Journal of Sustainable Tourism

ISSN: 0966-9582 (Print) 1747-7646 (Online) Journal homepage: https://www.tandfonline.com/loi/rsus20

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To cite this article: Karen Hofman, Karen Hughes & Gabrielle Walters (2020): Effective conservation behaviours for protecting marine environments: the views of the experts, Journal of Sustainable Tourism, DOI: 10.1080/09669582.2020.1741597

To link to this article: https://doi.org/10.1080/09669582.2020.1741597

Published online: 03 May 2020.

JOURNAL OF SUSTAINABLE TOURISM
https://doi.org/10.1080/09669582.2020.1741597

Routledge
Taylor & Francis Group

Effective conservation behaviours for protecting marine environments: the views of the experts

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ABSTRACT

Conservation agencies and eco-tourism operators spend considerable effort developing strategies and programs to educate visitors about environmental issues. Typically, these include appeals for individuals to adopt environmentally friendly lifestyles. A review of messages distributed by marine conservation organisations and studies on interpretive tourism experiences on the Great Barrier Reef indicate there are multiple suggestions about which conservation behaviours to adopt. Despite the vast variety of options, research reveals visitors' uptake of conservation behaviours following eco-tourism experiences is low. To contribute to an increase in conservation campaign effectiveness, this study uses a Delphi technique to ascertain the views of a panel of stakeholders who hold significant knowledge, experience and expertise in the health, management and conservation of coral reefs about which conservation behaviours would contribute most towards protecting the Great Barrier Reef and other sensitive marine environments. Initially, the panel identified over 60 actions and behaviours. Further iterations reduced this number to 34 items which were grouped into six categories. The categories ranked as most important were political actions and education. A comparison between expert opinions and current practice is made and implications and recommendations for the future design of reef-based interpretive programs and conservation campaigns are discussed.

ARTICLE HISTORY
Received 19 September 2019
Accepted 6 March 2020

KEYWORDS
Great Barrier Reef; conservation behaviours; Delphi; expert opinion; climate change

Introduction

Nature-based tourist destinations continue to attract billions of visitors globally every year (UNWTO, 2017). Of the five million international visitors to Australia, 68% engaged in some form of nature-based activity in the year ending June 2016. Visits to Australia's aquatic and coastal environments accounted for over two million of these international visitors (Tourism Australia, 2016). The most well-known of these is the Great Barrier Reef (GBR) World Heritage Site, which is continually ranked as the number one reason to visit Australia (Lonely Planet, 2019). The GBR has received considerable attention of late from scientists, researchers, public figures and the media due to the declining health of coral, fish and their habitats as a direct result of climate change. Although it is widely accepted that climate change is the result of human practices, responsibility to fix the problem has been placed on industries such as farming, tourism, mining and commercial fishing, or on government policy and actions.

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More recently, attempts to mitigate climate change and the declining health of the environment have resulted in an increase in conservation campaigns and strategies to influence environmental behaviour and lifestyle changes at the individual and household level (Capstick et al., 2014). Numerous conservation organisations, tour operators, educators and researchers have developed conservation strategies and campaigns. One example is visitor interpretation programs in marine environments designed to enhance the public's awareness and uptake of actions to protect the health of these ecosystems. Despite these efforts, individuals still find it difficult to believe that their individual contribution will help fix environmental problems (Novak, 2017). Research into the effect of interpretation supports this, showing the uptake of conservation behaviours in a variety of contexts has a disappointing track record (Ballantyne et al., 2007, 2011; Brown, Ham & Hughes, 2010; Hughes, 2013; Hofman & Hughes, 2018; Jacobs & Harms, 2014; Zeppel & Muloin, 2008). An explanation for this may be that in many instances the campaigns appear to be conducted in an ad hoc fashion, producing a situation where many different (and sometimes disparate) actions are championed. Instructions about which actions individuals should prioritise are rare, as is justification for the choice of actions being promoted.

The widespread uptake of environmentally friendly behaviour is unlikely to occur unless people both understand and take responsibility for the consequences of their individual actions. In other words, individuals need information about i) the impact of their current actions on the environment and ii) the actions likely to have the most impact in protecting environmentally sensitive areas. Without this, efforts to educate the public about how they can assist with environmental conservation could be wasted. This study aims to identify which conservation actions and behaviours are likely to be most effective in protecting marine environments. It achieves this by employing a Delphi technique to elicit the opinions of stakeholders who are considered to hold significant knowledge, experience and expertise in the health, management and conservation of coral reefs.

Literature review

The use of interpretation to change behaviour

Climate change continues to be one of most important and pressing issues on the current international environmental agenda (Paterson, 2016; Pullin & Knight, 2009). This urgency has prompted action at global, national and local levels, using both hard and soft approaches. Hard approaches include management through regulation, policy, fees and ticketing, and physical structures such as boardwalks, barriers and fencing. Soft approaches utilise education, interpretation and communication campaigns to persuade the public to adopt environmentally responsible behaviour.

Interpretation is regularly championed as the best way to facilitate visitors' uptake of environmental behaviour (Ballantyne et al., 2011; Dierking et al., 2004; Hughes, 2013; Madin and Fenton, 2004; Orams & Hill, 1998; Powell & Ham, 2008). Studies have investigated the efficacy of both existing interpretive programs (Madin & Fenton, 2004; Zeppel & Muloin, 2008) and those designed by researchers (Jacobs & Harms, 2014) and have occurred in a variety of captive (Ballantyne et al., 2007, 2018) and non-captive (Madin and Fenton, 2004; Powell & Ham, 2008; Zeppel & Muloin, 2008) nature-based contexts. Findings show that augmenting tourism experiences with well-designed interpretation enhances visitors' environmental learning by:

- developing their respect and appreciation for wildlife and nature;
- raising their awareness of environmental issues;
- promoting environmentally sustainable attitudes and actions; and
- building their capacity to adopt sustainable living practices,

(Ballantyne et al., 2011; Ballantyne & Packer, 2009; Lee & Moscardo, 2005; Tisdell & Wilson, 2005; Zeppel & Muloin, 2008).

Traditionally, studies have focussed on short-term behaviour changes and intentions to act. More recently, however, researchers have started to test the impact of interpretation on immediate on-site behaviours (Brown et al., 2010; Powell & Ham, 2008), and long-term off-site behaviour (Ballantyne et al., 2011; Hughes, 2013; Hofman & Hughes, 2018). To better understand the influence of interpretive programs on short-term, immediate and long-term behaviour change, the Theory of Planned Behaviour (TPB) (Ajzen, 1991) is commonly applied by researchers.

Many short-term behaviour change studies applying TPB show a promising increase in pro-environmental knowledge, attitudes and intention. For example, the impact of interpretation on the conservation intentions of whale tourists in Las Galletas, Tenerife, showed that interpretation can have a positive impact on visitors' intentions to donate money to a project that protects whales, and/or to volunteer a few hours a week with a whale protection organisation (Jacobs & Harms, 2014). Positive intentions are also evident in studies examining future plastic use following a whale watching/swim experience (Clark et al., 2019), and reducing resource consumption and participating in animal conservation activities following interpretation during a dolphin tour in Hong Kong (Cheng et al., 2018). These studies, however only measure intentions. The actual uptake of these behaviours is unknown.

Ham (2007) argues that interpretation is likely to be most effective when targeting immediate behaviours – i.e. those performed closer in time to when the interpretation is provided. A study measuring immediate behaviour (picking up rubbish on a walking trail in a National Park), combined TPB with the elaboration likelihood model (ELM) (Brown et al., 2010). Despite the treatment groups being statistically more likely to pick up rubbish than the control group, the highest percentage of compliance was only 36.6% (Brown et al., 2010). This is surprising given that opportunities to perform the target behaviour were present immediately after respondents were exposed to interpretive messages about picking up litter. A higher success rate was evident in a study of visitors' donation behaviour. Following a cruise to the Galapagos Islands, 78% of visitor groups who participated in a targeted interpretive program donated money to a campaign to conserve the islands' environment (Powell & Ham, 2008). The researchers attribute the success of this program to an increase in visitor knowledge and enjoyment of their experience.

The ability of interpretation to enhance visitors' on-site behaviour and behavioural intentions is encouraging, however, immediate actions and intentions remain a poor indicator of long-term behaviour change (Sniehotta et al., 2014). Contributing to the complexities are causal variables, namely attitudinal factors, external or contextual forces, personal capabilities and habit. These work in different ways to influence environmental behaviour (Stern, 2000). However, focussing primarily on attitudinal factors alone, may not provide an increase in the uptake of the targeted behaviours if the external forces or barriers individuals face in the implementation of such behaviours are not simultaneously addressed.

A growing number of longitudinal studies show varying success in long-term uptake of conservation behaviours. A recent study of aquarium visitors in South Africa asked visitors to make a promise to change one behaviour conducted in daily life to help protect penguins. Based on their aquarium experience, 49.4% of visitors who responded to the follow up survey had made an environmental change (Mann et al., 2018). Although this is a promising number, the authors suggest it is likely that those who responded to the final survey were more environmentally aware and were able to report they had made a change. A similar conclusion was drawn following a study on the influence of white shark cage-dive tourism on conservation behaviour change. Although the results showed there was an increase in each of these behaviours by the majority (69%) of participants, the pre-tour results show participants were already participating in the targeted behaviours (Apps et al., 2018). Indeed, the authors of both studies acknowledge that their sample was possibly biased towards participants already interested in and supportive of sharks and their conservation.

Table 1. List of conservation actions suggested by conservation organisations.

Action	WWF	Nature conservancy	Project aware	Ocean guardian	Reef teach	GBRMPA
Reduce energy use	*				*	
Use environmentally friendly products	*	*		*	*	
Recycle	*			*		
Choose sustainable seafood	*		*		*	
Volunteer time	*	*	*	*		*
Conserve water		*				
Reduce pollution		*				
Dispose of rubbish properly		*				
Support eco-friendly business		*	*			
Plant a tree		*				
Contact government/petition		*				
Spread the word/educate others		*	*	*	*	
Donate money			*		*	*
Reduce/refuse plastics				*		
Don't litter				*		
Choose micro-bead free products				*		
Encourage businesses to use plastic alternatives				*		
Don't use balloons				*		
Follow reef etiquette when diving/snorkeling			*		*	
Follow 3 Rs					*	
Purchase locally grown					*	
Drive less					*	
Offset carbon emissions when flying					*	
Join a community conservation group						*
Engage in citizen scientist programs						*
Visit zoos, nature centres, aquariums						*

Studies targeting long-term behaviour change with a more diverse audience have combined theories and/or frameworks in order to address the gap between intentions and action. This has not necessarily produced a higher uptake of long-term conservation behaviours. To illustrate, Ballantyne et al. (2011) study across four marine-based tourism sites revealed that visitors' levels of knowledge about marine conservation remained relatively high four months after their visit. Despite this, only 7% of visitors had adopted a new environmental behaviour as a result of their visit. Likewise, Hughes (2013) applied Community Based Social Marketing (CBSM), considered an extension of TPB (McKenzie-Mohr, 2011), in a study of families visiting a marine turtle rookery in Queensland. Despite most respondents stating intentions to increase participation in all 13 targeted conservation actions, three months later significant increases were only reported across three behaviours (Hughes, 2013). Changes were particularly apparent in the group who received post-visit support in the form of activity packs, fact sheets, email reminders and hatchling statistics (Hughes et al., 2011). Similar levels of long-term behaviour change were reported by Dierking et al. (2004). Visitors' level of short-term intended conservation action after a visit to the 'Conservation Station' in Disney's Animal Kingdom, was not reflected in their actions two to three months after the visit. Applying the Prochaska Stage Model of Behavioural Change (Prochaska & DiClemente, 1986), the researchers concluded that if the audience does not have the ability or desire to process the information provided, efforts to change their conservation behaviour are fruitless.

It seems that overall, the uptake of environmental actions following nature-based experiences is mediocre at best. Some researchers attribute this to a mismatch between environmental concerns and pursuance of material interests (Frederiks et al., 2015). Others have posited that it could be because visitors can't see the link between actions and their impact (Ballantyne et al., 2018; Hughes, 2013). Regardless of the reasons, current approaches are still not achieving meaningful and widespread change (Capstick et al., 2014), and further investigation is required. Interestingly, none of the studies reviewed here mention that the actions and behaviours targeted in interpretation might be a limitation (i.e., actions might be too difficult, too vague, or

conflict with each other), or that future research should focus on identifying actions likely to have the most environmental impact. The problem is further exacerbated by the proliferation of local, national and global environmental organsations, campaigns and messages.

Current conservation campaigns

Global and local conservation organisations that have previously focussed primarily on policy change are now concentrating on the power of individual contributions to conservation (WWF, 2017). Early attempts from 1990 by the US Natural Resources Defense Council at changing individual behaviour were presented in the form of books such as *50 Simple Things You Can Do To Save The Earth*, and *Save Our Planet: 750 Everyday Ways You Can Help Clean Up The Earth*. Both had little impact. Gardner and Stern (2002) suggest this was due to the volume of suggestions and the fact that no ranking of importance was provided to help readers select even a few.

Over the past decades there has been a marked increase in the number of conservation organisations aiming to increase public awareness of the issues of climate change, with most providing a list of pro-environmental behaviours individuals can perform. For example, The World Wildlife Fund's (WWF) goal is to ensure people and nature can thrive within the planet's natural resources. WWF focuses on bringing a positive change to the following areas: Species, Oceans, Food and Climate Change (WWF, 2017). The organisation continues to promote their long running animal adoption programs, a call for donations from individuals and daily actions as listed in Table 1. Another global organisation with similar goals is The Nature Conservancy. The organisation operates in 72 countries around the world and strives to ensure the planet's growing population can survive without destroying the very natural resources needed to survive. Areas of focus include Lands, Waters, Oceans, Cities and Climate. Behaviours emphasised by these and other organisations are summarised in Table 1.

In terms of the marine environment, Project AWARE is a global movement for ocean protection that focuses on connecting people's passion for ocean adventure with marine conservation. Initiated by the Professional Association of Diving Instructors (PADI) in the late 1980s, the organisation's actions focus on creating change locally and globally for the ocean and communities who depend on it. Project AWARE have '10 Tips for Divers to Protect the Ocean Planet' which includes five behaviours related to everyday living, such as making responsible seafood choices, shrinking one's carbon footprint and donating funds towards ocean protection; and five related directly to the practice of Scuba diving such as protecting underwater life, becoming a debris activist and being a role model to other divers (see Table 1 for complete list). Ocean Guardian is another international non-profit organisation that raises awareness about the health of the planet's oceans. Ocean Guardian's recent 'Rally against plastic' focuses on behaviours related to the reduction of plastic use, removal of rubbish on beaches, and advocacy to encourage others to do the same.

In an Australian context, The Great Barrier Reef Marine Park Authority (GBRMPA) advises the Australian federal government on the care and development of the GBR Marine Park. They provide long term protection and promote ecologically sustainable use through zoning and development of the Marine Park. GBRMPA relies heavily on their citizen scientist program, Eye on the Reef, to assist with protection of the GBR. Other citizen scientist programs related specifically to the GBR include Coral Watch; Reef Check; Redmap; Reef Life Survey; Explore the Seafloor and Reefwatch. Additionally, Reef Teach, an education centre for the Great Barrier Reef located in Cairns, Queensland, runs information shows educating visitors about the reef and its inhabitants. The organisation suggests 10 actions (see Table 1) individuals can do to help the reef in preparation for their visit to the reef and on their return home. Some of these are: follow reef etiquette when visiting the reef, support conservation organisations and educate others about marine life and climate change (Reef Teach, 2019).

The conservation organisations in Table 1 provide public education about current environmental issues in conjunction with suggested environmental behaviours and actions (generally 5–10 behaviours per organisation). What is evident from the organisations reviewed here is that the range of behaviours featured in marine interpretive programs is extensive – twenty-six different actions and behaviours. On the surface, a wide choice of behaviours would seem positive. However, research exploring the impact of educational campaigns and interpretive programs has concluded that too much information with too many options can lead to cognitive overload and a resultant decrease in motivation to act (Scheibehenne et al., 2010). Systematic research regarding the effectiveness of campaigns delivered by conservation organisation is limited, but studies that have been conducted have uncovered very little evidence to suggest conservation objectives are being met (Pullin & Knight, 2009).

Given that humans have limited time, energy and information-processing capacity (Gardner & Stern, 2002), perhaps conservation campaigns could be more effective if they prioritised behaviours and streamlined the choices provided. However, little is known about which individual actions and behaviours are most effective in protecting natural environments. Clearly this is important if interpretive experiences and conservation campaigns are to have meaningful and lasting changes on the health of the planet's ecosystems. Identifying which behaviours are likely to be the most effective in protecting the environment seems a logical step towards the selection of actions and behaviours to include in future environmental campaigns.

Theoretical underpinning

Human behaviour can be explained using many different theories. The Theory of Planned Behaviour has been used in many studies exploring the precursors to environmental behaviour. This theory states that intentions are a direct precursor of behaviour (Juvan & Dolnicar, 2016), and that intentions are determined by attitudes, subjective norms and perceived behavioural control (Ajzen, 1991). The long-term studies reviewed earlier however, have shown that intentions do not guarantee action (Ballantyne et al., 2011; Hughes et al., 2011; Mann et al., 2018). The TPB is also criticised for not predicting repeated behaviour or addressing the impact of morality on environmental behaviour (Klockner, 2013). The norm-activation-theory (NAT) (Schwartz & Howard, 1981), focuses on altruistic motives and the moral-drivers of pro-environmental behaviours (Klöckner, 2013). Still, the NAT does not explain repetitive behaviour. In an attempt to integrate value orientations, personal norms and beliefs, as identified through the New Environmental Paradigm (NEP), Stern's value-belief-norm theory (2000) evolved. The value-belief-norm theory (VBN), like the NAT, assumes that behaviour is determined by personal norms. Personal norms, according to the VBN, must be activated by a sense of responsibility and awareness of consequences (Klockner, 2013) for environmentally significant behaviour to occur. Stern (2000) suggests each target behaviour should be theorised separately due to the variety of causal factors across each action and individual.

Regardless of the theoretical approach employed, it is imperative that the behaviours targeted in campaigns and studies contribute towards the protection of the environment. This contribution can be direct or indirect. Direct environmental impacts stem from behaviours such as the purchase, use, and disposal of personal and household products. Indirect impacts result from behaviours such as signing petitions and lobbying which contribute to changes in environmental policies and legislation. Stern (2000) categorises all environmentally significant behaviours into four distinct types namely, environmental activism (indirect), nonactivist behaviours in public spheres (indirect), private-sphere environmentalism (direct) and other environmentally significant behaviours (direct).

According to Stern (2000) and Gardner and Stern (2002), behaviour change programs are most effective when they target a selection of behaviours from a combination of these types as

well as the motivations for engaging in pro-environmental behaviour. However, given the complexities of motivations to change behaviour, the optimal recipe still remains a mystery (Clayton et al., 2016; Miller et al., 2015).

To increase the effectiveness of behaviour change programs, Stern (2000) suggests the first step is to apply a specific set of principles. These are:

1. Identify environmentally significant behaviours in terms of impact;
2. Analyse actions and behaviours to identify responsible actors and actions; and
3. Explore their relevance to target behaviour from the actor's standpoint by considering the full range of causal variables.

To adhere to principles two and three, it is imperative that principle one is properly addressed and achieved. Similarly, CBSM (McKenzie-Mohr, 2011) also advocates identifying key behaviours as well as their associated barriers and facilitators to increase the likelihood of uptake of pro-environmental behaviours. To this end, the present study was designed to identify the key environmental behaviours most likely to have a positive impact on marine environments. The Delphi technique was used as it allows experts in a certain field to elicit their opinions on a specific topic; in this case, the identification of environmentally significant actions and behaviours individuals can perform that best contribute to the protection of the GBR.

Method

Delphi techniques are often used to seek the opinions of experts in a particular field of research. This method was selected over traditional survey and focus groups methods for two reasons. First, where traditional survey methods seek individual judgements on pre-determined items, the Delphi technique seeks the opinion of each participant during early rounds which is then used to formulate consecutive round surveys (Green et al., 1990). Second, focus groups can be logistically challenging due to the often-varying geographic locations of each participant and the high probability of dominant personalities monopolising the discussion. With Delphi approaches, the anonymity of each panel member eliminates not only this issue but also social desirability, a common limitation with both traditional surveys and focus groups.

The Delphi technique was first used in tourism research to forecast tourism demand (Archer, 1976). The Canadian Government Office of Tourism applied the Delphi technique to identify possible future tourism scenarios then rate the probability of these scenarios becoming a reality over the following decade (D'Amore, 1976). In 1977 Moller, Shafer and Getty, asked their Delphi panel to look forward to the year 2000 and predict the probability of events associated with natural resource management, environmental pollution and wildland-recreation management occurring. In the 1980s the technique was applied to forecast the future of the Singapore Tourism Industry (Yong et al., 1989). The Delphi technique continued to be used to predict the future tourism potential of South Africa and Botswana in numerous studies over the next three decades (Bloom & Leibold, 1994; Kaynak, Bloom & Leibold, 1994; Kaynak & Marandu, 2006; 2011).

Delphi techniques have also been used to identify future tourism challenges. Solnet et al. (2014) used it to identify workplace challenges the tourism sector in the Asia-Pacific is likely to face through to 2030 while Von Bergner and Lohmann (2014) identified the most prominent challenges to global tourism. Other applications include identifying the impacts of tourism projects on the environment (Green et al., 1990), developing strategies to manage the impacts of climate change on a coastal tourism region (Jopp et al., 2013), and identifying indicators for sustainable wetland tourism (Lee & Hsieh, 2016).

Variations to the traditional Delphi technique are often made to suit the intended outcome of a study, however, the basic principles of anonymity of participant responses, structure and

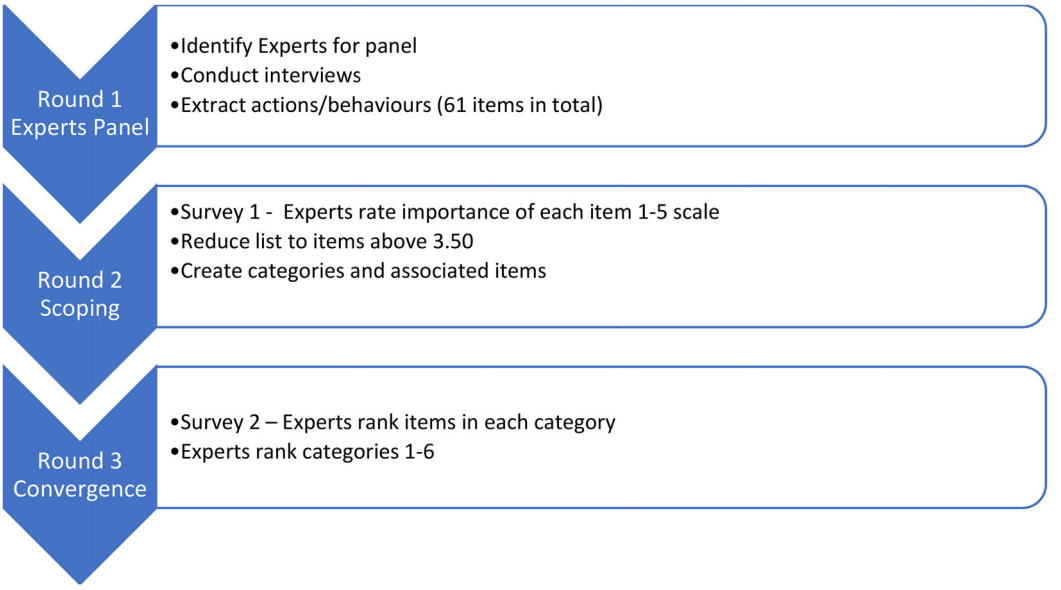

Figure 1. Delphi technique rounds employed in the current study.

repetition, and iterative and reflexive processes remain constant (Konu, 2015). The iterative rounds provide participants with collective panel responses and the opportunity to clarify or change their views whilst maintaining anonymity. The latter is important as it can reduce the effect of potential social difficulties amongst more dominant panel members (Jopp et al., 2013; Konu, 2015; Lee & King, 2009).

Execution of the Delphi technique involves three planned stages (see Figure 1). The first and perhaps most important stage is selection of an expert panel as this determines the quality of results generated (Hsu & Sandford, 2007). The experts are selected via purposive sampling, a non-random selection process that selects participants according to their closeness to the research problem. The number of panel members required remains a contentious issue. If the number is too small, responses may be too narrow or too broad (Barzekar et al., 2011), though there have been successful Delphi studies with as few as four panel members (Sinclair & Stabler, 1997). Despite larger numbers being a challenge to manage, success has also occurred with up to 900 members (Garrod & Fyall, 2000). Early application of the Delphi technique suggests the number of experts should be at least 10 (Dalkey & Helmer, 1969 in Barzekar et al., 2011). Although there is no consensus on the optimal number of panellists, it is agreed that a balance of expertise related to the research issue across the panel is critical. Given that the current study focuses on issues related to climate change, it was considered important to obtain a mixture of natural and social scientists, as recommended by Hall et al. (2015).

Procedure

The initial members of this Delphi panel were selected based on their direct and indirect association with the GBR. Specifically, scientists associated with GBR, well-known activists and key industry spokespeople in the area of natural resource management were selected. The lead author is closely involved in reef conservation activities and has a network of colleagues working in the field. In consultation with this network, she contacted 29 potential panellists via an email asking if they would like to participate in an interview and follow up surveys to help identify individual behaviours that can help protect the GBR. A total of 10 affirmative responses were received from this initial recruitment process. Using a snowball sampling approach, the email

Table 2. Roles of 18 panel members.

Title/role	Industry
Marine Park Tourism Operator Executive Director	Tourism
Tourism Industry Council CEO	Tourism
GBR Island Resort Owner	Tourism
Reef Operator - owner	Tourism operator
Researcher - Owner	Coral expert/tourism
Managing Director	NGO – GBR
Reef Program Manager	NGO – GBR
Natural Resource Management CEO	NGO – Agriculture
Citizen Science Project Manager	Not-for-profit
Citizen Science Project Manager	Not-for-profit
Neuroscientist-ecologist	Academia – Science
Coastal/Marine Research Fellow	Academia – Science
Marine Biologist	Science/tourism
Coral reef Researcher	Science
Director Science & Media	Science/NGO
Manager Office of GBR	Government
Director – Education, Stewardships and Partnerships	Government
Independent	Conservation advocate

also asked for panel member recommendations if those contacted were unable or unwilling to participate. A further three participants made contact with the researchers as a result of this request, increasing the number to 13 panellists. Continuing a snowball sampling approach, a further four participants were recruited on the basis of panellists' recommendations during their interviews. Additionally, one member of the panel was participating in a research expedition to the northern GBR to identify 'super' corals and offered to ask all those on board if they would be interested in participating in the study. This generated three more participants and a total of 20 members. Two of these were uncontactable during the interview phase and consequently excluded from the panel.

The final panel for this study resulted in 18 members including stakeholders who are considered to hold significant knowledge, experience and expertise in the health, management and conservation of coral reefs (see Table 2).

The second stage of the Delphi technique, often referred to as a scoping round, is used to seek the opinion of the selected experts on the topic of research. The lead author conducted one-on-one semi-structured interviews either face to face, by telephone or Skype. The aim of the interviews was to encourage participants to identify the main threats to the GBR and describe actions and behaviours that contribute to these issues. Participants were also asked to nominate specific daily/regular actions people could adopt to contribute to the protection of the GBR. The interviews lasted between 30 and 65 minutes and were consensually recorded. All participants agreed for their names and titles to be published. In accordance with the Delphi technique, responses would however remain anonymous to other panel members. Interviews were then transcribed, and the actions and behaviours suggested extracted. These formed the content of the first survey emailed to the panel.

The final stage, referred to as the convergence rounds, aims to converge the panellists' responses around the central problem through a series of survey 'rounds' (Garrod & Fyall, 2000). The number of rounds depends on the goal of the research. Rounds stop once consensus is reached, or stability of responses has been achieved (Murry & Hammons, 1995). Two rounds of surveys were administered in this study.

The goal of the first survey in this round was to identify and collate actions and behaviours considered the most important by all participants for inclusion in subsequent surveys. One of the advantages of incorporating all the interview responses into this first survey is that it allows participants to see other panellists' ideas (anonymously). Although participants may not have thought of some of these responses when interviewed, they now had the opportunity to rate their importance. In the present study, participants were asked to rate the importance of each

Table 3. Items scoring above 3.50 mean after Round 2/survey 1.

Action/behaviour	Mean
Lobby for renewables	4.83
Educate others on issues affecting the GBR	4.50
Reduce energy use	4.42
Educate yourself on issues affecting the GBR	4.33
Research political parties prior to voting	4.25
Stop using plastic bags	4.00
Turn air-con off when you leave the house	4.00
Buy your energy from those who don't use fossil fuels	4.00
Reduce waste	3.92
Turn off lights when not in use	3.92
Become involved in policy	3.92
Do a self-analysis on your personal carbon footprint	3.92
Re-engage with nature to learn about it	3.92
Change to solar power	3.83
Recycle plastic	3.83
Eat only sustainable seafood	3.83
Become aware of current legislation	3.83
Change heating temperature of hot water system	3.83
Buy green accredited products	3.83
Upgrade appliances to more energy efficient ones	3.83
Participate in citizen scientist programs	3.82
Sign petitions contributing to GBR protection	3.75
Don't use plastic	3.75
Don't litter	3.75
Don't buy items packaged in plastic	3.58
Contribute to carbon offset programs	3.58
Donate to reef protection agencies	3.58
Separate rubbish	3.58
Reuse containers	3.58
Buy local products	3.58

conservation behaviour on a Likert scale of 1 (not at all important in protecting the GBR) to 5 (extremely important in protecting the GBR). This survey was sent to 17 out of the 18 panellists as one did not use email. Participants were provided with instructions and a due date in order to create some urgency in completing the survey. An automatic email reply was received from two of the panel members stating they would not be attending to emails until a date after the set due date. These two were sent a reminder email upon their return. Twelve of the 17 panellists (70%) completed the first survey.

In line with usual Delphi practice (Barzekar et al., 2011), items with a mean rating higher 3.5 (out of 5) were moved into the next round of surveys. The reduced list of actions and behaviours were collated and categorised to create the survey for the second round. In the second survey, participants were asked to rank items within each category in order of importance with 1 being the most important. Panellists then ranked each category in order of importance. All 12 participants who had completed the previous survey completed this round.

Results

Scoping round – interviews to generate behaviours

When asked to identify the main threats to the GBR, participants unanimously nominated climate change. Other large contributors were water quality and sediment run off as a result of agricultural, mining and coastal development in the GBR basin. At a household level, participants felt that energy use, transport choices and waste creation/disposal were the biggest contributors to environmental decline and, as a consequence, had the potential to impact the future health of the reef.

Table 4. Ranking of behaviours within each category.

Categories	Actions and behaviours	Rank
Political actions	Research political parties prior to voting	1
	Lobby for renewable energy	2
	Become involved in policy	3
	Become aware of current legislation	3
	Sign petitions contributing to protecting the GBR	4
Education	Educate yourself on issues affecting the GBR	1
	Educate others on issues affecting the GBR	2
	Re-engage with nature to learn about it	3
Energy use	Reduce energy use	1
	Change to solar power	2
	Upgrade appliances to more energy efficient ones	3
	Turn off lights when not in use	4
	Buy your energy from those who don't use fossil fuels	5
	Turn off air-con when you leave the house	5
	Change heating temperature of hot water system	6
Household/Daily	Do a self-analysis on personal carbon foot-print	1
Behaviours	Reduce waste	2
	Buy local products	3
	Recycle plastic	4
	Eat only sustainable seafood	5
	Stop using plastic	6
	Don't litter	7
	Buy green accredited products	8
	Separate rubbish	8
	Reuse containers	8
Philanthropic behaviours	Contribute to carbon offset programs	1
	Participate in Citizen Scientist programs	2
	Donate to reef protection agencies	2
Transport use	Use more public transport	1
	Ride a bicycle	2
	Walk more places	2

At the end of the scoping round the eighteen interviews were transcribed, and 61 separate actions and behaviours were extracted. These were included verbatim in the first convergence round survey.

Convergence rounds – surveys to rank behaviours

Survey 1

The first of the convergence rounds asked the panellists to rate each of the 61 items on a Likert scale of 1 (not at all important) to 5 (extremely important). Mean ratings of importance ranged between 2.58 (demand more bicycle parking) and 4.83 (lobby for renewables). Using a cut-off of 3.5, the total number of actions and behaviours was reduced from the original 61 to 30 (see Table 3). Some of the 30 actions and behaviours listed in Table 3 were merged as they were considered very similar in wording and action. For example, three items (don't use plastic, stop using plastic bags, and don't buy items packaged in plastic) were merged into one action labelled 'Stop using plastic' for use in subsequent surveys. This produced a final sample of 28 actions.

The three researchers independently perused the behaviours listed in Table 3 and categorised them according to similarity. Following the initial collating exercise, the authors met to compare notes and decide on the final number of categories. A consensus was reached to group the remaining behaviours into five broad categories: energy use (7 items); education (3 items); political actions (5 items); household/daily behaviours (10 items), and philanthropic behaviours (3 items). There was an additional sixth category created for transport use (even though these items were rated under 3.50 in survey 1) because this behaviour is an iconic conservation behaviour targeted by many interpretive programs and conservation organisations. The rationale for this choice was that the researchers wished to confirm the panel's opinion about the low

Table 5. Ranking of importance of categories.

Categories	Median[a]	1st Choice (percentage)	1st & 2nd Choice (percentage)
Political actions	1	63.6	83.3
Education	2	33.3	66.6
Energy use	4	0.0	36.4
Household/daily behs	4	9.1	9.1
Philanthropy	4.5	0.0	9.1
Transport choices	4.5	0.0	0.0

[a]$N = 12$.

importance of this set of conservation actions. The three highest rated items were inserted into this category. Consequently, the total number of actions increased to 31 across the 6 categories.

Survey 2

The results of the next survey within the convergence round produced a ranking for each item within the categories (see Table 4). Rankings were determined using the median number given by participants. Where two items have the same median, they are listed as the same rank.

Participants were also asked to rank the importance of each category. Table 5 shows political action (making informed choices and lobbying for change) was considered the most important contribution individuals could make to reef conservation. In fact, 83.3% of participants nominated political activism as either the first or second most important category. Education of self and others was also seen as important, with 66% placing this as either first or second. Energy use was selected as number two by 33% of the 12 participants and only one participant chose Household/daily behaviours as number one and Philanthropy as number two. Transport continued to be ranked of low importance.

Discussion

The aim of this study was to identify, through expert opinion, environmentally significant actions and behaviours individuals can perform that best contribute to the protection of the GBR. A panel of experts identified sixty-one actions that could assist with reef conservation. Some of these behaviours overlap with those commonly targeted by the conservation organisations. These include making responsible seafood choices, shrinking one's carbon footprint, and donating funds towards ocean protection (targeted by Project AWARE and GBRMPA's Reef Teach), reducing use of plastics (targeted by Ocean Guardian); and educating others about marine issues (targeted by GBRMPA's Reef Teach). Recent academic studies of the impact of tourism experiences on visitors' long-term conservation behaviour have also focussed on many of the behaviours mentioned by experts. These behaviours include donating time or money to marine conservation (Apps et al., 2018; Ballantyne et al., 2011; Hughes, 2013; Hughes et al., 2011; Jacobs and Harm, 2013); recycling, picking up litter, reducing the use of plastics, and conserving energy (Ballantyne et al., 2011; Hughes, 2013; Hughes et al., 2011) and sharing information on social media (Apps et al., 2018).

The overlap between experts' opinions of what matters and what is currently being emphasised by conservation organisations, tourism operators and interpreters is encouraging, as it suggests that those tasked with nurturing and protecting reef environments are on the right track. In other words, many of the actions featured in conservation campaigns and interpretive programs are likely to contribute towards ensuring the long-term health of the Great Barrier Reef and other marine environments.

Interestingly, there were some behaviours that feature prominently in conservation campaigns and interpretation that were *not* listed by the experts: conserving water, reducing pollution, supporting eco-friendly businesses (though experts did mention buying eco-friendly products),

boycotting balloons or products with microbeads, offsetting carbon emissions, planting trees and composting. Evidently, experts did not feel these warranted a mention, suggesting that the focus of some conservation efforts may need adjusting. Perhaps campaigns featuring these behaviours have been less successful than anticipated because the impact of these is relatively small. If so, managers should consider whether inclusion of these in future initiatives is warranted.

All of the actions and behaviours could be categorised into three of Stern's (2000) four identified types of environmentally significant behaviour: environmental activism (e.g. become involved in policy, awareness of current legislation, lobby for renewables); nonactivist public-sphere behaviours (e.g., sign petitions, donate to reef protection agencies, research political parties prior to voting) and private-sphere environmentalism (e.g., change to solar power, upgrade appliances to more energy efficient ones, separate rubbish). 'Other' environmentally significant behaviour, where individuals may significantly influence the actions of companies they work for to be more environmentally friendly in their decision making, were not specifically mentioned by any of the experts. However, some of the behaviours and actions, such as energy use and the opportunity to educate others, could be adopted at a corporate level. According to Stern (2000), targeting a selection of behaviours from each of these identified types of environmentally significant behaviour should lead to more effective behaviour change programs.

When experts were asked to rank the potential of conservation actions to protect the marine environment, the overlap between their opinions and what is commonly featured in campaigns and interpretation was less apparent. Behaviours commonly targeted by campaigns and interpretation that experts felt were of lesser importance included items related to transport use, picking up litter, changing to more efficient light bulbs and using a coffee keep cup. This is not to say that these actions are unimportant, but rather, that experts felt they were less likely than others to have an impact. Perhaps some of these actions have been the focus of campaigns for so long that they have become iconic – campaigners and interpreters no longer question their relative relevance. Perhaps other behaviours with more potential impact have gone 'under the radar' of conservation groups. This is where using Delphi techniques to tease out expert opinions comes in particularly useful.

Delphi techniques often unearth unexpected results (Choi,Turk, Budruk & Phillips, 2011; Donohoe, 2011; Konu, 2015; Lee & King, 2009) and this study was no exception. Several actions and behaviours mentioned by the panellists rarely, if ever, feature in conservation campaigns and research studies. These were becoming involved in policy-making, being aware of current legislation, researching political parties prior to voting, changing the heat settings on swimming pools, turning off air conditioning, cooking less food, eating less meat, washing only full loads of clothing, buying second hand clothing, buying local, and conducting a self-analysis of one's personal carbon footprint. Perhaps most surprising was the finding that political activity (being more politically informed and active, lobbying for renewable energy, signing petitions) was considered to be the *most* important and effective action individuals could adopt. To date, these actions do not appear to have been targeted by conservation organisations or research studies. Despite the dominance of political activism in the final round, it is interesting to note that only six of the eighteen experts mentioned this in the initial interviews. Again, this highlights the power of Delphi techniques to elicit new perspectives and consensus.

Implications for practice

The aim of this study to identify and prioritise conservation actions is unique. This research design is innovative in that it obtains the opinions and views of reef scientists, managers and operators - to date, most behaviour change studies rely on the views of tourists or educators; other stakeholders are rarely included. The findings of this study provide actions that could be

targeted in conservation campaigns and interpretation that best contribute to the protection of the natural environment and consequent mitigation of the effects of climate change.

Many of the behaviours featured in current campaigns and programs were endorsed by experts in the fields of marine science, tourism, resource management, and public education and should therefore remain. Broadly, these include donating time and money to conservation activities, measuring and lowering one's carbon footprint, reducing use of plastics, buying sustainable seafood, and educating others about the health of marine environments. Experts' responses also suggest that more emphasis should be placed on encouraging and supporting people to educate themselves and others about issues affecting the reef and marine environments generally. It is also apparent that seldom-featured items, categorised here as political activism, should be added to the suite of actions featured in environmental campaigns and interpretive programs.

As mentioned, one of the key challenges of convincing individuals to adopt conservation actions is demonstrating how their choices affect the health of the environment. Environmental campaigns and interpretive programs often focus on broad categories of behaviour, referred to as 'headline behaviours' (Whitmarsh & O'Neill, 2010). Examples would be driving less or conserving water. Such appeals are commonplace, but it may not be clear to the general public how this should be achieved. The panel of experts tended to be more specific and prescriptive about required actions. Thus, rather than the headline behaviour 'drive less', they provided practical suggestions such as carpool to work, walk rather than drive, ride a bike and use public transport wherever possible. Likewise, the headline behaviour 'conserve water' was communicated as take shorter showers, install a water tank and wash only full loads of clothing. Perhaps environmental campaigns would be more persuasive and successful if they were more specific about what actions are required.

Providing a ranking of importance of targeted actions may also increase the uptake of conservation actions. As humans can only devote so much time and effort to solving environmental issues (Gardner & Stern, 2002), and to avoid overload and consequent apathy (Hofman & Hughes, 2018), providing a ranking of importance and effectiveness of the targeted actions' pro-environmental impact, is paramount. Conservation organisations could target and promote these behaviours and actions, preferably collaboratively, in order to increase not only uptake but also the pro-environmental impact when performed by more individuals.

The provision of specific strategies for action has been mentioned by several researchers as critical in prompting tourists to adopt environmental actions. Ballantyne et al. (2007) note that although individuals may be familiar with conservation issues, this does not equate to them knowing what to do. Hughes et al. (2011) found that post-visit support, including suggestions and examples, helped visitors to a turtle rookery convert their intentions into environmental action. Likewise, Hofman and Hughes (2018) study suggests that the key requirements for behaviour change is to provide powerful environmental messages and tailored support that includes strategies for action. Other researchers argue that targeting multiple, specific items allow for a more reliable measure of the uptake of pro-environmental behaviours (Whitmarsh & O'Neill, 2010). This is due to the fact that participation in one environmental behaviour does not automatically guarantee participation in other similar behaviours (Barr, 2007; Ebreo & Vining, 2001; Granzin & Olsen, 1991; Oskamp et al., 1991). As Heimlich and Ardoin (2008) explain, although individuals often engage in actions that are conceptually similar, researchers should be wary of assuming that involvement in one behaviour is consistent with, or indicative of, involvement in other similar practices.

One of the reasons for this selective uptake of environmental behaviour is that there are many real and perceived barriers preventing individuals adopting 'green' lifestyles. These include lack of infrastructure and support (e.g., lack of curbside collection of recyclable products inhibits recycling), financial outlay, time commitments or physical effort (Heimlich & Ardoin, 2008). It is interesting to note that all the behaviours the expert panel listed in the top two categories require minimal financial outlay or physical effort. Admittedly, some investment of time would

be required to research political parties and current legislation and policy, as would educating oneself on issues affecting the GBR. But on the whole, the effort required is minimal. To reduce this effort further, perhaps future campaigns and interpretive messages could include a summary of key issues in relation to conserving marine environments, current legislation and its impact on the natural environment, and suggested resources individuals could access to familiarise themselves with the policies of political parties.

Limitations and future research directions

This study provides a list of actions and behaviours that experts in the fields of science, tourism and education consider important in contributing to the protection of the Great Barrier Reef and other environmentally sensitive tourism destinations. There were, however, a number of limitations. First, while efforts were made to recruit a wide range of marine and tourism experts, it is acknowledged that many of the panellists were from the public sector or national organisations. This might not be fully representative and might also explain the emphasis on political activism. Second, not all interviewees responded to requests to rank the conservation behaviours. Third, the emphasis on political activism might be difficult to operationalise for destinations and companies attracting large numbers of international visitors. Particular attention would need to be given to wording, acknowledging that some visitors would have minimal influence on the political actions and decisions of their home countries.

These limitations aside, the list generated in this study can be used to inform the design of future environmental campaigns and reef-based visitor experiences. This is, however, just the first step. Additionally, more research around climate change and sustainable tourism is needed (Scott, 2011), as are further studies to test existing and new methods of disseminating conservation messages. Further research could also consider the publics' understanding of, and misconceptions about, the actions that are commonly classified as leading causes of climate change – a subject of much political debate.

It is evident that closer collaboration amongst conservation organisations, tourism professionals and researchers would be beneficial. Although working collaboratively comes with its challenges, the environmental benefits of effective collaboration even on a local scale far outweigh the challenges (Kark et al., 2015). Encouraging conservation organisations to work more collaboratively whilst targeting a similar set of behaviours could result in a higher uptake of the selected actions and behaviours. Similarly, tourism operators to the GBR could incorporate items from those listed by the experts into interpretive programs for their visitors.

Researchers have argued that identifying environmentally significant behaviours is a necessary precursor to designing effective behaviour change programs (Gardner & Stern, 2002; Stern, 2000). By rating and prioritising conservation behaviours, the expert panel in this study have provided a clear focus for future conservation initiatives. We propose that employing behaviour change theories such as the TPB (Ajzen, 1991), VBN (Stern, 2000) or the CBSM framework (McKenzie-Mohr, 2011) to target the identified behaviours should help to protect the GBR and other sensitive marine areas.

The GBR currently attracts over 2 million visitors a year. Influencing the knowledge, attitudes, and behaviour of these visitors through interpretation that highlights high-impact actions is critical. However, the long-term health and survival of the GBR depends on much more than this. We need to improve the everyday environmental actions and habits of millions of people around the world, most of whom will never visit this natural wonder. For this, we require the collaborative efforts of global, national and local governments, conservation organisations, educators and tourism bodies to collectively promote the everyday environmental actions that give our planet's largest living resource the best chance of survival.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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