ecosystem models for management advice: an analysis of recreational and commercial fisheries policies in Baja California Sur, Mexico	Montemayor	Ecological Modelling	The effects of ecosystem dynamics in an already overfished system must not be overlooked, as they can hinder or even reverse desired management outcomes.
2002	Evaluating ecotourism in natural protected areas of La Paz bay, Baja California Sur, Mexico: ecotourism or nature-based tourism?	Monteros	Biod. and Conserv.	The majority of operators classified as ecotourism operators were found to be benefiting conservation locally in some way, but costs are not comparable to those required to conserve the protected areas of the region.
2014	La huella de carbono de la observación de ballena jorobada (*Megaptera novaeangliae*) en las Islas Marietas, Nayarit, México	Ortega	Rev. Int Contam. Amb.	Per passenger carbon footprints of the whale watching operations in Islas Marietas are above the global average.
2000	El ecotourismo, una nueva modalidad del turismo de masas	Rabago	Rev. Int Contam. Amb.	In order for ecotourism to develop to its full potential, it is essential to have local communities involved at all stages of its development.
2013	Impact of climate change on sustainable management of Gray whale (*Eschrichtius robustus*) populations: whale-watching and conservation	Salvadeo	Arch. Bio. Sci.	Climate change is good for calf production in terms of numbers but bad in terms of the new areas that will eventually become new whale watching grounds where the whales will face new threats.
2007	A social relational approach to the conservation and management of fisheries: the rural communities of the Loreto bay national marine park, BCS, Mexico	Sanchez	Simon Fraser University	Cultural values and tradition are deeply embedded in fishing communities and information sharing is prevalent within communities but not as widespread between communities.
2003	The influence of social capital on the development of nature tourism: a case study from Bahia Magdalena, Mexico	Sawatsky	Uni of Toronto	Significant differences in the types of social capital can explain the structure of ecotourism operations in Bahia Magdalena.
2014	How do small-scale fishers adapt to environmental variability? Lessons from Baja California, Sur, Mexico	Sievanen	Mar. Stud.	Fishers have become more concerned with environmental variability and fluctuations in catch, but tourism development may give them an adaptation strategy which can mitigate reductions in earnings due to catch fluctuations.
2009	Management of a marine protected area for sustainability and conflict resolution: lessons from Loreto bay national park (Baja California Sur, Mexico)	Stamieszkin	Ocean and Coast. Man.	Management needs to be based on ecosystem science, and good communication between all stakeholders is essential to ensure shared co-management of the area.

Table S2 (Cont.). – Table of the 47 publications identified and reviewed.

Year	Title	1st author	Publication	General result / conclusion
1997	Human perturbations and conservation strategies for San Pedro Mártir island, Islas del Golfo de California reserve, México	Tershy	Environmental Conservation	Commercial fishers are responsible for more of the disturbances to the natural systems than tour operators, who follow their own guidelines to ensure minimal disturbance to the animals.
1999	A survey of ecotourism on islands in northwestern México	Tershy	Environmental Conservation	Neither government regulations nor cost of trips are important impediments to ecotour operators in the Northern Gulf of California.
2007	Community-based management through ecotourism in Bahia de Los Angeles, Mexico	Torres	Fisheries Research	Human interactions with the whale sharks may lead to negative impacts for both the sharks and the tourist industry relying on them. This paper led to the generation of a "code of conduct" for whale shark tourism operations.
2011	Economic benefits of recreational services provided by the aquatic biodiversity of the national park archipelago Espiritu Santo	Trejo	Nat. Auto. Uni. of Mexico	Foreign visitors perceive a greater benefit of local biodiversity conservation than local tourists and are willing to pay more to conserve it.
1999	Balancing conservation with development in small-scale fisheries: is ecotourism an empty promise?	Young	Human Ecol.	Secure local access rights and mobilization of nascent community-based organization could help develop the ecotourism industry in Baja California significantly.
2011	Maestría en ingeniería civil planeación territorial "planeación para el desarrollo regional sustentable con la incorporación del turismo en el corredor costero San Felipe – San Luis Gonzaga, Baja California, México (1988-2008)."	Zavala	Inst. Poli. Nac.	Infrastructure is the primary consideration in building tourism in the area of San Felipe and adjacent tourism corridors.
1994	Evaluating ecotourism in Mexico's biosphere reserves: whale watching activities in the world heritage site of Laguna San Ignacio, Baja California Sur, Mexico 1994-2002	Agerted	Uni. Baja California	Stakeholders would benefit from evaluating their current costs and considering technological investment (boat engines) as well as the wider spread use of the internet to promote their businesses.
2009	Establishing a socio-economic baseline of sea turtle ecotourism in Baja California Sur, Mexico	Finkbeiner	Duke Uni.	Perceptions of ecotourism are optimistic, although current participation is low, and in some areas infrastructure is lacking for current development of the industry.
2008	Sustainability and balanced ecotourism management: lessons from whale watching in Laguna San Ignacio, Baja California Sur, Mexico	Chong	Uni of Ontario	Future research should look at developing new ecotourism strategies as well as using St Ignacio as a case study on which to build other ecotourism opportunities in Mexico.
2010	Sustainable tourism planning for the only coral reef in the Gulf of California: Cabo Pulmo national park	Arizpe	Sust. Tour. IV	The quality of life has improved greatly since the protection of the area. High-impact sites need close future management observation to ensure the sustainability of the developments in the area.
2011	An alternative tourism model for sustainable development in Los Cabos, Baja California Sur, Mexico	Arizpe	Ecosyst. Sust. Dev. VIII	Los Cabos has inadequate development plans. Steps need to be taken to ensure that mass tourism does not overtake ecotourism in the area and in BCS in general.
2007	Traditional and alternative tourism in Loreto	Gámez	Loreto, The future of the first capital of the Californias	Continued development of Cabo Pulmo must account for the ecological integrity of the reefs on which the tourism is based and its development must involve the participation of all stakeholder groups.
2012	Sustainability and the traditional tourism model in Baja California Sur, Mexico	Ganster	Sust. Tour.V	The development of tourism in Baja California presents a clear threat to the ecosystems in the area. Future management considerations must foremost consider the environment, then the industrial development of BCS.