LINKING TOURISM AND NATURAL RESOURCE MANAGEMENT THROUGH OUTPUT INDICATORS

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ABSTRACT

There is growing concern about the future of coral reef health in the Great Barrier Reef, and the health of the tourism industry based upon it. Using strategies of ecotourism accreditation and permitting systems, studies of the economic value of the tourism industry to the local region, tourism industry and natural resource management align themselves for healthier reefs and a stronger, more resilient industry. This paper uses a model of indicators to look at the linkages between natural resource management and industry performance. We use input indicators, i.e. the expertise and financial resources put into maintaining a healthy reef, output indicators, visitor perceptions of the reef and their experience, and outcome indicators, satisfaction scores, to do this. We find that there has been a large input investment, which links to some, but not all of the outputs. Outcomes, however, appear to be more highly determined by the level of staff service, the diving and snorkelling experiences, and the weather conditions. We suggest therefore that the linkages between natural resource management and industry is complex one, and additional research into the resilience of the industry is required to maintain a strong reef tourism sector.

Keywords: reef tourism natural resource management indicator
INTRODUCTION

As a growing market, nature-based tourism faces interesting dynamics for a diverse group of stakeholders, including natural area managers, commercial operators, tourists themselves and in many cases local community. In many settings nature-based tourism forms the interface between the business models of tourism and natural resource management and conservation ethics (Fennel & Smale, 1992; Shultis & Way, 2006). One result of this interface is the creation of a symbiotic relationship where commercial operators seek permits from natural resource managers whilst resource managers use arguments about the economic value of tourism as a rational to conserve and protect natural areas (Dixon et al., 1993; Figgis, 1993; Thomas, 1990; Wood, 1991). As this relationship between operators and managers has evolved, there has been growing interest in the reciprocal impacts that occur between tourists and their environment. Some general research fields that fall into this category include the impacts of tourists on a natural area and its flora and fauna and the role that nature plays in tourist satisfaction (Chin et al., 2000; Higginbottom, 2004; Marion & Reid, 2007; Rouphael & Inglis, 1997)

In this paper, we examine the links between natural resource managers and commercial operators through the medium of key performance indicators. In this study the key performance indicators are limited to those which reflect the level of visitor satisfaction with their reef experience and which are relevant to both parties. Working on the belief that a feedback loop can be established between natural area management, tourist satisfaction and operator viability (Figure 1), we adopt a systems approach to understanding the links between commercial operators and natural resource managers. To achieve this, we use the indicator model proposed in Figure 1, adapted from Herriman, 2008. In this model, it is suggested that there is a progression of different types of indicators from input indicators, to output indicators and finally outcome indicators. In doing so, we trace the links between natural
resource management, natural science monitoring and research to, finally, social science research including satisfaction and reef experiences.

**Figure 1: Links between natural resource management and tourism operators**

In our example, we use the context of tourism on the Great Barrier Reef and propose that a common goal between industry and management is visitor satisfaction, an outcome indicator in the model proposed in Figure 1. The Great Barrier Reef Marine Park (GBRMP) provides an insightful example of the relationship between marine park managers and commercial operators for several reasons, discussed more fully in Schluter et al., 2007. The World heritage listed Great Barrier Reef (GBR) marine park covers an area of 348 000km2, and includes coral reefs, mangrove areas, open water, and seagrass beds, and several hundred islands. It is managed by the Great Barrier Reef Marine Park Authority (GBRMPA) as a multi-use area able to be used for recreation including tourism and fishing, and for commercial fishing. In the GBR 820 operators have permits to carry tourists within the Park while just under 2 million tourists visited the Park in 2007 (GBRMPA, 2008; Peut & McGinnity, 2007). The GBRMPA has recognised the value of the Park as a tourism attraction and has developed a relatively pro tourism position on tourism usage of the park but from
the perspective that tourism activities must be sustainable and environmental friendly.

The importance placed on eco-friendly tourism is manifested in several ways; operators that have obtained eco-certification are entitled to extended operating permits; each visitor to the park on commercial vessel pays an Environmental Management Charge to the Marine Park Authority; the Authority has established a Tourism and Recreation Critical Issues Group; and encourages operator crews to collect data on the health of the reef at their permitted visitation sites (Schluter et al., 2007). Further, the Marine Park Authority has developed a number of tourism related research priorities and associated key performance indicators. These are questions such as:

- What factors influence the development and implementation of interpretive programs and materials by different stakeholders within the GBR tourism industry? How can the GBRMPA work more closely with the GBR tourism industry to enhance their interpretive programs and materials with GBRMP values and GBRMPA messages?
- What programs and processes might be suitable and appropriate for tourism operators to achieve and maintain best practice environmental management standards in the GBR? What benefits and issues are associated with these accreditation programs and process? What national and international experience is relevant?
- What are the future trends and drivers impacting on tourism and recreational use of the GBRMP? What are future possible implications for the ecological and cultural values of the GBRMP? What does this mean for future access and use of the GBR for tourism and recreation, and for institutional arrangements for resource-use and management from State and Federal Government perspectives?
Economic research undertaken by Access Economics for the GBRMPA has valued reef tourism’s contribution to the local economy at AUD$6 billion with 55,000 people employed in the local community making it the second largest industry in the region (after agriculture). As some research has demonstrated the importance of healthy reef ecosystems to tourist satisfaction (Harriot, 2002; Williams & Polumin, 2000; Uyarra et al., 2005; Rudd, 2001), the contribution of the reef to the local economy has been used by the marine park managers as economic arguments to seek continued financial support for reef conservation and protection. Protection currently involves two major management projects; water quality improvement; and biodiversity conservation in the form of management responses to climate change and fisheries-related pressures. Combined, the outputs of these projects will improve the quality of the reef leading to an enhanced visitor experience and from the perspective of the local community lead to enhanced resilience (defined by Folke et al., 2003, as “the ability of socio-ecological systems to cope with and adapt to change”) in a period of change.

The relationships described in Figure 1 can be applied to the GBR as shown in Figure 2.

**Figure 2: possible links between GBRMP management and tourism operators**

![Figure 2: possible links between GBRMP management and tourism operators](image)
RESEARCH AIMS

Based on the ideas presented in Figure 2, this paper examines the links between natural resource management practices and operator outcomes. Our aim is to identify areas where there are unambiguous links between input, output and outcome indicators, as well as highlight areas where these links are not so clear, and conservation objectives and industry objectives may be better served by different goals and strategies.

In the first instance managers’ inputs into this system are identified and resulting outputs are investigated as improved natural resource quality and the recognition of natural resource quality as identified by visitors. Outcomes are measured through trends in visitor satisfaction, recommendation to visit and value for money measures.

RESEARCH METHODS

To identify the inputs, outputs and outcomes indicators, this paper examines the inputs of the marine park managers, the outputs (indicators of biodiversity, water quality and their importance in the visitor experience) as measured by natural scientists and social scientists, and finally the outcomes for the marine tourism sectors measured through social science visitor surveys. The sources of information (primary and secondary data) used in the research are therefore (1) natural resource management websites, information sheets, and so forth to measure input indicators, (ii) Marine & Tropical Science Research Facility (MTSRF) visitor surveys to measure output indicators and (iii) MTSRF visitor surveys to measure outcome indicators.

The Marine and Tropical Science Research Facility’s (MTSRF) visitor surveys form part of a project funded by the Federal Government’s Department of Environment,
Heritage, Water and Arts (DEWHA) that examines the sustainable use of marine resources in the GBRMP. The principle methodology for this research is visitor surveys distributed through participating reef tour boat operators. Crew from these marine tourism operators distribute and collect the surveys at four locations across the Great Barrier Reef (Port Douglas/Cairns, Townsville, the Whitsundays, and the Capricorn Coast). A total of 4800 surveys have been collected since the project began in November 2006, and provide data on reef visitors’ socio-demographic characteristics, and travel behaviour, activities, and reef experiences and satisfaction. Table 1 provides a description of the main respondent characteristics.

Table 1: summary socio-demographic and travel characteristics of MTSRF GBR visitor survey (N = 4800)

<table>
<thead>
<tr>
<th>Characteristics Tested</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-demographics</td>
<td>35% Australian, 25% students, 23% professionals, 45% 20-29 years old.</td>
</tr>
<tr>
<td>Travel behaviour</td>
<td>28% travelling with friends, 27.5% travelling with their partner, 75% first time visitors, 36% staying in backpackers for 2-5 days</td>
</tr>
<tr>
<td>Reef trip experience</td>
<td>69% were first time GBR visitors, 36% chose the trip based on agents’ recommendation, 41% planed to dive, 45% had visited other reefs, 75% went snorkelling, 53% swam and 43.5% went diving.</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Mean satisfaction score was 8.49/10, 79% perceived that they had value for money, 87% would recommend the trip to others, 55% said the reef greatly met their expectations, and 61% said the trip greatly met their expectations. Staff accounted for 36% of satisfaction responses, diving and snorkelling for 28% of best experiences, and the weather for 21% of worst experiences.</td>
</tr>
</tbody>
</table>

From Table 1, it is the latter information that is of interest in this paper. It includes satisfaction and expectations confirmation/disconfirmation ratings, results of open-ended questions on determinants of satisfaction, comments on best and worst experience, and measures on perceived value for money and post-trip recommendations to visit the reef. A content analysis of the open-ended questions allows themes that are important in the visitor experience to be identified and reported as output indicators whilst satisfaction, expectation confirmation, perceived
value for money, and post-trip recommendations are seen as outcome indicators. The data were then analysed using SPSS16.00 to look for relationships between the variables; in most cases chi-squared (Pearson’s correlation) were used, and where nominal and interval data (satisfaction scores) were compared, Eta tests were used.

There are several limitations in the research methodology that must also be noted. The first is that survey distribution and collection is entirely dependent on boat crews, which creates the potential for surveys to be misplaced or forgotten amongst other crew duties. This distribution method may lead to concerns over the randomization of sampling. Whilst boat crews have been asked to maximize sampling randomization (e.g. asking the crews to approach every fourth table on the larger boats, or every third seated person on the smaller boats, on set days of the month), it cannot always be guaranteed that staff, particularly new or casual staff, are following these instructions. The issue of randomization can also, to some extent, be addressed through large sample sizes, built up through time.

Additionally, some specific markets might not have been captured because the survey instrument is only distributed in English causing a strong bias towards Anglophone respondents. Again, this is a limitation of the methodology as boat crew cannot be expected to carry and distribute surveys in a range of languages, as well as issues of time, financial and human resources required for back-translation of open-ended questions. These limitations are acknowledged within the context of the research, and it is noted that whilst general trends may be recognizable and extrapolated, data represents only the respondents that completed the survey, indicating relatively high internal research validity but lower external research validity.

**RESEARCH RESULTS AND DISCUSSION:**

In this section we commence with a discussion on input indicators with a specific emphasis on programs designed to enhance the quality of the marine environment.
This is followed by a discussion on tourist’s interests and satisfaction with their visit to the reef which to a large extent is determined by the quality of the natural environment as well as the organisation of the tour which takes them to the reef.

**Input indicators:**

In this analysis programs identified as addressing water quality and conservation of biodiversity are classed as measures of inputs into the quality of the natural environment. The first of these, water quality, is centred around the Water Quality Action Plan, released by the Federal Government in September 2001 and launched in 2003, followed in 2008 by the Labour Government’s *Reef Rescue Plan*. The inputs into this Plan include (i) the establishment of a scientific working group to review available data, (ii) coordination of data from the National Land and Water Resources Audit, Australian Institute of Marine Science (AIMS) (river monitoring studies and long term monitoring studies), Co-operative Research Centre for the Great Barrier Reef, GBRMPA (chlorophyll monitoring studies and pesticide residue studies), Australia and New Zealand Environment and Conservation Council (pesticide, sediment and water quality guidelines), (iii) the establishment of working partnerships between Queensland EPA, GBRMPA, CSIRO, AIMS, James Cook University, University of Queensland, as well as industry (mostly agriculture), natural resource management (NRM) boards and local community groups. In 2008, this program received additional support through the Federal Government’s $200 million *Great Barrier Reef Rescue Plan*. The new plan covers the following areas:

- $146 million investment in a new Water Quality Grants Scheme;
- $12 million committed to significantly extend the Reef Partnerships Program;
- $10 million provided for new grants for Water Quality Research & Development;
- Significantly strengthen the Great Barrier Reef Water Quality Monitoring and Reporting Program by investing an extra $22 million;
• Establish a new $10 million Land and Sea Country Indigenous Partnerships Program; and
• Publish an annual “Great Barrier Reef Water Quality Report Card”.

The targets identified for water quality improvement are:

• Sediment – a 38% reduction from 11,700,000 tonnes per year to 7,300,000 tonnes per year
• Nitrogen – a 39% reduction from 39,300 tonnes per year to 24,000 tonnes per year
• Phosphorus – a 47% reduction from 7,400 tonnes per year to 3,900 tonnes per year
• Chlorophyll – a 30 to 60% reduction below present levels in coastal waters.
• Heavy metals and pesticides – reductions in detectable levels.

The monitoring program for these targets include six elements; (i) river flux monitoring, (ii) chlorophyll monitoring, (iii) Pesticide residue monitoring, (iv) Point source discharge monitoring, (v) Seagrass monitoring, (vi) Inshore reef monitoring. For each catchment area along the GBRMP, targets for sediment, nitrogen and phosphate loads have been identified. As an example, Table 2 shows the targets for the Barron River in Cairns.

Table 2: Catchment Targets for the Barron River in Cairns.

<table>
<thead>
<tr>
<th></th>
<th>1850 T/yr</th>
<th>Current T/yr</th>
<th>Current T/km³</th>
<th>Ratio</th>
<th>2011 % Red’n</th>
<th>2011 T/yr Target</th>
<th>2011 T/km³ Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sediment Export</td>
<td>18000</td>
<td>45877</td>
<td>180247</td>
<td>8.1</td>
<td>33</td>
<td>97738</td>
<td>120765</td>
</tr>
<tr>
<td>Total N Export</td>
<td>109</td>
<td>321</td>
<td>396</td>
<td>2.9</td>
<td>33</td>
<td>215</td>
<td>265</td>
</tr>
<tr>
<td>Total P Export</td>
<td>5</td>
<td>34</td>
<td>42</td>
<td>6.8</td>
<td>33</td>
<td>23</td>
<td>28</td>
</tr>
</tbody>
</table>

Data Confidence Index = 2
Source: GBRMPA
Queensland’s Environmental Protection Agency currently produce a Water Quality Report Card that allows the general public to track change in water quality. Table 2 provides an example of the type of data made available to the public. The report card (available at http://www.epa.qld.gov.au/register/p02256bj.pdf) also states that whilst little data is available outside the major urban centres of South East Queensland, there has been a 27% increase in nitrogen loads in Cairns (with a corresponding increase in Phosphorus) and a 17% increase in nitrogen loads in Rockhampton.

The second input that has been funded to enhance the reef environment is the conservation of biodiversity. The programs funded in this area focus on two areas; (i) climate change, which mainly affects the health of coral communities and many shellfish due to increase water temperatures and acidification, and (ii) conservation of protected species and management of fisheries. Information on the Climate Change Response Program is available through GBRMPA’s website (http://www.gbrmpa.gov.au/corp_site/key_issues/climate_change/management_responses) and states that the GBRMPA has received funds for a $2 million Climate Change Response Programme. This Programme includes a Coral Bleaching Response Plan which has been developed to monitor and assess the severity and extent of coral bleaching on the Great Barrier Reef each summer. The information generated assists ongoing improvement of the systems developed to monitoring and predicting weather conditions that are conducive to coral bleaching as well as increase understanding of the ecological responses to elevated sea temperature. Results are communicated to the industries and communities that depend on the reef. As part of this plan, publically available information on coral bleaching was made available on the GBRMPA’s website up until 2006.

Information on fisheries management centers around the marine park representative area zoning plans. The conservation plans for protected species include plans for Some shells - helmet shells, triton shells, tridacnid clams, some fish - seahorses, pipefish, sea dragons, potato cod, Queensland grouper, barramundi cod, Maori wrasse, all groupers (Epinephelus) more than 100cm, some sharks - whale shark, grey
nurse shark, great white shark, freshwater sawfish, sea snakes, crocodiles, marine turtles, birds, seals, whales and dolphins, and dugongs. Again, there appears to be little, if any, publicly available data on the status and trends of these species and little information on the investments made to ensure the long-term survival of these species, many of which would appear to be popular reef tourism attractions.

**Output indicators**

Output indicators were measured as the presence or absence of features related to the input indicators mentioned above. In this case, therefore we are looking for water quality and features related to the health of the coral ecosystem that affect the tourist experience. As a comparison, we have included the results the other features of the tourist experience that were frequently mentioned in response to the questions “what factors influenced your satisfaction rating?”, “what were the best features of the experience for you?” and “what were the worst features of the experience for you?”. Figures 3 to 5 show the results of the content analysis of responses to these questions.

**Figure 3: Frequencies of factors (as a percentage) that respondents felt determined their satisfaction scores.**
The categories shown in Figure 3 indicate that the staff had the greatest effect on visitor satisfaction. This was followed by the natural environment, the weather, food and snorkelling and diving experiences. Whilst respondents were not asked specifically for the direction of the relationship between their response and satisfaction (positive or negative), this can be determined in most cases from the actually response. In the case of water quality, which made up less then 2% of the total responses, 72% of the comments were positive whilst the remainder felt that the water visibility and quality was not so good. A few examples of both types of comments are provided below:

- Quality of snorkelling, equipment, clarity and water temperature, amount of marine life.
- Friendly crew good diving conditions warm and clear water

Or

- Weather not great, clarity of water could have been better. Expected more colourful fish
- Found snorkelling difficult in the conditions, water cloudy.

Similarly, comments about the natural environment were overwhelmingly positive (92.5%) as shown in Figure 4. Examples of positive and negative comments include:

- Shark sightings, the lack of coral bleaching and reef damage different kinds of fishes and corals/healthy environment
- Good environmental management (low impact), good snorkelling, well organised, excellent staff

Or

- The reef was not what I expected. But the crew and boat were brilliant.
- The condition of the reef in general, as I have dived other reefs it is obvious the GBR is dying fast.
The negative comments concerning the reef centred on the dead or dying condition of the coral (18 responses), lack of fish or megafauna such as sharks, turtles and rays (17 responses), the lack of coral colour (14 responses), the bleached condition of the corals and Crown of Thorns starfish damage (three responses).

Figure 4: Frequencies of factors (as a percentage) that respondents identified as a best experience during the trip.

As a best experience, being able to go snorkelling or diving was the most frequent response, followed by the marine life, and in most cases simply seeing the reef, which was mentioned by 33% of respondents. Finally, whilst many respondents (30%) said that they had had no worst experience, the remaining responses (see Figure 5) focussed on the weather and elements such as rough seas and seasickness, cold air/water temperatures and lack of sunshine (41.5%), followed by the long trip out to the reef, poor quality or badly timed food and drinks, uncomfortable snorkelling and diving. The quality of the marine environment was mentioned by 5.2% of respondents and the water quality was mentioned by 1.2% of respondents. In the former case, 36 responses focussed on the dead or damaged coral, 31
respondents complained of lack of fish diversity, few large fish, sharks or turtles and 31 respondents mentioned the lack of coral colour or the bleached aspect of the coral.

Figure 5: Frequencies of factors (as a percentage) that respondents identified as a worst experience during the trip.

Looking at changing patterns of respondents’ experiences over the last 20 months, we see few changes in response types, with staff being the main determinant of satisfaction, followed by the natural environment, weather and diving and snorkelling activities (Figure 6). For the purposes of this paper, water quality has been included in Figure 6, despite its infrequent mention by respondents. Interestingly, whilst the trend lines across the 20 months indicate that all of the important factors mentioned above are decreasing in frequency, water quality is slightly increasing (although this result must be interpreted with caution as water quality is not mentioned by many respondents overall).
Figure 6: determinants of satisfaction for respondents from November 2006 to June 2008.

Similar patterns exist in the responses to best experience, with variations between months, but overall diving and snorkelling tend to dominate the best experiences, followed by the marine life and the staff. Again all three features are declining in frequency of response across time (Figure 7).

Figure 7: Best experiences for respondents from November 2006 to June 2008.
Finally, when asked about their worst experience, the number of respondents who mentioned weather as a bad experience, and the number of respondents who felt that they had had no bad experience are both declining slightly (Figure 8).

**Figure 8: Worst experiences for respondents from November 2006 to June 2008.**

![Graph showing worst experiences](image)

It is obvious that whilst some of the measures within the input model do flow through to the outputs, there are far more (independent) elements such as staff hospitality and professionalism, food and drinks, weather conditions and comfort and safety issues (including feeling safe whilst snorkelling or diving for the first time) play important roles in the reef experience. The next two sections will identify how these elements come together in the outcome indicators of visitor satisfaction.
Outcome indicators

The outcome indicators that are used in this study centre around four measures of satisfaction: a satisfaction score; expectation (dis)confirmation measures for both the trip to the reef and the reef itself; perceived value for money; and recommendation to others. Figure 9 shows these measures for each month of data collection as well as the trend lines for the five measures. Only perceived value for money has been decreasing over time, whilst the other measures are slowly increasing.

Figure 9: Changes in satisfaction measures for respondents between November 2006 to June 2008.

To test for relationship between the variables in Figure 4, two tests were used. The first was a chi-squared test for independence to check for relatedness between the categorical variables reef expectations, trip expectations, recommendation to others, and perceived value for money. Additional, an Eta test was used to measure the relationship between satisfaction and the four variables mention above. Eta is a measure of association that ranges from 0 to 1, with 0 indicating no association and values close to 1 indicating a high degree of association. The results are shown in Table 3, indicating significant relationships between the four categorical data, partial relationships between satisfaction and reef expectations, trip expectations and value
for money, and a relatively low relationships between recommendation to others and satisfaction. From the Eta results and for the purposes of this study, we use satisfaction scores as a proxy measure for the three measures of satisfaction regarding reef and trip expectation (dis)confirmation and value for money and disregard the measure of recommendation to others, as it does not correlate well with satisfaction.

Table 3: Analysis of correlations between satisfaction measures.

<table>
<thead>
<tr>
<th></th>
<th>Reef expectations</th>
<th>Trip Expectations</th>
<th>Recommendation to others</th>
<th>Value for money</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reef expectations*</td>
<td></td>
<td>3.264</td>
<td>3.523</td>
<td>3.463</td>
</tr>
<tr>
<td>Trip Expectations*</td>
<td></td>
<td></td>
<td>2.310</td>
<td>4.398</td>
</tr>
<tr>
<td>Recommendation to others*</td>
<td></td>
<td></td>
<td></td>
<td>3.836</td>
</tr>
<tr>
<td>Satisfaction**</td>
<td>0.509</td>
<td>0.561</td>
<td>0.284</td>
<td>0.427</td>
</tr>
</tbody>
</table>

* Categorical data were analysed using Chi-squared tests
** Categorical and interval data were analysed using Eta test.

Linking output and outcome indicators

For each of the visitor experience output indicators that have been examined, we can overlay visitor satisfaction scores to determine how satisfaction (our outcome indicator) is affected by the output indicator. Figures 10 to 12 present this information in a visual manner, whilst a further three Eta tests present the trends in numeric form (Table 4). No clear trends are apparent in Figures 10 to 12, and the results of the Eta test (Table 4) support the fact that no one factor correlates strongly with decreasing or increasing satisfaction. The strongest association presented in Table 4 is between staff and the quality of service and satisfaction scores (0.279) and not surprisingly, between the lack of bad experiences and satisfaction scores (0.223). Neither of these associations can be regarded as strong, a fact that will be considered in more detail in the discussion.
Figure 10: Trends in satisfaction overlayed onto monthly frequencies of responses on staff, the natural environment, the weather and diving/snorkelling as an influence in satisfaction.

Figure 11: Trends in satisfaction overlayed onto monthly frequencies of responses on diving/snorkelling, the marine life, the staff as a best experience.
Figure 12: Trends in satisfaction overlayed onto monthly frequencies of responses on the weather, and lack of bad experiences as a worst experience.

Table 4: Correlations between satisfaction scores as output indicator and nine outcome indicators (four for determinants of satisfaction, three for best experiences, and two for worst experiences), using an Eta test.

<table>
<thead>
<tr>
<th></th>
<th>Staff service(^1,2,3)</th>
<th>Natural environment/Marine Life</th>
<th>Weather conditions</th>
<th>Snorkelling &amp; diving</th>
<th>No bad experience</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Satisfaction scores</strong></td>
<td>0.279</td>
<td>0.032</td>
<td>0.177</td>
<td>0.075</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>0.040</td>
<td>0.026</td>
<td>N/A</td>
<td>0.083</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Satisfaction scores</strong></td>
<td>N/A</td>
<td>N/A</td>
<td>0.097</td>
<td>N/A</td>
<td>0.223</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
CONCLUSION

The research presented in this paper aimed to link the inputs of natural resource managers into the outcomes of the tourism industry as measured by tourist satisfaction through the intermediate output measures of tourist experiences. By examining the experiences of tourists over a 20-month period we find that whilst the natural environment consistently rates as the second most cited determinant of tourist satisfaction, it appeared to be declining in importance throughout time. This trend is repeated in the other determinants of satisfaction, with the exception of water quality, and throughout the other measures of positive tourist experiences. This result is in itself interesting as it would appear that water quality issues represent one of the largest investments in terms of financial support from the Federal Government, as well as public communication efforts and monitoring updates.

In addition, the frequency of response “no worst experience” also declined over the survey period. These results suggest that as measures of output indicators, the trend is towards a worsening tourist experience. However, when looking at the outcome indicators, that is satisfaction indicators, in this case shown as several interesting trends. First, we note that three of the four indicators, value for money being the exception, appear to be increasing over time. They also appear to be poorly related to any one particular aspect of the tourist experience, as indicated by the results of the Eta analyses. Further, whilst satisfaction is increasing and value for money is decreasing, it appears that the measure “would recommend this trip to others” is poorly correlated with either of these measures, suggesting perhaps that tourists may continue to recommend reef trips independently of their experiences, their satisfaction scores, and their perceptions of having received value for money.

Whilst it would appear that the relationship between output indicators and outcome indicators is a complex one, where the whole is more than the sum of its parts, it is apparent that staff have the greatest influence on satisfaction scores. This indicates
the need for involvement by other stakeholders, such as regional tourism bodies and industry associations, in ensuring high quality reef tourism experiences. This would complement the work already being undertaken by natural resource managers in the area of biodiversity conservation and water quality improvement. In addition, according to existing industry reports, the need to address barriers to recruiting, training and retaining high quality marine tourism staff has already been identified. The barriers, according to a report by Tourism Whitsundays, include the need for multi-skilled staff, the perception that it is transient labour, the rapid burn-out time for staff, the ad-hoc and inflexible nature of marine tourism training requirements, the financial barriers to investment in staff training and the lifestyle challenges for staff (lack of services).

In conclusion, we suggest that the model proposed here is a useful way of tracking the impact of reef conservation programs on tourism experiences, but, given the importance of staff as an output indicator and value for money as an outcome indicator, we recommend that more stakeholders are brought into the management of tourism on the Great Barrier Reef in recognition of the complex nature of reef tourism experience. We suggest in conclusion that the linkages between natural resource management and industry is complex one, and additional research into the resilience of the industry is required to maintain a strong reef tourism sector.

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