The role of Great Barrier Reef tourism operators in addressing climate change through strategic communication and direct action

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ABSTRACT

The projected decline in reef health worldwide will have huge repercussions on millions of stakeholders depending upon coral reefs. Urgent action is needed to sustain coral reefs into the future. Tourism operators are recognised as stewards of Australia's Great Barrier Reef (GBR), a World Heritage Site, and are taking action on climate change, through their business practices and by engaging guests with interpretation and targeted messages. Yet little is known about how tourism operators along the GBR perceive climate change, or what actions they believe are most effective to address climate change impacts on the GBR. We describe a set of semi-structured interviews with 19 tourism operators in the Whitsundays and Cairns, the most popular tourism destinations along the GBR. Using a thematic analysis to code and report patterns within the data, we show tourism operators recognise the threat of climate change and strongly support increased action to address it. Most respondents are hesitant to engage their guests about climate change despite acknowledging an interest, expertise, and responsibility to do so. Understanding the barriers preventing tourism operators from addressing climate change is an important step towards helping them, and the tourists visiting the region, take action to protect the GBR.

KEYWORDS

Behaviour change; climate change; coral reef management; human dimension; interpretation; natural resource management; socio-ecological system

Introduction

Coral reefs are considered to be the "canaries in the coal mine" of climate change because of their vulnerability to environmental alterations, particularly to the ongoing and projected increases in temperature due to climate change (Anthony et al., 2011; Great Barrier Marine Park Authority, 2014). Climate change impacts on coral reef ecosystems are expected to include a greater prevalence of coral disease (Beeden, Maynard, Marshall, Heron, & Willis, 2012), an increase in tropical cyclone severity (Knutson et al., 2010), ocean warming and acidification leading to decreased coral growth (Anthony et al., 2011; Lough & Cantin, 2014), and changes to the abundance and distribution of marine species (Great Barrier Marine Park Authority, 2007). These impacts are predicted to have widespread and

severe consequences for industries and individuals who rely upon coral reefs for food, well-being, and livelihoods (Adger, Barnett, Brown, Marshall, & O'Brien, 2013; Marshall, 2010).

Widespread behaviour change by the general public is urgently required to prevent catastrophic damage to these beautiful and vital underwater landscapes (Great Barrier Marine Park Authority, 2014). Crucial to this process is the effective communication of the climate change threat, impacts, and responses available for the general public to take action (Moser, 2010; Moser & Dilling, 2004). However, climate change has become a highly political issue (Whitmarsh, 2011) and large numbers of people remain confused or unsure about the severity of the threats (Leviston, Walker, & Morwinski, 2012), both to themselves and important natural areas (Young & Mar, 2010).

Long-recognised as important stewards of the GBR, tourism operators have a key role to play in educating the public about the GBR and ensuring that visitor impacts are minimised. As part of this work, tourism operators rely heavily on communication and interpretation to engage their guests, including face-to-face presentations, signage, and the distribution of materials such as fact sheets (Great Barrier Marine Park Authority, 2016). The Great Barrier Reef Marine Park Authority (GBRMPA), the federal agency tasked with managing the long-term preservation of the GBR, provides climate change information packages to tourism operators (Great Barrier Marine Park Authority, 2016), and also enforces minimum standards of environmental behaviour through regulation and collaboration. For example, the GBRMPA encourages an eco-certification programme that ensures sustainable and high-quality nature-based experiences (Day & Dobbs, 2013). A programme operated by Ecotourism Australia serves as a certification scheme for the GBRMPA, and these certified "high-standard operators" carry more than 60% of all tourists visiting the GBR in 2012 (Day & Dobbs, 2013). Additionally, Australia has an obligation under the World Heritage Convention to present the outstanding universal value of the GBR (Lucas, Webb, Valentine, & Marsh, 1997). Tourism operators are thus well placed to deliver this information as well as other messages that relate to conservation and management of the threats to the GBR. Tourism operators also have a vested interest in providing a satisfying experience for visitors to the GBR (Coghlan, 2012a). Providing the public with information about the GBR, its management, and threats to its future may create a more informed evaluation and, ultimately, greater community desire to preserve the environment (Harriott, 2002). Unfortunately, despite being recognised as the most severe long-term threat to the GBR (Great Barrier Marine Park Authority, 2014), little is known about how GBR tourism operators perceive the threat of climate change, and how or why they present information about climate change to their guests.

Australia's tourism industry is vulnerable to climate change impacts. These risks pose major challenges to the sustainability of these destinations yet have not been sufficiently examined in tourism research (Shakeela & Becken, 2015). Climate change impacts can destabilise tourism operations in affected destinations, thereby creating risks to the industry and threatening ongoing economic and social sustainability (Hambira, Manwa, Atlhopheng, & Saarinen, 2015). Australia's tourism industry is not immune to these threats. Despite being aware of the significance of climate change, the tourism industry in Australia does not necessarily view it as an urgent issue to address and, consequently, a widespread response is lacking (Ruhanen & Shakeela, 2013). Consequently, government intervention may be required to create lasting and meaningful behaviour change within the industry (McKercher, Prideaux, Cheung, & Law, 2010).

Tourist use of the environment continues to increase, and one effective management response to reduce negative associated impacts due to inappropriate behaviour is through education (Orams, 1996b). Education that leads to a voluntary reduction in pressure on the environment is known as interpretation, defined by Tilden (1957) as "an educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand media, and by illustrative media, rather than simply to communicate factual information". Supporters of strategic interpretation believe it can mitigate negative impacts of tourism whilst developing a motivated and educated public that supports conservation (Powell & Ham, 2008). Indeed, interpretation has been shown to successfully reduce tourism impacts on the environment (Ham et al., 2009; Tubb, 2003), including a

reduction in litter in a national park (Brown, Ham, & Hughes, 2010). Other studies have shown that interpretation leads to little or no improvements in environmental attitude or pro-environmental behaviour (Lee & Moscardo, 2005), possibly due to the ways in which the information was presented (Beaumont, 2001).

Resource managers, i.e. individuals who develop conservation policies, plans, and projects that help people interact with the environment in an ecologically sustainable manner, often rely upon interpretation to influence visitor attitudes and knowledge, hoping these changes help to fulfil management or business objectives (Hughes & Saunders, 2005). Although attitudes have been shown to be influential causal variables associated with environmentally significant behaviours (Stern, 2000), a change in attitude does not necessarily guarantee a change in the corresponding behaviour (Whitmarsh & Lorenzoni, 2010). Furthermore, perceived self-efficacy has been shown to be a strong predic- tor of behaviour (Moser & Dilling, 2004), including the facilitation of intentions into action (Armitage & Conner, 2001). Along the GBR, a greater emphasis on the ease and accessibility of pro-environmen- tal actions, e.g. recycling and reducing energy consumption, may lead to an increase in conservation-related behaviour (van Riper, Kyle, Sutton, Yoon, & Tobin, 2012). People who visit the GBR for snorkelling and diving activities may thus be a receptive audience to target with conservation messages that seek to influence key attitudes and behaviours. The aim of this study was to investigate the role of GBR tourism operators in addressing climate change through strategic communication and direct action.

Little empirical research has explored the perspectives about climate change held by those working in the Australian tourism industry (Ruhanen & Shakeela, 2013). Climate change may permanently affect the benefits that tourism operators derive from nature-based tourism experiences, but vulnerability can be reduced if action is taken (Marshall, Marshall, Abdulla, Rouphael, & Ali, 2011). Along the GBR, many tourism operators are taking considerable actions to address climate change, e.g. the installation of a hybrid solar/diesel power station at Lady Elliott Island Eco Resort (Zeppel, 2012). Unfortunately, other tourism operators avoid personal or corporate responsibility for climate change action, preferring instead to focus on promoting the tourism experience whilst remaining unaware or ill-informed about climate change (McKercher, Mak, & Wong, 2014). It is against this background that we conducted a study to explore tourism industry perspectives about climate change impacts, interpretation, and direct action. Clarification of the perceptions, barriers, and ongoing efforts of tourism operators to engage their guests about climate change, and to directly address impacts via their own business practices, will assist resource managers to encourage tourism operators to take more positive and direct action. To address the knowledge gap identified by McKercher et al. (2014)), we explored four main research questions:

(1) What do tourism operators perceive the threat of climate change to be across multiple scales?
(2) How do tourism operators feel about offering interpretation to their guests about climate change?
(3) What do tourism operators believe is the best way for them to communicate with their guests about climate change?
(4) How do tourism operators believe they can most effectively take action to address climate change impacts on the GBR?

To answer these research questions, we conducted a set of semi-structured interviews with 19 tourism operators from the Cairns and Whitsundays regions, two of the most popular and iconic tourism destinations along the GBR. These interviews focused upon four key areas of inquiry:

(1) Perceptions of climate change threats, impacts, and responses among tourism operators.
(2) The interpretation materials and messages that GBR tourism operators provide to guests.
(3) Perceptions of the ease and effectiveness of activities that tourism operators can do to take action on climate change. Ten activities were specified, based upon priorities identified by the

GBRMPA (GBRMPA, 2008; Great Barrier Marine Park Authority, 2012; Young & Mar, 2010; Young & Temperton, 2008): providing interpretation for tourists that promotes conservation and sustainable use of the GBR; use of fuel efficient engines; separation of waste by tourists for recycling; participation in industry best practices, via a code of practice or MOU; participation in GBRMPA's Eye on Reef programme (a reef monitoring programme that allows visitors to collect information about reef health); use of green energy (e.g. solar); use of an emissions calculator; use of carbon offsets; use alternative fuels such as biodiesel and ethanol; providing interpretation such as best practice guidelines – to help their guests/passengers minimise their impacts on the Reef.

(4) The role of tourism operators in addressing climate change impacts on the GBR, particularly the ways to overcome perceived obstacles to conservation and how to facilitate opportunities to encourage pro-environmental behaviours and engagement with guests.

Methods

Sixteen tourism operators were surveyed in 2013 and then interviewed again in 2014/2015. Three tourism operators were only interviewed in 2014/2015 and were not included in the original 2013 study. In order to maximise the utility of our results for resource managers, we sought to obtain an in depth understanding of the operators that carry the majority of visitors to the GBR. Specifically, we focused on a subset of operators with the capacity to influence the most visitors. Thus, these operators represent businesses that cumulatively carry a disproportionately large number of tourists along the GBR. A detailed analysis of these individuals can guide managers on the best strategies to encourage these operators to effectively communicate, and influence, tourists about climate change. These strategies can easily be repeated with additional operators to further tailor messaging to their needs. Further, if we did not focus this study on those that carry the most visitors, the resulting recommendations may not be focused on their needs and requirements (which due to high passenger numbers may be quite different from other smaller operators), potentially undermining the value of this information in guiding management decisions. Overall, the unit of measure is the GBR and these 19 respondents are part of a single case study exploring how tourism operators communicate with the millions of visitors with whom they annually interact.

Respondents were first contacted over the telephone as part of baseline surveys conducted by the Social and Economic Long-Term Monitoring Program (SELTMP) of the GBR from June through August 2013. For more information about how and why certain individuals were selected for interviews, please see Curnock et al. (2014). Quantitative surveys focused upon identifying the relationship that people had with the GBR, including their values, perceptions, and beliefs. As a follow-up to the 199 surveys conducted by the SELTMP study, a set of semi-structured interviews with 19 tourism operators were conducted in December 2014 and January 2015. These interviews used a mixed-method approach to answer our research questions. For most social science research questions, this method is better than relying solely upon qualitative or quantitative approaches (Tashakkori & Teddlie, 1998). Interviews were conducted face to face at a location selected by the respondent, e.g. their office or home. Three tourism operators not included in the original SELTMP surveys were included in the follow-up study in order to obtain a broader suite of operator types. Excerpts from the results of the large-scale quantitative SELTMP surveys are presented as context to the results of these fine-scale qualitative interviews.

Study area

The GBR, the largest coral reef ecosystem on the planet (Great Barrier Marine Park Authority, 2009), is situated along the coast of Queensland, and comprises nearly 3000 individual reefs which are home to an extraordinary diversity of marine plants and animals (Great Barrier Marine Park Authority, 2009). At more than 348,000 km^2, the GBR offers a wide variety of recreational activities including fishing, island

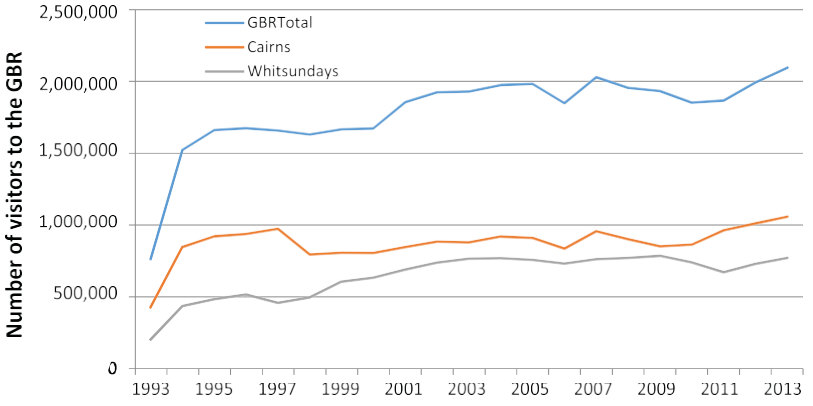

Figure 1. Long-term trend in full-day visitations to the Great Barrier Reef via the Cairns region and the Whitsundays region from 1993 to 2013 (adapted from Biggs (2011) and using data from http://www.gbrmpa.gov.au/visit-the-reef/visitor-contributions/gbr_visitation).

visits, nature walks, and snorkelling and SCUBA dive trips (Curnock et al., 2014) that generate vital economic contributions to Australia (Tobin et al., 2014). GBR tourism is particularly important, contributing some 64,000 full-time jobs and more than $5.2 billion to the Australian economy each year (Deloitte Access Economics, 2013). Additionally, the GBR attracts millions of visitors per year from throughout Australia (Curnock et al., 2014), the majority of whom are strongly connected to – and concerned about – the GBR (Goldberg et al., 2014). Since 1993, approximately 85% of tourism visits along the GBR have occurred in the Cairns and Whitsundays (which includes Airlie Beach) regions (Figure 1). Cairns is the main gateway city to the GBR, receiving approximately 2.5 million visitors annually (Prideaux, McNamara, & Thompson, 2012), while the Whitsundays region is home to 74 islands, the popular backpacking area of Airlie Beach, and several upmarket resorts such as Hamilton Island.

The GBR has been managed as a Marine Park for decades and a number of activities are strictly prohibited, including oil drilling and mining. Unfortunately, the long-term outlook for the GBR is "poor and getting worse" (Great Barrier Marine Park Authority, 2014) due to a number of anthropogenic impacts, the most significant being climate change (Anthony et al., 2011). In response to the suite of threats facing the GBR, the GBRMPA has initiated a comprehensive, ecosystem-based approach to management (Ruckelshaus, Klinger, Knowlton, & Demaster, 2008). Thus, its iconic status, vulnerability to climate change, ongoing best-practice management and well-developed marine tourism industry make the GBR an excellent location to explore tourism operator perceptions about climate change.

Designing the semi-structured interviews

Interview questions were developed following a review of the scientific literature and subsequent discussions with resource managers at the GBRMPA. Some questions were self-developed while others were based upon previous regional studies. All questions sought to fill key knowledge gaps identified by resource managers. The questions were designed to examine industry perceptions of climate change as a whole, rather than specific individual impacts. A 10-point Likert scale was used to assess the importance of interpretation topics, the perceived threat of climate change across multiple scales, and the ease and effectiveness of various activities in addressing climate change on the GBR.

Conducting the interviews

Semi-structured interviews were conducted with 19 owners and managers of charter fishing operations as well as businesses that provide snorkel and SCUBA dive trips, either single- or multi-day

Table 1. Summary demographic characteristics of the tourism operator respondents.

	Mean	Median	Std. Dev.	Minimum	Maximum
Age	47	48	8.95	31	64
Time spent in the tourism industry	20 years	21	8.8	7	36
Time spent in the GBR region	22 years	25	9.4	7	35
Days operating on the GBR in the last year*	323	360	90	50	365
Estimated proportion of household income that came from GBR tourism in the last financial year*	90	100	16	50	100
Number of full-time equivalent employees*	67	35	104	2	400

*Based on data collected from the respondents during the SELTMP surveys in 2013 (Curnock et al., 2014).

excursions, in the GBR Marine Park. These businesses have different priorities, yet all of them provide tourists with a first-hand experience of the GBR. Most interviews were conducted in person – although two were conducted over the phone – and interviews were recorded to ensure accuracy in data capture and analysis. The average length of the interview was 33 minutes, ranging from 24 to 60 minutes. The tourism operators interviewed had spent considerable time in the tourism industry and the GBR region (Table 1). Most respondents were males (16 out of 19), with an average age of 47, who were heavily reliant on GBR tourism for their livelihoods. Respondents worked in businesses that were highly variable in size: three businesses had more than 150 employees and six had less than 10 employees.

Data analyses

Qualitative responses to the semi-structured questions were evaluated using a thematic analysis (Bryman, 2012). Thematic analyses are independent and reliable qualitative approaches that use codes to identify, analyse, and reports patterns within data (Braun & Clarke, 2006; Vaismoradi, Turunen, & Bondas, 2013). Codes are defined here as "a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based data" (Saldana, 2009, p. 3). Codes were pre-tested by having an independent coder review the same section of interview using the defined codes. Following this, codes were examined, discussed, and revised based on the recommendations in Gorden (1998) for coding categories to be both "all-inclusive and mutually exclusive". Inferential statistical analyses were not conducted due to the small sample size. However, to compare variability in responses, the means and standard errors were calculated using the quantitative responses to the statements that used Likert scales. In the tables presented in the Results section, codes are highlighted in bold, e.g. "Business operations", as shown in Table 2.

Results

Tourist operator perceptions about the threat of climate change at multiple scales

Most tourism operators (13 out of 19) interviewed believed that climate change was "an immediate threat requiring action". Two respondents believed that climate change was a "serious threat, but the impacts were too distant for immediate concern", while three needed "more evidence to be convinced of the problem". Only one respondent did "not have a view on climate change" and nobody felt that "climate change is not a threat at all". Respondents thought the threat of climate change varied depending upon the spatial scale considered (Figure 2). Most respondents (15 out of 19) agreed that climate change was a threat to themselves, their business (14 out of 19), the GBR tourism industry (16 out of 19), and the GBR (16 out of 19). However, respondents believed that climate change was a more extreme threat to the GBR (mean = 8.89, SE = 0.38, n = 19) than it was to the tourism industry (mean = 8.11, SE = 0.38, n = 19), their own business (mean = 7.21, SE = 0.53, n = 19), or them personally (mean = 6.95, SE = 0.62, n = 19).

Table 2. The responsibilities that respondents feel are key components of their job as tourism operators on the Great Barrier Reef.

"As a tourism operator in the GBR, what do you feel are your top three responsibilities around your job?"	Total mentions	Tourism operators who mentioned it (n = 19)
Business operations	28	19
Ensuring a good visitor experience	9	9
Safety	8	8
Management, profitability, and various administration matters	7	7
Staff training, hiring, and development	4	4
Conservation of the GBR socio-ecological system	15	13
Protecting and preserving the environment	9	9
Sustainable use of the GBR	4	4
Social concerns	2	2
Community engagement and advocacy	7	7
Educate people and get messages across	5	5
Raise awareness and be an advocate for the GBR	2	2

Tourism operator perceptions about responsibilities, interpretation, and engagement

Respondents believed they had two overriding responsibilities as a tourism operator on the GBR: operate their business and protect the environment (Table 2). Their main concerns were to ensure a good visitor experience, provide a safe environment for guests and staff, manage the profitability and administrative matters related to business operations, and hire and train good staff. The following quote typifies one such motive:

> (The) main responsibility is just that people have a good time and enjoy themselves and want to come back. (Tourism Operator 4)

Most operators (13 out of 19) highlighted that sustainable use and conservation of the marine environment was paramount to their work. These operators focused their responses in three main areas: environmental protection, sustainable use, and social concerns. Nearly half of the respondents (9 out of 19) mentioned environmental protection and preservation as one of their top three business responsibilities. Consider, for example, this interview extract in which a tourism operator identifies his/her priorities as:

> Protecting our environment, and that being the precious island that we live on and also our beautiful reef, protecting what's in the reef. (Tourism Operator 3)

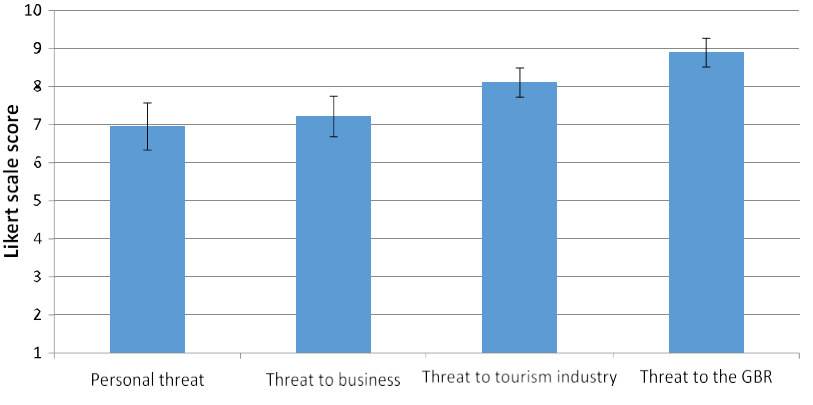

Figure 2. Comparison of mean rating scores showing tourism operator perceptions of the threat of climate change to the GBR, the tourism industry, their business, and to themselves. Responses were ranked on a 10-point Likert scale, where 1 = not a threat at all and 10 = an extreme threat.

Table 3. Respondent perceptions about how to help tourists understand the threats to the GBR.

"How do you think we could help tourists to understand what the real threats to the GBR are?"	Total mentions	Tourism operators who mentioned it (n = 19)
Provide more/better education and interpretation	20	16
Educate tourists	10	10
Provide interpretation for tourists	6	6
Improve the science/facts about the issue	4	4
Awareness and promotion	5	5
Utilise marketing resources such as endorsements and spokespeople	3	3
Improve the stories portrayed in the media	2	2
Improved governance and management	4	4
Lead by example, "walk the talk"	2	2
Have better government decisions and leadership	2	2

Finally, seven operators noted that engaging the community and advocating protection of the GBR was a core responsibility. Specifically, these seven operators highlighted the important role of providing interpretation in this process, that is, in the words of one operator:

> Getting an environmental message out to domestic and international travellers. (Tourism Operator 1)

Sixteen respondents agreed that providing more and/or better education and interpretation was a useful approach to help tourists to understand the threats to the GBR (Table 3). Respondents expressed various ideas about how best to communicate with tourists, including more effective representation in the media, improved government leadership, and better scientific research. Most operators (16 out of 19) felt that engaging with tourists and educating them about threats to the GBR was an effective option to increase their understanding about threats and the potential behaviours they could adopt to mitigate them. As one operator commented:

> Education is the short answer. The reef operators, yeah, and everyone in Cairns has a role to play. Everyone should provide information about the health of the reef. (Tourism Operator 7)

Respondents believed that an additional way to inform tourists about the threats to the GBR was to use media stories and endorsements from high–profile figures. About a quarter of respondents felt that media and marketing interventions would help educate tourists about the GBR. Consider, for example, the following observation:

> Media is one way. I think a lot of people come with a preconceived idea of what they'll see or what they'll not, particularly international tourists… They come out here and quite a bit of feedback we get is "ah, it's a lot better than what we thought it would be. We heard it was all dead." (Tourism Operator 12)

Finally, some respondents (4/19) believed that improving how the GBR is managed would help tourists to understand the threats to the GBR. These tourism operators believed that more effective governance and leadership would indirectly influence the perceptions of visitors about the GBR. For example:

> By doing, not saying, you know, move towards a much stronger environmental presentation of tourism. (Tourism Operator 10)

Interpretation and messages about climate change provided by tourism operators

All of the respondents provided interpretation about the GBR to their guests, focusing on three main themes: education and awareness (15 out of 19), conservation activities such as resource management (14 out of 19), and information they believe enhanced the tourist experience (4 out of 19; Table 4). Most of the education and awareness-raising topics focused upon facts about the GBR and general knowledge, e.g. the size and history of the GBR. A few respondents (3 out of 19) discussed unique environmental attributes and more complex topics such as ecosystem dynamics. Other topics

Table 4. The interpretation themes provided by tourism operators to their guests.

"What are the main themes of the interpretation about the GBR that you provide for your guests?"	Total mentions	Tourism operators who mentioned it (n = 19)
Education and awareness about the GBR	23	15
General knowledge about the GBR	8	8
Biodiversity of the GBR	7	7
Threats to the GBR, e.g. climate change	5	5
Unique environmental attributes	2	2
Ecosystem dynamics	1	1
Conservation activities	18	14
Environmental protection	14	14
Environmental management	4	4
Tourist experience	6	4
Ensuring a good trip for guests	4	4
Expectations for the day	2	2

included the key threats to the GBR such as coral bleaching as well as the diversity of fish and corals, as illustrated by the following comment:

> The key message is the incredible diversity that we have. (Tourism Operator 1)

Conservation activities such as environmental protection and management approaches were also a main theme in the interpretation that many tourism operators provided to their guests. This included information about how tourists could minimise their impacts on the environment, e.g. recommendations about what behaviours to avoid. Respondents also focused upon how tourists could help protect the GBR and support the existing management arrangements in place, e.g. no-take areas. Here is an operator stressing this point:

> Key messages would have to be to look after our Great Barrier Reef, like not standing on it and all that sort of thing and don't touch anything and don't remove anything from the reef. (Tourism Operator 16)

Finally, four respondents focused interpretation on ensuring that tourists had a good experience. These respondents sought to guarantee an enjoyable time for their guests by complementing the visit with stories and anecdotes about the GBR. The following comment expresses this priority:

> We provide the most adventurous or almost extreme experiences for people… you also are giving them very often the best natural experience they've ever had in their life, so that's the building block and then interpretation complements all of that. (Tourism Operator 13)

Compared with topic areas such as biodiversity and threats to the GBR, interpretation related to climate change was seen to be less of a priority for tourism operators to discuss (Figure 3). Respondents agreed strongly that informing tourists about the fish and corals they may encounter on the day was very important. Although threats to the GBR and the impacts of climate change were also seen as important, the majority of respondents did not discuss climate change with their guests. Just 7 out of 19 respondents include it in the interpretation they regularly provide to guests.

Tourism operator actions to address climate change impacts on the GBR

Respondents were questioned about 10 environmental behaviours related to climate change and the conservation of the GBR (Table 5). The three most commonly undertaken behaviours, i.e. those behaviours with the highest proportion of tourism operators who report doing them, also received the three highest scores related to the ease of doing these behaviours, as assessed by the tourism operators. That is, the behaviours perceived to be the easiest were the ones that were most often done. Additionally, two of the three least common behaviours (use of green energy and use of alternative fuels) were perceived to be the most difficult behaviours for the tourism operators to do.

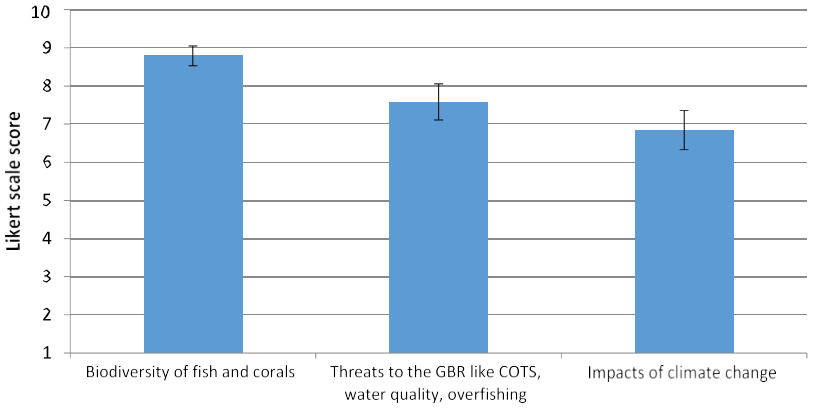

Figure 3. Comparison of mean rating scores showing tourism operator rankings of the importance of informing tourists about biodiversity, threats to the GBR, and the impacts of climate change using a 10-point Likert scale, where 1 = not at all important and 10 = the highest importance.

The four behaviours that were done least all relate to climate change mitigation: Use of an emissions calculator, use of green energy, use of carbon offsets, and the use of alternative fuels such as biodiesel and ethanol. Interpretation that encourages best practices and the conservation and sustainable use of the GBR was the most commonly undertaken behaviour and was also seen to be the easiest behaviour to implement (Table 5; Figure 4).

Of the 10 behaviours included in the interviews, tourism operators believed that maintaining industry best practices and recycling were the two most effective ways to address climate change on the GBR (Figure 5). Participation in GBRMPA's Eye on the Reef programme was perceived to be the least effective way to address climate change on the GBR. Respondents believed that high staff turnover in their businesses made it difficult to effectively participate in the Eye on the Reef programme. They also did not recognise the link between monitoring and management, believing that the programme did not focus on initiating change. Carbon offsets were also largely seen to be ineffective to address climate change on the GBR as many operators were sceptical about their efficacy, validity, or reliability.

Opportunities and obstacles for operators to address climate change on the GBR

The opportunity to influence tourist opinions was affected by a variety of attitudes held by respondents, including their internal perceptions (e.g. personal motivation) as well as external factors (e.g. the

Table 5. Tourism operator perceptions of the ease and efficacy of ten environmental behaviours.

Behaviour	Proportion of operators who do it*	Mean of perception of ease (n = 19)	Mean of perception of effectiveness (n = 19)
Providing interpretation for tourists that promotes conservation and sustainable use of the GBR	100%	9.00	6.47
Participation in industry best practices, via a code of practice or MOU	94%	8.05	7.84
Participation in GBRMPA's Eye on Reef program	79%	8.11	5.74
Use of fuel efficient engines	75%	4.95	7.37
Separation of waste by tourists for recycling	69%	7.42	7.68
Use of an emissions calculator	50%	6.53	6.53
Use of green energy (e.g. solar)	44%	4.11	7.11
Use of carbon offsets	38%	5.72	6.12
Use alternative fuels such as biodiesel and ethanol	6%	4.06	6.50
Providing interpretation such as best practice guidelines – to help your guests/passengers minimise their impacts on the Reef	*N/A (wasn't included in the 2013 SELTMP surveys)*	8.79	7.21

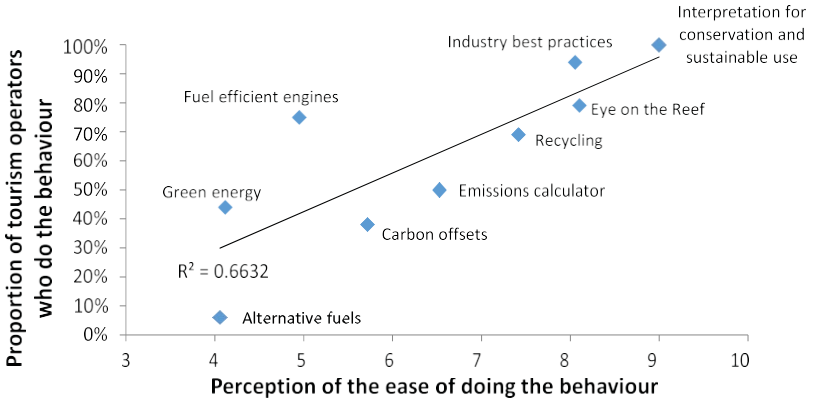

Figure 4. The proportion of tourism operators that undertake nine environmental behaviours plotted against the perceptions of ease to do those behaviours. Responses were ranked on a 10-point Likert scale, where 1 = very difficult to do and 10 = very easy to do. The proportion of operators undertaking the behaviour was taken from the 2013 SELTMP surveys (Curnock et al., 2014).

chance to converse directly with large numbers of people; Table 6). In particular, respondents thought they could use their location to their advantage. Many operators (11 out of 19) recognised that being out on the GBR provided a valuable opportunity to use visual examples to complement the information and messages they provided their guests. Here is a comment that illustrates this attitude on the part of operators:

> We have a living example that we can actually show to people and portray it. (Tourism Operator 1)

Many operators (8 out of 19) also agreed they could effect proactive change in people, both in terms of their knowledge but also their behaviours. They felt this was a valid reason for them to influence public opinion, but some operators felt they could influence change beyond just the guests they took out to the GBR. Consider the following interview response, for instance:

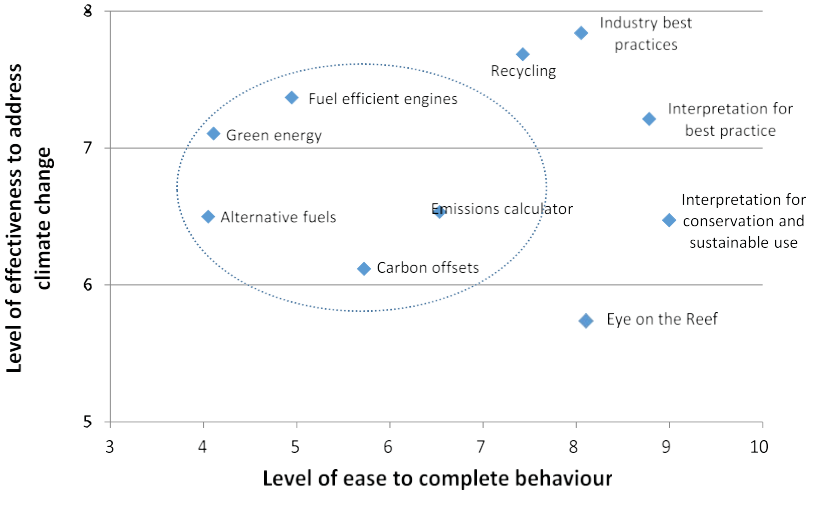

Figure 5. The perceived levels of ease and effectiveness of 10 different conservation behaviours related to climate change. Responses were ranked on two separate 10-point Likert scales. Ease to complete the behaviour was ranked on a scale where 1 = very difficult to do and 10 = very easy to do. Level of the effectiveness of each behaviour to address climate change was ranked on a scale where 1 = not at all effective to address climate change on the GBR and 10 = very effective to address climate change on the GBR. The behaviours in the circle are those that directly relate to climate change mitigation.

Table 6. The role of tourism operators in influencing public opinions about the GBR.

"Do you think tourism operators have a role to play in influencing public opinions about the conservation of the GBR? Why or why not?"	Total mentions	Tourism operators who mentioned it (n = 19)
Location: They are out on the GBR	14	11
They are "out on the front line"	8	8
They can use physical examples on the GBR to support their ideas	6	6
Self-efficacy: They can effect change	8	8
Can influence knowledge and behaviour	8	8
Responsibility: They feel an obligation to do something	8	8
They feel responsible to protect the GBR and the tourism industry	6	6
They have an emotional connection and/or concern	2	2
Opportunity: They have an engaged audience	6	6
They have a captive audience to connect with	4	4
They can reach many people	2	2

> Because through education we can inform the community and people will leave the area with a better appreciation of the GBR. (Tourism Operator 17)

Respondents (8 out of 19) also felt an obligation to influence the wider public opinion, recognising they had an emotional connection, obligation, and/or concern for the GBR that merited their efforts to effect change. Here is an operator giving voice to their sense of obligation:

> People working in the industry have enormous love and affection for the reef and a care factor and, um, I think information presented through that quarter is extremely influential on the customer. (Tourism Operator 10)

Finally, six respondents believed that they have a large and captive audience to engage, as illustrated by the following interview extract:

> We have a captive audience who want to learn about the system. (Tourism Operator 5)

Several perceived obstacles made it challenging for respondents to provide interpretation for tourists about climate change and the GBR. First, the plethora of cultures and languages among international tourists visiting the GBR was seen as a hindrance to operators wishing to communicate with tourists. For example, due to the high volume of international tourists, information and fact sheets needed to be translated into many languages, including French, Spanish, Chinese, and Italian. The following excerpt illustrates the challenge faced by operators:

> Lots of big tour groups coming out with very little control or very little knowledge of where they're coming due to language barriers and as best as we try to advise them, it just doesn't always get through. (Tourism Operator 3)

Additionally, the day trips to the GBR often have very strictly scheduled timelines such that there is not much time available for elaborate discussions or presentations. Many reef trips are tightly coordinated to ensure passengers are given safety briefings, morning tea, lunch, and that guests are provided with ample opportunity to sign up to purchase photos, dive packages, and other reef experiences. Interpretation must thus compete with these activities for the attention and time of the guests, as well as other unexpected occurrences such as seasickness. This challenge is summarised in the words of one operator as follows:

> I guess what would make it hard is at times the trips are run quite tight, there's certain things they have to do. Depending on weather and conditions, some trips don't run as smooth as others and so the opportunities might not be there to give the full interpretation program. (Tourism Operator 18)

Third, some respondents were cautious about discussing negative topics with guests as they were concerned how these discussions would affect the tourism experience on the day. Respondents also feared that guests would misinterpret information and spread bad publicity about the GBR back home, negatively influencing the tourism industry by reducing visitor numbers and business revenue. This reticence is typified by the following respondent comment:

> We don't want to sour anyone's experience on the day by putting out negative messages. (Tourism Operator 7)

This appears to be an example of Greenhushing, i.e. failing to raise – or admit to answering – difficult environmental issues, for fear of upsetting the customers (Font, Elgammal, & Lamond, 2017). It is a complex issue of behavioural change that is only now being researched in depth.

Fourth, many respondents believed the government and/or industries or organisations with a vested interest would object or disapprove of them providing interpretation to tourists about climate change and the GBR. Tourism Operator 17 believed "the resources industry, particularly the coal mining industry" would disapprove, while Tourism Operator 18 felt that "industries in conflict, such as the mining developments going on at the moment" would also object to such communication with tourists. Finally, many tourism operators believed that tourists were out for a good time, and, as Tourism Operator 5 stated, "people don't want to be lectured" about environmental issues.

Discussion and conclusions

Most respondents recognised the threat of climate change to themselves, the tourism industry, and the GBR. Additionally, they believed they had a role to play in influencing public opinion about the conservation of the GBR. However, some respondents were reluctant to discuss climate change with tourists and they had mixed views on the actions they could take to address climate change on the GBR, believing certain behaviours to be difficult, ineffective, or expensive. Here, we discuss these findings in depth, including a consideration of the implications for resource management and stakeholder engagement.

Perceptions about the threat of climate change across multiple scales

A majority of respondents recognised the severity, potential impact, and urgent need to address climate change. There were, however, differing perspectives regarding the tourism industry's vulnerability, with perceptions of climate change influenced by the respondents' sense of the spatial scale of the threat (Shakeela & Becken, 2015). That is, respondents believed that climate change was a more extreme threat to the GBR than it was to them personally. This is consistent with other studies showing that individuals often do not believe that climate change is an immediate, personally relevant threat (Scannell & Gifford, 2013) and that distant locations are more threatened than local areas (Spence & Pidgeon, 2010). However, as a consequence of running a business that depends upon a healthy ecosystem, tourism operators are intimately intertwined with their surrounding environment. In that regard, there is no true separation of a threat to their business from a threat to the GBR. This is important because individuals who perceive climate change to be personally threatening are more likely to take action to address those threats (O'Connor, Bord, & Fisher, 1999). Climate change is a sensitive, politically charged topic, and certain biases in respondent responses may remain due to their desire to appear socially responsible. Further clarification of why tourism operators feel personally threatened by climate change may assist in the development of messages and programmes that help them to recognise the threat and take action to address it. Research like this would be especially worthwhile for resource managers seeking to initiate mitigation and adaptation behaviours among tourism professionals along the GBR, particularly as tourism operators may be reactive rather than proactive in dealing with climate change (Hambira et al., 2015).

Providing interpretation to guests: accepting a messenger role but what message?

Tourism operators accept responsibility to provide trusted interpretation to their guests and they prefer to provide messages that are positive, informative, and contribute to a good visitor experience on the day. Many respondents were proud that guests looked to them for information, ideas, and to answer questions about the GBR. Moreover, respondents hoped to use these exchanges to inspire

people, increase their knowledge and, ultimately, change their behaviours. These intentions are well supported by previous research. Interpretation has been shown to enhance visitor knowledge and encourage environmentally responsible behaviours (Xu, Cui, Ballantyne, & Packer, 2013). Further, interpretation can improve the tourist experience in protected areas while concurrently addressing address negative impacts in those places (Kuo, 2002; Orams, 1996a).

Most interpretation focused on local issues such as the flora, fauna, and weather conditions that tourists were expected to experience on the day. Threats to the GBR were seen as less of a priority for these interactions and few respondents openly discussed climate change with their guests. Several tourism operators believed that guests were on holiday and, consequently, they were very cautious about providing negative information that could adversely affect the enjoyment of the tourism experience. They were also fearful that negative word-of-mouth publicity would influence the decisions of tourists to come and visit the GBR, thus damaging their business/livelihood. These fears are not unfounded, as interpersonal influence can be an important information source for consumers making a purchasing decision (Litvin, Goldsmith, & Pan, 2008) and negative publicity can have severe repercussions on popular tourism destinations (Brayshaw, 1995). This issue can be an especially diffi- cult one for some small businesses (Borden, Coles, & Shaw, 2017).

However, alternative message frames are available. Interpretation can foster positive attitudes towards conservation (Van Dijk & Weiler, 2009) and several respondents relished this role, hoping tourists would return home and encourage friends and family to change their behaviours as well. Tourism operators thus appear well-prepared and positioned to tell positive stories that contribute to a rewarding reef experience for their guests. It is also in their long-term interest to encourage their guests to tackle climate change, particularly because the main impact on the GBR of most visitors is remotely, mostly through burning fossil fuels. Operators are taking action, for example, using industry best practice, yet more can be done to encourage visitors to take action to support the GBR by reducing their carbon footprint, for example, by offsetting flights or using renewable energies. However, message framing is key and action on climate change could be communicated as being part of everyone's responsibility, particularly as negative message frames will largely be avoided due to fears of damaging repercussions on their business and the industry.

Providing interpretation: how and what is the best approach to deliver the message?

Tourism operators believed that positive messages are the most effective way to communicate with their guests about climate change, and they were open to receiving help with this process. Many said they would use materials about climate change that were provided to them. They also expressed an openness to collaborate with the GBRMPA on the development of interpretive materials, particularly materials that are professionally produced with the support of respected scientists and backed up by good data. As such, considerable potential exists to work with operators to develop, refine, and assist them with the distribution of interpretation materials related to climate change (GBRMPA, 2008; Great Barrier Marine Park Authority, 2012). Resource managers are encouraged to prioritise pilot programmes to pursue such a partnership, particularly as previous efforts in the GBR region have demonstrated the potential for successful collaborations between environmental managers and community groups to enhance environmental outcomes (Nursey-Bray & Rist, 2009). Further, visitors to coral reefs may support improvements to education materials designed to raise tourist awareness about the environment (Needham & Szuster, 2011), and improved interpretation materials have been shown to both enhance the satisfaction of tourists visiting the GBR (Coghlan, 2012a, 2012b) whilst making substantial contributions towards the sustainability of the tourism industry (Moscardo, 1998). However, various engagement barriers were also identified. Some operators were hesitant to provide pamphlets or brochures as they believe people would not read them; language and cultural issues prevent effective communication and awareness raising; and communicating with large groups of individuals in an effective manner is difficult. While there is a captive audience on the boats, there are numerous issues at play that mitigate against effective communication. Factors

identified by respondents included, *inter alia*: people get seasick if the weather is bad, they are tired after a long day on the GBR, they are tired in the morning as they had to get up early, and they have other things to do (e.g. if they signed up to do a SCUBA dive, they have forms to fill out, etc.). Further research, or perhaps a pilot programme, that clarifies ways to overcome these obstacles would be helpful for tourism operators seeking to better engage their guests.

Taking action on climate change impacts on the GBR: what works and what does not?

Many operators felt that money was a limiting factor in undertaking climate change mitigation activities, i.e. they believed that certain behaviours are too expensive. This finding is consistent with the work of Zeppel and Beaumont (2013), who showed that tourism operators preferred easy, low-cost actions leading to financial savings. Unfortunately, market forces are often insufficient to produce tourism activities that foster sustainability and, as a consequence, government interventions are required (Bramwell, 2012). Federal subsidies, rebates, loans, or government assistance packages may be effective mechanisms to assist tourism operators to reduce their greenhouse emissions (Odeku, 2013). Resource managers and policy-makers seeking to mitigate greenhouse gases must find ways to assist tourism operators in performing climate change mitigation behaviours thought to be difficult, perhaps by overcoming perceived barriers and obstacles to action. For example, many operators expressed an interest in using alternative fuels, but they also noted that these fuels are largely unavailable in the rural and remote areas where they work. Additionally, several operators noted that there are no recycling facilities available in the ports they use. Thus, it seems that tourism operators may be motivated to undertake difficult behaviours with appropriate assistance and support. Future research and pilot programmes which explore the barriers and benefits to action would be a valuable contribution towards encouraging climate change mitigation among tourism operators on the GBR.

Tourism operators believed they had a role to play in affecting public opinion, expressed a desire to make a difference, and were taking a variety of actions to mitigate greenhouse gas emissions. Although some behaviours such as industry best practices and recycling were seen to be most effective at addressing climate change, the mean scores did not have strong variability, ranging from 5.74 to 7.84. There are two probable explanations for this: either the operators believed that many things needed to be done to protect the GBR, or they were unsure about what approach is most effective and thus they simply agreed that most things do make a difference. Activities that reduce greenhouse gas emissions such as the use of green energy and fuel-efficient engines were rated as the most difficult behaviours to undertake. This perception was mostly due to the associated costs or because of the harsh conditions, i.e. salt water corrosion, daily use of engines, long distances to travel, the large amount of energy required to operate, etc. Again, pilot programmes established in collaboration with resource managers would be beneficial. Tourism operators want to do more to protect the GBR, but they face various barriers that must be overcome.

Implications for resource management

Tourism operators are open to the idea of providing climate change interpretation to their guests, yet they remain cautious about how the materials should be produced, what topics should be covered, and how the messages should be delivered. Tourist numbers are a primary concern for tourism operators and many believe that climate change stories in the media will “scare away guests”. Unfortunately, rather than confronting this perception, many operators prefer to avoid the discussion. Most operators do not discuss climate change with their guests. However, all tourism operators were open to using and presenting information and interpretation materials provided by external sources, including resource management agencies such as the GBRMPA. Here, we present a few options for resource managers and policy-makers seeking to encourage tourism operators to take a more proactive approach to climate change engagement with their guests. Future research plans and projects should focus on the following:

- Resource managers are encouraged to closely collaborate with tourism operators regarding the development and implementation of climate change messaging. A unified message delivered across the GBR tourism industry would help build solidarity among operators while concurrently prioritising and perpetuating key points to tourists, potentially influencing their attitudes and behaviours. Disseminating pertinent information related to climate change and the GBR may also be a useful strategy for policy-makers and resource managers who seek to build understanding and support for conservation initiatives (Jamal, Prideaux, Sakata, & Thompson, 2015). Identifying the key messages and delivery mechanisms is a key first step.
- Policy-makers may benefit from a closer engagement with tourism operators regarding the ongoing political debates about climate change and their impact on the GBR tourism industry. Many tourism operators in Queensland believe emissions–reduction measures to be integral to sustainable tourism (Zeppel & Beaumont, 2013). However, the respondents expressed concern with the existing government policies and believed that increased government support would greatly enhance their ability to take action to protect the GBR. Specifically, respondents felt that increased funding is required to appropriately address the impacts of climate change and they are willing to act with government support.
- Pilot programmes are required to identify and demonstrate how sustainable sources of subsidies, grants, and rebate programmes can be used to assist on-the-ground actions among GBR tourism operators. Most operators understand the threat of climate change and want to do more to address it. They simply require assistance and support. Pilot programmes should provide resources and opportunities for tourism operators to test what options work best. These trials can provide valuable lessons learned to inform the implementation of wider initiatives across the entire tourism industry, if required.

Conclusions

Tourism operators recognised that climate change is an extreme threat at multiple spatial scales and they are taking a variety of actions to address this threat. Unfortunately, climate change mitigation behaviours were perceived to be difficult and many were not being done despite being seen as an effective way to address climate change. However, there were exceptions. The adoption of fuel-efficient engines was seen to be difficult but effective at addressing climate change, and most operators used them. This is likely due to the additional benefit they provide operators in terms of cost savings, coinciding with their core responsibility as a business owner. Several other constraints to action were identified including a lack of money and equipment. For instance, several operators were open to using alternative fuels but noted there are none available in their area. Overall, respondents recognised the opportunity they have to inform and effect change in the lives of the guests they take to visit the GBR, and they are interested in taking action. Thus, pilot programmes that provide government support for climate change action are likely to succeed because tourism operators are interested in doing more to help protect the GBR and they are already taking action to do so. Finally, respondents expressed concern about the impact of negative climate change messages on their customer experience and industry as a whole. Discussions about climate change should thus be framed in a positive light. Options include highlighting the world-class management already underway in the GBR, that climate change requires everyone to take action, and that an incredible opportunity exists for guests to support this process and inspire others to do the same when they return home, perhaps via the use of renewable energies or flight offsets. Showcasing the vast range of proactive actions that tourism operators and resource managers are taking to help protect the GBR may reinforce the need for collective action and positively frame the discussion about climate change threats to the GBR. While the socio-ecological impacts of climate change on the GBR are almost inconceivably large, so too is the opportunity to galvanise millions of people to take action that will ensure its long-term future.

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