The Resilience of Coral Reef Tourism to Global Change and Crises

Corrected PhD thesis submitted by
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Publications association with this thesis

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Biggs, D. 2011. The resilience of Australian reef-based enterprises to climate change and systemic shocks. *Ecology and Society 16(1): 30. [online] URL: http://www.ecologyandsociety.org/vol16/iss1/art30/* (Chapter 3)

Biggs. D.; Biggs, R.; Dakos, V.; Scholes, R.J.; Schoon, M.L. 2011. Are we entering an era of concatenated crises? *Ecology and Society 16(2): 27 [online] URL: http://www.ecologyandsociety.org/vol16/iss2/art27/* (Chapter 2)

Biggs, D.; Abel, N; Knight, A.T.; Leitch, A; Langston, A; Ban, N.C. 2011. The implementation crisis in conservation planning – could mental models help? *Conservation Letters 4:169-183* (Included as Appendix 1)

Biggs, D.; Turpie J.; Fabricius, C.; Spenceley, A. 2011. The value of avitourism for community-based conservation – an analysis from South Africa. *Conservation and Society 9(1): 80-90* (Included as Appendix 2)

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Reports and popular articles

Biggs, D. 2011. Case study: the resilience of the nature-based tourism system on Australia's Great Barrier Reef. A case study for the 2011 Australian State of the Environment Report. Commonwealth Department of Sustainability, Environment, Water, Population and Communities. Canberra. Australia.

Biggs, D. 2010. Cyclone Ului, Climate Change, Crises, and Reef Tourism Operators – Initial Findings. A report to the Great Barrier Reef Marine Park Authority. Townsville, Australia

Biggs, D.; Brewer T.D. 2010. Make your conservation PhD relevant: bridging the research-implementation gap. Published online on 23 April 2010 by ConservationBytes: http://conservationbytes.com/2010/04/23/make-your-phd-relevant/#more-3744

Duncanson, P.; **Biggs, D**. 2008. The Lower Burdekin Water Quality Improvement Tender: A market based incentive for water quality outcomes. Burdekin Solutions Ltd, Townsville, Australia. 83pp. http://www.bdtnrm.org.au/downloads/MBI-REPORT.pdf

Book Reviews

Biggs, D. 2010. A Review of "International handbook of the economics of tourism" edited by Larry Dwyer and Peter Forsyth, Edward Elgar, Cheltenham, UK, and Northampton, MA, USA, 2006, 495 pp., *Journal of Sustainable Tourism* 18:153 - 156

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Conference Presentations

During the course of my PhD, I gave the following invited and conference presentations:

Biggs, D. 2011. Lifestyle Identity Drives Reef Tourism Enterprise Resilience and Propensity to Conserve Australia's Great Barrier Reef. Resilience 2011: Resilience, Innovation and Sustainability: Navigating the Complexities of Global Change. www.resilience2011.org

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Biggs, D. 2009. Social resilience to systemic shocks: the case of reef tourism. *Mini Symposium on conservation management in socially complex systems. Waikato University Campus, Hamilton, New Zealand*. 2 September 2009.

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Abstract

Escalating global change may have profound impacts on society. There is concern over a potential increase in environmental-induced and other crises as a result of this escalating change. In today's highly connected world the impacts and extent of crises may spread in novel and unexpected ways. Thus, there is renewed science and policy interest in the ability of society to cope with and positively adapt to crises and change.

The resilience concept has gained increased attention as a way to understand the ability of ecosystems and society to cope with crises and change. Resilience is the capacity of a system to absorb disturbances or shocks and adapt to change without fundamentally switching to an alternative state. Resilience thinking acknowledges that systems of human and nature are interactive social-ecological systems and are not isolated from each other.

Coral reef tourism is an ideal sector in which to explore the resilience of society to crises. Coral reef tourism is centred on coral reefs – an ecosystem which is under threat from climate and broader global change. In addition, coral reef tourism is dependent on the flows of people, money, and resources from distant parts of the world. Thus, coral reef tourism provides a lens which incorporates both the impacts of climate and broader environmental change as well as the manifestations of a highly connected world.

This thesis investigates the resilience of coral reef tourism to crises resulting from climate change and other factors on Australia's Great Barrier Reef and in Phuket, Thailand. Key players in reef tourism are the enterprises that take tourists by boat to visit offshore coral reefs. For this reason, this thesis focuses on reef tourism enterprises as the scale of analysis.

A review of the literature suggests the following factors as key determinants of enterprise resilience: financial capital; human capital (skills and ability of enterprises owners and staff); lifestyle values (the extent to which enterprise owners and staff are motivated by lifestyle considerations); social capital (support from family, friends, community, and government); enterprise age and experience; and the ecological condition of coral reefs.

As many of the livelihood benefits from tourism in low and middle income countries stem from enterprises in the informal sector that are not registered, licensed, or taxed this thesis includes analysis of both informal and formal enterprises. Thus, this thesis investigates resilience in three different contexts: informal enterprises in Phuket, Thailand, formal sector enterprises in Phuket, Thailand, and formal enterprises on Australia's Great Barrier Reef. This thesis asks the following research questions: 1) Which factors can predict the resilience of reef tourism enterprises? 2) Are there differences between formal and informal enterprises in the theoretical components of resilience, and in their response actions and the factors that enabled their survival of crises in Thailand? 3) What commonalities can be identified in the factors associated with the resilience of reef tourism enterprises in different socio-economic and governance settings? And, 4) Are resilient reef tourism enterprises more supportive of coral reef conservation than non-resilient enterprises and what motivates this support?

Data were collected through semi-structured interviews with enterprise owners or senior managers. Binary logistic regression analysis was used to determine the factors which predict the resilience of reef tourism enterprises to crises. Strong lifestyle values and high levels of human capital both positively predict the resilience of enterprises on Australia's Great Barrier Reef. The results of a binary logistic regression analysis shows that access to finance and higher levels of social capital, in the form of support from family, friends and government during a crisis, predict resilience among informal enterprises in Phuket, Thailand.

There are marked differences between formal and informal enterprises in Thailand in the theoretical components of resilience, and in their response actions and the factors that enabled their survival of crises. Informal enterprises in Thailand report better financial condition in a crisis scenario, and higher levels of social capital in the form of government, family and community support than formal enterprises. Both formal and informal enterprises in Phuket indicate the importance of lifestyle values in their participation in the reef tourism industry. During past crises informal enterprises have responded mainly by temporarily closing down and relying on subsistence or an alternative source of income. The main response by formal sector enterprises to past crises was cost-cutting.

A redundancy analysis was used to identify the commonalities in resilience among all enterprises surveyed. Social capital in the form of support from government, NGOs, family and friends, perceived good reef condition, and lifestyle considerations such as identity are associated with the resilience of all enterprises. Financial capital is associated with the resilience of informal and formal enterprises in Phuket, but to a lesser extent with enterprises in Australia.

The relationship between enterprise resilience, and enterprise contribution to conservation is important for sustaining coral reefs. Chapter 3 shows how lifestyle values are positively associated with enterprise resilience. Chapter 6 shows how enterprises with high lifestyle values on Australia's GBR have higher conservation ethic scores, and participate more extensively in conservation actions. Hence, enterprises with higher lifestyle values are more resilient to crises and more likely to support conservation efforts.

This PhD contributes to understanding the resilience of nature-based tourism enterprises to crises and global change in both the formal and informal tourism sectors. The importance of lifestyle values in strengthening the resilience of all enterprises surveyed to crises is a key contribution of this work. In addition, lifestyle values form a nexus with enterprise resilience, enterprise conservation ethic, and contribution to conservation. This thesis provides a basis for more in depth research into the resilience of enterprises and other social agents exposed to crises and the effects of global change. Finally, this thesis is a foundation for researchers and policy-makers to actively enhance the resilience of the iconic reef tourism sector and enable the continued enjoyment of coral reefs into the future.

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Chapter 1: Introduction

GLOBAL CHANGE AND CRISES

Escalating changes at the scale of the planet pose profound problems for society. Climate change, deteriorating ecological conditions, and ongoing loss of biodiversity all influence the occurrence and impact of disturbances and shocks to ecological and the socio-economic systems that rely on ecosystem goods and services (Millenium Ecosystem Assessment 2005, IPCC 2007, Balmford et al 2009, Rockstrom et al. 2009). These ecological disturbances occur against a backdrop of conventional drivers including economic, cultural, political, and institutional pressures that impact on societal well-being (Marshall 2010). Due to economic linkages and flows of resources and people, impacts of crisis and shocks may spread rapidly in novel and unexpected ways (Adger et al. 2009). For example, international security concerns following the 2001 attacks on the United States and the SARS outbreak in Asia in 2003 affected travel globally (Hall et al. 2004). Similarly, the global financial crisis of 2008/9 emanated from the US housing market but quickly spread to affect availability of credit across most sectors of the global economy (Brunnermeier 2009). Interaction between pro-biofuel policies of western Europe and the USA, increasing energy prices, and droughts in key food production regions led to food riots and shortages across central America, Africa and Asia (Beattie 2008).

Due to the uncertainty about the timing of major disturbances, and how their effects may propagate, there is a resurgence of research and policy interest in the ability of society to cope with crises and adapt to change. However, research on the ability of society to cope with and adapt to change has a long history (Adger 2000). Three important and overlapping concepts

pervade the literature on society's ability to cope with, and adapt to, environmental crises and broader social-ecological change. The concepts are vulnerability, adaptive capacity, and resilience.

VULNERABILITY, ADAPTIVE CAPACITY AND RESILIENCE

Vulnerability and Adaptive Capacity

Definitions

Vulnerability is defined in different ways but the most widely accepted definition for application to social systems is that it is the susceptibility of a system to disturbances and is determined by exposure and sensitivity to perturbations and the capacity to adapt (Adger 2006, Gallopin 2006, Nelson 2007). Exposure is the extent to which a system experiences environmental or socio-political stress (Adger 2006). The characteristics of these stresses include their magnitude, frequency, and duration (Burton 1993 cited in Adger 2006). Sensitivity is the degree to which a system is affected by a perturbation (Adger 2006). For example, in the case of a community exposed to drought, exposure is the likelihood and potential magnitude of a drought and the sensitivity depends on factors such as the livelihood characteristics of the community and households within it that influence how they are affected by the drought. A household dependent on rain-fed crop production would be more sensitive to a drought than a household in which the main income-provider has a permanent, salaried job. However, some authors argue that sensitivity and exposure should be combined because they overlap to a large extent (Smit and Wandel 2006).

Adaptive capacity is defined in a variety of ways. Gallopin (2006) defines adaptive capacity as the the capacity of any human system from the individual to humankind to increase (or at least

maintain) the quality of life of its individual members in a given environment or range of environments. Adaptive capacity is also viewed as the third component of vulnerability together with exposure and sensitivity (Gallopin 2006). Adaptive capacity is determined by the preconditions necessary to enable adaptation, and includes social, economic, and physical elements and the ability to mobilise these elements for adaptation (Nelson et al. 2007). Adaptive capacity therefore enables the process of adaptation. Adaptation includes the decision-making process and the actions undertaken to deal with or maintain the capacity to deal with change (Nelson et al. 2007). At the local level, adaptive capacity is influenced by factors such as managerial ability, access to financial, technological and information, resources, infrastructure, the institutional environment within which adaptations occur, political influence, and social and kinship networks (Blaikie 1994, Adger 1999, Smit and Wandel 2006). Some determinants of adaptive capacity manifest at the local scale, such as the presence of a strong social network to provide support in the face of a crisis (Smit and Wandel 2006). Other determinants of adaptive capacity are dependent on larger scale socio-economic and political systems (e.g. the availability of government support and grants in the face of a crisis). Many of the determinants of adaptive capacity are therefore the same as those that affect a system's sensitivity (Smit and Wandel 2006). Vulnerability and adaptive capacity are thus context-specific and vary over time, as well as among nation states, communities, households and individuals.

Evolution and history of concepts

Until the last decade, the majority of research on vulnerability of social systems has either measured and analysed vulnerability as a lack of entitlement or analysed vulnerability to particular hazards or disasters (Blaikie 1994, Turner et al. 2003, Adger 2006, Cutter and Finch 2008). Entitlements refer to the legal and customary rights to exercise command over resources

such as food (Sen 1981). Research on vulnerability as a lack of entitlement has largely been associated with studies on sustainable livelihoods and food insecurity (Adger 2006). An example of a lack of entitlement is that a group of households within a community may be marginalised as a result of political and social processes. This group of households may have access to only marginal land for subsistence agricultural production and limited access to financial resources to buy food in the event of a crop failure, and low levels of social capital and support. These households are vulnerable because of their lack of entitlements to land, social support, and financial resources.

The natural hazards research tradition has incorporated engineering, physical science and social science to investigate vulnerability (Adger 2006). Physical elements of exposure, and the likelihood and impact of natural (e.g. floods, tsunamis, volcanoes) and technological social and political hazards are considered in the natural hazards tradition (Burton 1993 cited in Adger 2006). Natural hazard's research has shown that natural and socio-political hazards have differing impacts on different groups in society. Pressure and release models (Blaikie et al. 1994) aimed to integrate an understanding of the political and social structures that lead to vulnerability, with the vulnerability to hazards tradition which has a greater emphasis on the physical elements of exposure (Turner et al. 2003, Adger 2006). Pressure and release models explicitly define risk as a function of the perturbation and the vulnerability of the exposed unit. These models consider the conditions that make exposure 'unsafe' and to the causes creating these conditions (Blaikie et al. 1994, Turner et al 2003). An example of unsafe exposure would be a group of low income households who live close to a river with a flooding risk, but who do not have the financial or social capital to move elsewhere where their risk is reduced.

The shortcoming of the pressure and release model is that it still does not adequately account for feedbacks and dynamic interactions between sub-systems as part of a broader social-ecological system (Turner et al. 2003). A social-ecological system is one in which ecosystems (e.g. coral reefs, grasslands, forests) interact with human systems (e.g. political systems, economic systems, culture, social systems) in an inter-linked and co-evolving fashion. Over the past decade, there has been a shift towards conceptualising vulnerability as a property of coupled social-ecological systems. This shift to a more holistic approach to vulnerability that explicitly accounts for interaction between natural and human systems seeks to analyse the elements of vulnerability (i.e. exposure, sensitivity and adaptive capacity) of a bounded system at a defined spatial scale (Turner et al. 2003, Adger 2006).

Resilience

The concept of resilience has roots in the field of ecology and can be traced to systems approaches that were applied in the 1960s and 1970s in an attempt to understand the complex structure and dynamics of ecosystems (Folke 2006, Gallopin 2006). In the seminal paper by C.S. Holling (1973), resilience is defined as the capacity to persist within a particular state in the face of change. As part of that definition, Holling (1973) also proposed that ecosystems can exist in multiple states or configurations and resilience is the ecosystem property that mediates such transitions between or among states. Early applications of the resilience concept were on boreal forest dynamics in North America (Ludwig et al. 1978) and semi-arid savannah ecosystems (Walker et al., 1981). The idea of multiple states had profound implications for how ecosystems were managed, which led to applications in natural resource management systems including rangelands, freshwater systems (Fiering 1982), and fisheries (Walters 1986).

Application to social science

Resilience also began to influence fields outside of ecology. In anthropology, Vayda and McCay (1975) challenged the equilibrium-centered view of culture. In ecological economics, Perrings and others (1992) adopted a coupled social-ecological systems and resilience perspective and argued for a more inter-disciplinary and systems-oriented view of ecological economics. In management, King (1995) used the resilience literature to develop ideas of how organisations could avoid and manage ecological surprise. Other social science disciplines also influenced by the resilience perspective included environmental psychology, cultural theory, and human geography (Folke 2006).

At least until the late 1990s, most social science research and policy debates were firmly wedded to a static and equilibrial view of systems. The contribution of the resilience perspective was to challenge this view of systems as always tending to return to one equilibrium (Scoones 1999). The 'balance of nature' perspective within the social sciences was reinforced by models that were dependent on stable, equilibrial notions of social order. Ecological anthropology, political ecology, and environmental and ecological economics maintained a static view of the environment of the environment until the late 1990s, with some exceptions such as the Beijer Institute (Berkes and Folke 1998). The more complex systems view presented by ecologists such as Holling suggested that environments behave in a non-linear, non-deterministic, fashion often with unpredictable feedbacks. Moreover, social, political, economic, and ecological processes interact dynamically at different spatial and temporal scales, requiring analyses to be sensitive to the possible interactions between these systems across scales (Scoones 1999).

The concept of social resilience aimed to link the ecological notions of resilience to social systems, because the resilience concept was seen to offer a useful way of thinking about sustainability in social and economic processes (Levin et al. 1998, Adger 2000). However, taking the resilience concept straight out of ecology and applying it to social systems was contested in the social sciences because it assumed there are no fundamental differences between ecological and social systems (Adger 2000, Westley et al. 2002). Therefore, the concept of ecological resilience was applied as a metaphor in thinking about social systems. In this context, social resilience is defined as the ability of groups or communities to cope with external stresses and disturbances, and to maintain their functional characteristics and a defined identity (Adger 2000). Social resilience is influenced by a range of factors including social capital, quality of institutions and governance, and levels of inequality (Adger 2000). Social resilience is clearly also affected by the levels of dependency on a particular natural environment, and the ability of that environment to continue to deliver the ecosystem services a community or society depends on. In this way, the resilience of the social system and the ecological system interact to determine the resilience of social-ecological systems.

Main tenets of resilience theory

In 2002, the book 'Panarchy' synthesised the research and conceptual development on resilience (Gunderson and Holling 2002). Recent reviews of resilience (e.g. Folke 2006, Nelson et al. 2007, Gunderson et al. 2010), have also summarised the main tenets of resilience theory. The elements of resilience theory of most relevance to societal ability to cope with, and adapt to, crises and change are discussed briefly in this sub-section.

Multiple stable states and thresholds: One of the fundamental contributions of the resilience framework is the realisation that most social-ecological systems can organise around a number of possible states or basins of attraction (Folke 2006, Gallopin 2006, Nelson et al. 2007). For example, a savanna ecosystem can transition from a grass and shrub-dominated state suitable for cattle production to a thorny thicket dominated state that is not suitable for cattle (Walker and Myers 2004). A stable state is characterised by a certain structure or make-up, function (how it works) and feedback between variables. The 'boundary' or point of transition between two stable states is called a threshold – once a threshold into an alternative state is crossed, it can make a return to the earlier state difficult or impossible (Walker et al. 2004). A change to an alternative stable state, or basin of attraction, is known as a regime shift. In some cases regime shifts are sharp and dramatic but they can also be gradual (Walker and Myers 2004). Because complex systems are defined by non-linear feedbacks it can be difficult if not impossible to identify the location of thresholds without actually experiencing a regime shift (Carpenter et al. 2001, Nelson et al. 2007).

*Identity and desirable state*s: A particular basin of attraction or stable state is defined by a combination of function, structure, and feedbacks between variables (Gallopin 2006). From an ecological perspective no particular state is 'better' or 'worse'. Nonetheless, because of social goals and values some states are more desirable than others (Nelson et al. 2007). For example, a particular savanna ecosystem may be grass and shrub dominated or dominated by thorny thickets (Walker and Myers 2004). A land-owner practising wildlife tourism would likely prefer the more open grass and shrub dominated state because tourists will be able to see the wildlife more easily. By contrast, a conservation agency interested in a suite of threatened species dependent on a thicket habitat – would prefer that state. Hence, the desired state of an

ecosystem and a social-ecological system depends on the values, preferences and the associated negotiation process among different stakeholder groups. A desirable state is characterised by a particular composition of variables, feedbacks, and interactions that deliver the desired outcomes or services and has a particular identity (Cumming et al. 2005). Resilience viewed from the perspective of a stakeholder defined state with a particular identity refers to the ability of a system to tolerate and adapt to a disturbance without collapsing into a qualitatively different state with a different identity that no longer delivers the desired system outcomes or services (Cumming et al 2005).

Stability landscape and transformation: The stability landscape of a system is composed of the configurations of different basins of attraction and the thresholds or boundaries separating them (Gallopin 2006). The stability landscape is part of the structure of the system and depends on the fixed or very slowly varying factors of a system. Changes in these slowly changing variables can cause a shift in the stability landscape. Whereas resilience refers to the capacity of a system to remain in a particular basin of attraction in the face of disturbance and change transformation implies a shift in the stability landscape itself. A transformation represents a fundamental change in the nature of a social-ecological system and the way the socio-economic and ecological variables interact (Carpenter and Folke 2006).

Cross-scale interactions: The interactive relationships between social and ecological variables at different temporal and spatial scales means that social drivers can cause shifts in ecosystem state and ecological systems and vice versa (Scoones 1999, Walker and Myers 2004). The resilience of a particular state of a social-ecological system state therefore depends on political, economic, and cultural drivers interacting with ecological drivers over different spatial and

temporal scales. Cross-scale interactions are pertinent to the vulnerability and adaptive capacity of a social or social-ecological system. Environmental disturbances for example may occur at a household, regional, or global scale and perturbations have different onset times and durations (Nelson et al. 2007). Similarly, social processes vary in spatial and temporal scale from household or small business level decisions to national and multi-national agreements and actions (Clark 1985). The spatial and temporal scales at which social and ecological processes interact is thus important in the maintenance of particular services or outcomes from a social-ecological system.

Much of the work on resilience has focussed on the capacity of systems to absorb shocks and still maintain function (Folke 2006). Yet, another aspect of resilience investigates the capacity for re-organisation, innovation, renewal and transformation (Gunderson and Holling 1995, Carpenter and Folke 2006, Olsson et al. 2006, 2008, Gelcich et al. 2010). This latter body of resilience research is related to research on adaptive management, governance, innovation, and social learning. A central notion is that uncertainty and surprise are inherent to complex systems (Carpenter and Gunderson 2001). Crises and change may provide windows of opportunity for positive adaptations, while change should be actively managed and facilitated, rather than reacted to (Gunderson et al. 1995, Olsson et al. 2006, 2008, Gelcich et al. 2010).

Psychological resilience

Psychological resilience receives remarkably little attention in the ecological and social-ecological resilience literature (Holling 2001, Gunderson and Holling 2002, Folke 2006) considering how closely related the concept is to the social aspects of resilience. Psychological resilience has numerous definitions but the general emphasis is on the ability of individuals to

cope with, and remain functional amidst crisis and ongoing adversity (Almedon and Glandon 2007). The psychological resilience concept is applied to mental and physical health (Almedon 2008). Psychological resilience focuses on the traits or strengths of an individual to cope with sudden or ongoing stressors as well as the process through which the individual manages those stressors (Masten 1994, Rutter 2008).

Measuring vulnerability, adaptive capacity, and resilience

Developments in research on vulnerability and adaptive capacity over the past decade have recognised the importance of dynamic interactions between biophysical and social systems and the nested scales of interaction and feedback between systems (Turner et al. 2003, Adger 2006, Nelson et al. 2007). For example, the vulnerability of subsistence and semi-subsistence farmers to food insecurity as a result of a drought does not only depend on local seasonal variation in production conditions and movements in local food prices. Their vulnerability is also determined by conditions in other production regions around the world that affect the price of food, internationally determined variables such as the price of oil, the financial capacity and political willingness of governments to provide aid during a crisis, as well as the complex interaction among these variables (Brinkman et al. 2009). Recent research recognises the inherent uncertainty in predicting the complex and dynamic ways in which individuals, organisations, and society may respond to disturbances and change (Gallopin, 2006; Marshall, 2010). These developments have brought research on vulnerability and adaptive capacity closer to research on social resilience and the resilience of social-ecological systems.

The resilience concept therefore overlaps to a large degree with the concepts vulnerability and adaptive capacity (Gallopin, 2006; Miller et al., 2010). Vulnerability is the susceptibility of a

system to disturbances and is determined by exposure and sensitivity to perturbations, and the capacity to adapt (Adger, 2006; Gallopin, 2006; Nelson et al., 2007). Resilience, with its origins in systems ecology, has a more systems-oriented approach, whereas the concepts vulnerability and adaptive capacity are more focussed on the actors and their response to change (Miller et al. 2010). However, as explained above, resilience operates at multiple scales from an entire country or sector to individual actors such as enterprises and households. At the scale of individual actors, a focus of increasing research on resilience (Gelcich et al., 2006; Marshall 2007a, 2007b, 2010), the resilience concept overlaps to a large degree with the concepts vulnerability and adaptive capacity.

Furthermore, vulnerability, adaptive capacity and resilience are frequently considered together in studies although this is not always explicitly acknowledged. This leads to confusion in what the terms mean (Gallopin 2006). For example, research on the resilience of households or enterprises typically includes measures of adaptive capacity (for e.g. Marshall 2007a,b, Marshall 2010). Research on vulnerability generally takes the form of single case studies, or of index-based studies of different countries based on socio-economic and environmental variables (e.g. Cutter et al. 2003, Cutter and Finch 2008, Brooks et al. 2005). Because adaptive capacity is one of the determinants of vulnerability, studies on vulnerability and adaptive capacity frequently overlap to a large degree. Index-based studies of vulnerability are frequently couched in terms of the adaptive capacity of communities or countries to cope with disturbances and change (Adger 1999, Brooks et al. 2005, Smit and Wandel 2006). Empirical studies of adaptive capacity have predicted the determinants of adaptation among semi-subsistence resource users (Gelcich et al. 2006, McClanahan et al. 2009, Cinner et al. 2011), primary producers and commercial fishers (Marshall 2007a,b), and ski enterprises (Hoffman et al. 2009). Furthermore, some

authors view resilience as one component of adaptive capacity and the concepts of resilience, vulnerability, and adaptive capacity are clearly closely related, although the relationship between these concepts is imprecise (Gallopin 2006).

RESILIENCE AND NATURE-BASED TOURISM

Definition and studies to date

Nature-based tourism is the visitation of tourists to relatively undeveloped natural areas and the associated attractions including scenery, wildlife, or marine life (Ceballos Lascurain 1996). Nature-based tourism is a service-based, non-extractive use of biodiversity and is of growing importance in the economies of many countries (Scholes and Biggs 2004, Balmford 2009). Yet, nature-based tourism has received little attention in studies of vulnerability, adaptive capacity, and resilience. Even in the tourism literature more broadly, studies of vulnerability, adaptation and resilience are quite limited.

Studies of the capacity of the tourism sector to cope with crises and disturbances to date fall into four broad categories. 1) studies on the impacts of large disturbances such as the global financial crisis, or a SARS outbreak, on tourism arrivals at the national, regional or global scale (Kuo et al. 2008; Ritchie et al. 2010); 2) modelling and scenario-based analyses, varying from highly theoretical (Casagrandi and Rinaldi 2002) to studies focussed on specific issues like the impact of climate change (Maddison 2001; Hamilton et al. 2005); 3) mostly qualitative case studies, typically focussed on the response to disasters or shocks (Irvine and Anderson, 2004; Baker and Coulter 2007; Cioccio and Michael 2007; Laws et al. 2007; Smith and Henderson, 2008); 4) and research on how environmental change may affect the tourism industry (Arrowsmith and Inkerban, 2002; Petrosillo et al. 2006; Marshall et al. 2010). A number of

studies in the fourth group have focussed on environmental changes due to climate change and how tourism may be able to adapt to these changes. Such studies often focus on the ski industry (Koenig and Abegg 1997; Elsasser and Burki 2002; Steiger and Mayer 2008; Hoffmann et al. 2009), or the response of tourists to coral reef degradation (Cesar 2000; Graham 2000; Westmacott et al. 2000; Uyarra et al. 2005; Andersson 2007, Marshall et al. 2010).

The resilience concept has attracted increasing attention from tourism researchers as a way to understand tourism's ability to cope with crises, systemic shocks and change (Farrell and Twining-Ward, 2004; de Sausmarez, 2007; Simpson et al., 2008; Strickland-Munro et al., 2010). A resilience-based approach is useful because it considers the ability of a system to maintain and adapt its essential structure, identity and functioning in the face of often unpredicatable change and crises (Holling, 1973; Adger, 2000; Cumming et al. 2005). Yet, the growing but limited literature on the resilience of tourism systems to date includes mainly conceptual pieces on the value of the resilience concept to tourism studies (Farrel and Twining-Ward, 2010; Cochrane, 2010) and qualitative applications of the concept to protected area and community-based tourism (Strickland Munro et al. 2010; Ruiz Ballestros, 2010). For example, Ruiz Ballesteros (2010) conducted an in-depth three year ethnographic study in an Ecuadorian community using participant observation and in-depth interviews to develop a qualitative perspective of the social-ecological resilience of a lagoon system. Yet, to date, there has been no quantitative, empirical study on the determinants of resilience among actors in tourism such as tourism enterprises.

This PhD thesis examines the resilience of coral reef tourism enterprises to crises and change. This thesis contributes mainly to the domain of resilience research that focuses on the capacity

of systems to absorb shocks and still maintain function and less to the research that emphasises the capacity of systems for re-organisation and renewal (Folke 2006). In addition, enterprise resilience, defined in the following paragraph, combines the concept of social resilience (Adger 2000) with the ecological perspective on resilience as the capacity of a desired state with a particular identity to absorb and adapt in the face of crises and change without collapsing into a different state with a different identity (Cumming et al. 2005).

Multiple stable states in nature-based tourism

Alternative stable states are defined by particular identities that exist at specific spatial and temporal scales. For example, at the scale of hundreds of kilometres (the size of a small country or large province) reef based tourism may be a primary economic activity – which can be considered to be a stable state. Such a reef tourism-dominated state has a particular set of structures (boats, reefs, docks, divers) and feedbacks (revenue generation, insurance, government subsidies) that define its identity and also stabilize that identity. Yet changes in economic incentives or the degradation of reefs may shift tourism based enterprises away from reef tourism to a new state in which the main form of economic activity is for e.g. casino tourism. Similarly, at smaller scales, the enterprise scale, an enterprise may shift from a condition of solvency, to an insolvent state, or it may have the capacity to shift from a position in which its core business is reef-based to casino tourism. As described above, when dealing with social and social-ecological systems, the definition of what constitutes a defined identity requires a value judgement (Cumming et al. 2005). For example, in the case of enterprise resilience, a business economist who is only interested in profitability and employment might claim that a reef tourism enterprise is resilient if it maintained its income and employment by switching to a completely different activity (for arguments-sake the provision of micro-finance).

However, a researcher or stakeholder group interested in reef tourism might argue that if an enterprise is no longer active in reef tourism that it is not resilient. Explicit definition by stakeholders or researchers of a desired state, and consideration of the variables and interactions in the social and ecological system that may 'push' a system into an undesirable state are unique benefits of applying a resilience lens to understanding the ability of society to cope with and adapt to crises and change.

Coral reef tourism

Coral reef tourism is a good example of a coupled socio-ecological system through which to explore resilience. The threats to reef ecosystems include coral bleaching, ocean acidification, over-fishing, fertilizer and sediment runoff, coastal development, and poorly managed tourism activities (Hall 2001, Hughes et al. 2003, Bellwood et al. 2004, Hughes et al. 2010), all of which can erode the ecological resilience of reefs. Reef tourism is also affected by socio-economic and political crises and the interactions between the ecosystems and socio-economic and political systems the reef tourism sector depends on (Gossling and Hall 2006, Ritchie 2008, Hall 2010). Reef tourism in many parts of the world requires a boat to visit offshore reefs, so different forms of capital (boats, equipment, etc.) and skills are necessary for tourists to enjoy reefs and are critical components in the functioning of a reef-based tourism system. A reef tourism enterprise is defined as an entity consisting of one or more individuals who earn income through the delivery of a service to visitors. Thus, the focus of this thesis is on the resilience of reef tourism enterprises.

A review of the tourism and business literature suggests that the factors that may enhance the resilience of reef tourism enterprises are similar to the factors identified in the research on

vulnerability, adaptive capacity and social resilience discussed above. The most pertinent variables identified for the resilience of reef tourism are discussed in detail in chapters 3 and 4. Briefly, the variables are human capital (skills and attitude of key staff), enterprise age and experience, social capital (social networks and support), the extent of staff motivation by lifestyle values, and the condition of coral reefs and (Figure 1). The factors hypothesised to be determinants of resilience are used as the independent or explanatory variables, and a variety of measures of resilience are used as the dependent variables in the analyses. The independent and dependent variables, and how they are measured and analysed, are detailed in the data chapters (chapters 3 to 6).

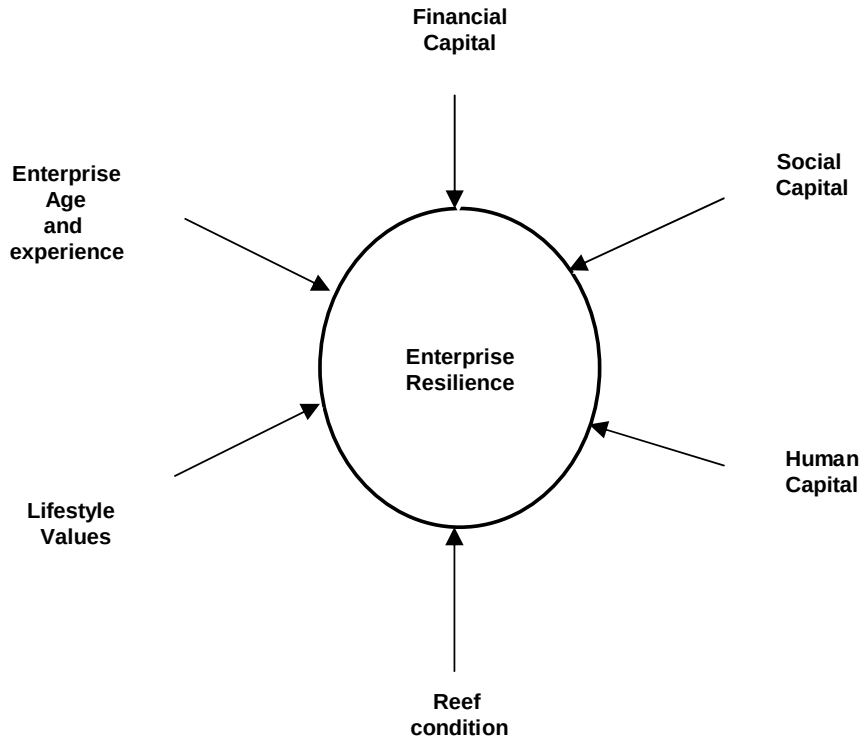

Figure 1: The factors that affect the resilience of reef tourism enterprises (for a more detailed discussion on the factors – see chapters 3 and 4).

Reef tourism is characterised by a continuum of enterprise sizes and characteristics that make it a good lens through which to understand resilience in tourism. On one end of the continuum are the large commercial enterprises, with substantial investments in boats, offices, marketing, and equipment that employ hundreds of people (see chapters 3 and 4). On the other end of the continuum are the small, informal boat enterprises, and individual or family-owned businesses that do not own their own boats, but rent boats or space on boats when they have clients.

Coral reef tourism enterprises and vulnerability, adaptive capacity and resilience

As described above, the concepts of resilience, vulnerability, and adaptive capacity overlap to a large extent and in empirical research the terms are often used interchangeably (Gallopin 2006). Researchers frequently report on the vulnerability of countries or households by measuring components of adaptive capacity (e.g. Brooks et al. 2005), or report on social resilience by measuring adaptive capacity (e.g. Marshall 2010). Therefore, this thesis defines an enterprise that is resilient to crises and change to a have a high adaptive capacity and a lower vulnerability to crises. Similarly, an enterprise with low levels of resilience to crises and change has lower adaptive capacity and higher vulnerability.

Resilience and socio-economic and governance contexts

The resilience of reef tourism enterprises to climate change and crises varies across different socio-economic and governance settings. This is because the vulnerability, adaptive capacity and resilience of enterprises and other actors are affected by larger scale socio-economic and political systems (Walker and Myers 2004, McClanahan et al. 2009). Factors such as local culture and the economic power of a country or region affect the resilience of enterprises within that country or region (Ruiz Ballesteros 2010). To enable an understanding of the resilience of reef tourism enterprises in different contexts I selected Australia's Great Barrier Reef (GBR) and Phuket, Thailand as my study sites. Australia is a high-income country with a high Human Development Index and excellent governance and is characterised by political and socio-economic stability (Worldwide Governance Indicators 2010a). Australia received 5.5 million international visitors in 2009 (World Tourism Organisation 2010) and tourism contributes 4.6% to national GDP (Australian Government 2010). Thailand is a middle-income country with moderate governance scores that has been plagued by political instability over the past decade

(Worldwide Governance Indicators 2010b). Thailand received 14.5 million foreign visitors in 2009 and tourism constitutes 6% of the total GDP (Tourism Authority of Thailand 2010). Expenditure per foreign visitor in Australia is 3.6 times than Thailand. Phuket, one of Thailand's main centres for reef tourism, has suffered from a number of disasters over the last 15 years, most notably the 2004 tsunami and the political crisis of 2008 and 2009 (Cohen 2008). The impacts of these disasters on tourism to Phuket, and to Thailand are discussed in more detail in chapter 4. In contrast, enterprises on Australia's GBR have not suffered tourism crises of similar levels since the 1989 Australian airline strike and the collapse of Ansett Airlines in 2001 (Leiper 2002).

Formal and informal tourism enterprises and resilience

Because many of the livelihood benefits from tourism in low and middle-income countries accrue through the informal economic sector, it is important that studies of resilience to crises consider both the formal and informal tourism sectors (Wahnschafft 1982, Nemasetoni and Rogerson 2004, Liu and Wall 2006). The informal sector is primarily composed of small-scale self-employed entrepreneurs and enterprises (Aguilar and Campuzano 2009). An informal tourism enterprise is often the major source of cash income for a family, as part of a broader livelihoods strategy that includes activities such as subsistence agriculture or fishing (Tao and Wall 2009). The informal sector is further characterised by easy market entry, family ownership, unregulated and competitive markets, intensive labour, and dependence on indigenous resources (Kermath and Thomas 1992, Mead and Morrisson 1996). Informal tourism enterprises typically have lower capital investments, and are more likely to close down for a period of time, and start up again (Mead and Morrison 1996, Rogerson 2004). The households that informal tourism enterprises contribute to, are also likely to have diverse livelihood strategies, with

tourism being one component (Tao and Wall 2009). In contrast, enterprises in the formal sector tend to be licensed, registered for taxation, officially enumerated, and often eligible for government subsidies. However, the formal/informal categorisation is best understood as a continuum of enterprise characteristics rather than as a clear-cut dichotomy (Mead and Morrisson 1996, Aguilar and Campuzano 2009). Informal reef tourism enterprises, and the factors that enable their resilience, are discussed in more detail in chapter 4. Despite the importance of the informal tourism sector around the world the resilience of informal nature-based tourism enterprises to crises and change has received little attention to date.

Enterprise resilience and conservation

The relationship between the resilience of an enterprise and its contribution to maintaining the health of a natural resource (e.g. coral reefs) is important for the resilience of the ecological system on which enterprises depend. Reef tourism, as a form of nature-based tourism, is directly dependent on the enjoyment by tourists of a natural attraction and its marine life. In addition, for over two decades nature-based tourism has been viewed as a way to harness human and economic values to achieve conservation outcomes and enhance the resilience of ecosystems (Diamantis 1999, Kiss 2004, Naidoo and Adamowicz 2005, Spenceley 2008). The motivations of nature-based tourism enterprises to contribute to conservation, and the mechanisms through which they contribute to conservation are discussed in more detail in chapter 6. Yet, the relationship between the resilience of enterprises in nature-based tourism, and the contribution of the enterprises to conservation, particularly during times of crisis have been little studied.

Scale of analysis of resilience of tourism

In consideration of the resilience of the reef tourism sector, the focus on the enterprise as a scale of analysis merits an introduction. As described above, the majority of studies on the resilience of tourism to crises and change focus at the scale of the entire sector through tracking variables such as the total tourist arrivals or total income from tourism (e.g. Hamilton et al. 2005, Kuo et al. 2008) in response to climate change or crises at the national, regional scale. Another scale and area of focus on tourism typically focussed on the response to disasters or shocks at the scale of an island, or a particular destination such as Phuket or Bali (Baker and Coulter 2007, Cioccio and Michael 2007, Smith and Henderson, 2008), mostly as qualitative case studies. A study by Hoffman and colleagues (2009) quantitatively examined the factors that enable tourism enterprises in an entire sector to adapt to change using the case of adaptation among ski lift operators in the European Alps.

Whilst enterprises may start-up and close down, provided the enterprises that close down are balanced out by new entrants into the market – the overall sector may be highly resilient even though individual enterprises are not. Considering the importance of re-organisation, innovation, and renewal in the resilience of systems (Gunderson and Holling 2002) it can be argued that in certain systems the rapid turnover of individual agents (e.g. enterprises) is what sustains the resilience of the broader sector or system. For example, in boreal forest ecosystems it has been shown that the loss of resilience of individual forest stands may enable resilience at the landscape scale, if changes in the configuration of forest on the landscape stabilise regional fire patterns (Johnstone et al. 2010). Despite an extensive literature search, it was not possible

to find published data on the average age or levels of enterprise turnover in reef tourism or other similar nature-based tourism enterprises.

The best available data on the age of reef tourism enterprises is contained in Biggs 2011 which forms chapter 3 of this PhD thesis, which indicates that the average age of reef tourism enterprises is 13 years. This suggests that investigating the factors that enable the resilience of individual enterprises is an appropriate way to advance the understanding of the resilience of reef tourism in the face of crises over the time scale of a decade.

RESEARCH QUESTIONS

The aim of this thesis is to examine the resilience of the coral reef tourism enterprises in Australia and Thailand to crises and change. Towards achieving this aim, I set out to answer the following research questions:

1. Which factors can predict the resilience of reef tourism enterprises?
    a. Which factors can predict the resilience of reef tourism enterprises in a high income, good governance setting?
    b. Which factors can predict the resilience of reef tourism enterprises in the formal and informal tourism sector in a middle-income country?

2. Are there differences between formal and informal enterprises in the theoretical components of resilience, and in their response actions and the factors that enabled their survival of crises in Thailand?

3. What commonalities can be identified in the factors associated with the resilience of reef tourism enterprises in different socio-economic and governance settings?

4. Are resilient reef tourism enterprises more supportive of coral reef conservation than non-resilient enterprises, and if so what motivates this support?

THESIS OUTLINE

This thesis is presented as a series of chapters to facilitate publication of this research. This section indicates the contribution of each chapter to the overall thesis and to addressing the four research questions (Figure 2).

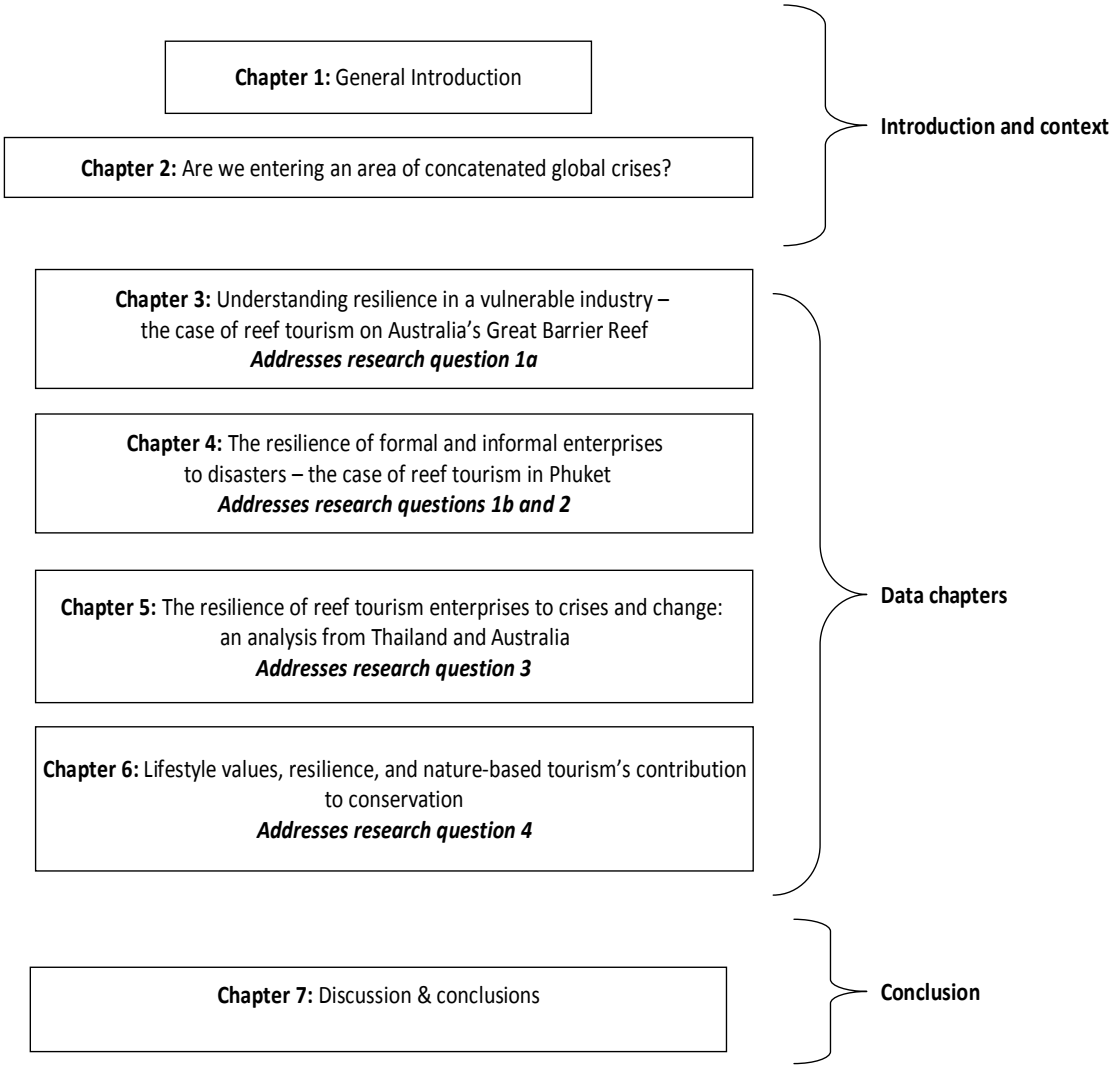

Figure 2. Chapter structure of this thesis

Chapter 1: 'Introduction' outlines the theoretical and applied context for this PhD, within the broader literature on resilience, vulnerability, adaptive capacity, and adaptation.

Chapter 2: 'Are we entering an era of concatenated global crises?' This chapter provides a further introduction to the thesis by presenting a case for why there may be an escalation of crises in coming decades. The chapter argues that one of the potential ramifications of rapid and

increasing anthropogenic global change is an escalation of large crises from the local to the global scale. The two factors that can interact to contribute to this escalation in shocks are: 1) increasing pressure on ecosystems, putting them at risk of collapse; and 2) an unprecedented level of connectivity and interdependency in global society. The potential for a future of escalating shocks requires adaptations in science and governance including a) an increased tolerance of uncertainty and surprise, b) strengthening capacity for early detection and response to shocks, and c) flexibility in response to enable adaptation and learning. The possibility of a future of concatenated global crisis demonstrates why understanding the resilience of sectors to such as reef tourism to large disturbances is paramount. I developed this paper and Reinette Biggs, Vasilis Dakos, Michale Schoon and Bob Scholes assisted with the development of the ideas and with the editing of this paper.

Publication:

Biggs. D.; Biggs, R.; Dakos, V.; Scholes, R.J.; Schoon, M.L. 2011. Are we entering an era of concatenated crises? *Ecology and Society 16(2): 27 [online] URL: http://www.ecologyandsociety.org/vol16/iss2/art27/*

Chapter 3: 'Understanding resilience in a vulnerable industry - the case of reef tourism on Australia's Great Barrier Reef' empirically examines the perceived resilience of reef tourism enterprises on Australia's Great Barrier Reef to large disturbances or shocks that result in a slump in tourist demand. Binary logistic regression analysis of two measures of enterprise resilience demonstrates the importance of human capital in strengthening enterprise resilience. Lifestyle identity, measured as the extent to which owners and senior managers are active in reef tourism as a lifestyle choice, is positively related to enterprise resilience. Finally, reef tourism enterprises indicate that financial and marketing support are the most important

actions that government can take to support enterprises in the face of a large shock. This chapter addresses research question 1a. I wrote this chapter, with editorial assistance from Terry Hughes and Joshua Cinner.

Publication:

Biggs, D. 2011. The resilience of Australian reef-based enterprises to climate change and systemic shocks. *Ecology and Society 16(1): 30. [online] URL: http://www.ecologyandsociety.org/vol16/iss1/art30/*

Chapter 4: 'The resilience of formal and informal enterprises to disasters – the case of reef tourism in Phuket' contrasts the factors that contribute to the resilience of formal and informal reef tourism enterprises in Phuket, Thailand. Informal enterprises report better financial condition in a shock scenario, as well as higher levels of social capital in the form of government, family and community support than formal enterprises. Formal and informal enterprises both display high lifestyle benefits from their participation in reef tourism. The response of enterprises to the 2004 tsunami and the 2008 political crisis are explored. This chapter concludes that authorities responsible for regulating and supporting reef tourism should account for the lifestyle benefits accrued to formal and informal enterprises and take steps to enable enterprise flexibility and cost-cutting during crises. This chapter addresses research questions 1b and 2. I conducted the analysis for, and wrote this chapter with editorial support from Michael Hall and Natalie Stoeckl.

Publication:

Biggs D, C.M. Hall, N. Stoeckl. The resilience of formal and informal tourism enterprises to disasters – the case of reef tourism in Phuket. *Journal of Sustainable Tourism.* In Press.

Chapter 5: 'The resilience of reef tourism enterprises to crises and change: an analysis from Thailand and Australia explores the commonalities in the factors associated with the resilience of formal and informal enterprises in Phuket, Thailand and enterprises on Australia's Great Barrier Reef. Using redundancy analysis, this chapter shows that human capital, government and NGO and family support, perceived good reef condition, and lifestyle considerations such as identity, are closely associated with the resilience of all enterprises. Financial capital is associated with the resilience of informal and formal enterprises in Phuket, but to a lesser extent with enterprises in Australia. Collaboration with competing firms is closely associated with the resilience of formal enterprises in Phuket only, which suggests that this group of enterprises is under the most pressure. The findings of this study suggests that the lifestyle benefits to enterprises should be actively considered by policy-makers, and that a nuanced understanding of the resilience of tourism enterprises in different contexts is required.
. This chapter addresses research questions 3. I wrote this chapter with editorial support from Christina Hicks, Joshua Cinner and Michael Hall. I worked together with Christina Hicks in conducting the analysis for this chapter.

Publication:

Biggs, D; C. Hicks, J.E. Cinner, C.M. Hall. The resilience of reef tourism enterprises to crises and change: an analysis from Thailand and Australia . In preparation for *Annals of Tourism Research.*

Chapter 6: 'Resilient nature-based tourism enterprises favour conservation - findings from Australia's Great Barrier Reef' explores the relationship between the resilience of nature-based tourism enterprises and their support of, and contribution to, conservation on Australia's Great

Barrier Reef. Chapter 3 shows that enterprises with high lifestyle values are more resilient. This chapter shows that enterprises with high lifestyle values have higher conservation ethic scores, and participate more extensively in conservation actions. Thus, enterprises with high lifestyle values are more resilient to crises and more likely to support conservation efforts. Bureaucratic, regulatory, and infrastructure constraints limit enterprise participation in conservation. Conservation agencies can work to reduce these constraints to ensure that the conservation benefits from nature-based tourism enterprises are maximised. This chapter addresses research question 4. I conducted the analysis and wrote this paper with editorial support from Natalie Ban and Michael Hall.

Publication:

Biggs, D., N.C. Ban, and C.M. Hall. Lifestyle values, resilience, and nature-based tourism's contribution to conservation. In review with *Environmental Conservation.*

Chapter 7: Discussion and Conclusions. The final chapter summarises the findings of the thesis and discusses them with reference to the literature and the contributions to knowledge. The importance of lifestyle values in the resilience of reef tourism enterprises to crises and change for both formal and informal tourism enterprises are discussed in consideration of research on other industries characterised by lifestyle motivations. Opportunities to integrate quantitative research on enterprise resilience with advances in tourism and business research on issues such as innovation and directions for future research are explored. Potential trade-offs between the efficiency and resilience of enterprises to change are discussed. This chapter concludes with thoughts on the management implications of my PhD research.

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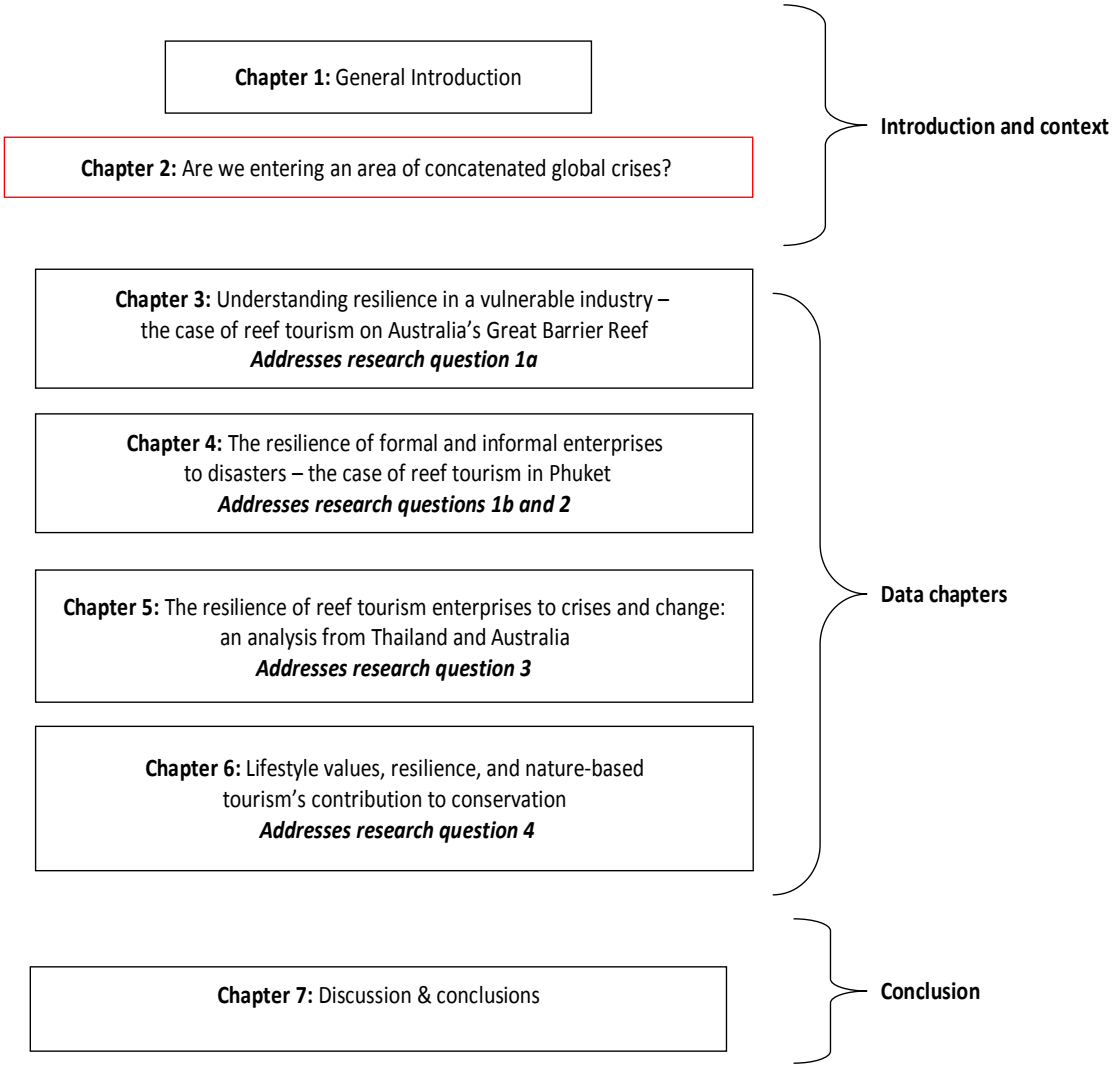
Chapter 2



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ARE WE ENTERING AN ERA OF CONCATENATED GLOBAL CRISES?

Duan Biggs [1], Reinette (Oonsie) Biggs [2], Vasilis Dakos [3], Robert J. Scholes [4] and Michael Schoon [5]

ABSTRACT

An increase in the frequency and intensity and environmental crises associated with accelerating human-induced global change is of substantial concern to policy-makers. The potential impacts, especially on the poor, are exacerbated in an increasingly connected world which enables the emergence of crises that are coupled in time and space. We discuss two factors that can interact to contribute to such an increased concatenation of crises: 1) the increasing strength of global versus local drivers of change, so that changes become increasingly synchronized; and 2) unprecedented potential for the propagation of crises, and an enhanced risk of management interventions in one region becoming drivers elsewhere, due to increased connectivity. We discuss the oil-food-financial crisis of 2007 to 2008 as an example of a concatenated crisis with origin and ultimate impacts in far-removed parts of the globe. The potential for a future of concatenated shocks requires adaptations in science and governance including a) an increased tolerance of uncertainty and surprise, b) strengthening capacity for early detection and response to shocks, and c) flexibility in response to enable adaptation and learning.

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INTRODUCTION

The risk of an escalation in the number and intensity of crises arising from accelerating human-induced global change is an issue of substantial concern to policymakers (MA 2005; IPCC 2007, Battisti and Naylor 2009, Rockstrom et al. 2009). In particular, there is evidence to suggest that large-magnitude disturbances may become increasingly coupled in time and space, leading to concatenated global crises (MA 2005, Adger et al. 2009, Rockström et al 2009). An escalation in global shocks, and particularly concatenated global shocks, are likely to have especially large impacts on the world's poor and jeopardize efforts to substantively reduce global poverty in the 21st century (WRI 2008, UNDP 2010, World Bank 2010).

Disasters such as the recent flooding in Pakistan and China, unprecedented fires in Russia, and hurricane Katrina, which had damage costs of over US$250 Billion (Comfort 2005), are recent examples of 'natural disasters' that particularly affected the poor. There is now substantial evidence that the frequency of such events is likely to increase due to human induced global change, including climate change, land-cover conversion and increased global connectivity (MA 2005, IPCC 2007). If such events in addition become more concatenated, their impacts are likely to be worsened. For instance, the impacts of recent flooding in north-eastern Australia increased the vulnerability of affected areas to the impacts of cyclone Yasi.

Growing global connectivity increases the potential for crises to spread, synchronise, and interact in novel ways as social-ecological systems (SESs) around the world become increasingly connected (Young et al. 2006, Peters et al. 2008). The global number of internet users grew by 362% from 360 million in 2000 to 1.67 billion in 2009 (International Telecommunications Union 2009), and has been an important factor in the spread of political dissent, for example in North

Africa. International tourism arrivals grew from 25 million in 1950 to just under 700 million in 2002, and over 900 million in 2007 (World Tourism Organisation 2008), but then dropped worldwide during the 2008 financial crisis. In biotic systems, the spread of alien invasive species is also accelerating (McGeogh et al 2010), particularly in association with the increased movement of goods and people around the globe.

This paper provides a synthetic summary of the mechanisms through which large-magnitude disturbances are increasingly coupled in time and space, leading to concatenated crises. Concatenated crises are disturbances ('shocks') that emerge near-simultaneously, spread rapidly, and interact with each other across the globe. We analyse the food price crisis of 2008 – an interaction between the oil price spike of 2007, pro-biofuel policies, and reactionary protectionism - as an example of a globally coupled crisis in which origin and effects stemmed from far-removed parts of the world and diverse economic sectors, and particularly impacted the poor. Finally, we discuss recent advances in resilience thinking, specifically how advances in detecting regime shifts and in governance thinking can build resilience to concatenated crises.

MECHANISMS FOR CONCATENATED CRISES

Two mechanisms may lead to the enhanced concatenation of crises. First, global drivers are becoming increasingly dominant over local drivers as determinants of the dynamics of SESs. This increases the pressures experienced by a SES (many failures are attributed to 'multiple stresses', acting additively or even multiplicatively). Importantly, it also leads to synchronous changes across systems in different parts of the globe, increasing the scale of disasters. Second, increased connectivity can enable local disturbances to propagate faster, turning local disasters

into global crises. Increased connectivity also means that there is a higher risk of management responses in one system unintendedly precipitating undesirable change in far-removed systems.

Powerful global scale drivers

Global-scale processes are increasingly important drivers of change. Examples include climate change (IPCC 2007), ocean acidification (Orr et al. 2005), invasive species (McGeogh et al. 2010), and pandemics such as the extinction of amphibians due to the Chytrid fungus, (Berger et al. 1998), and the globalisation of agricultural commodity markets (Adger et al 2009). Global drivers on their own, or in combination with local drivers, can put sufficient pressure on local ecosystems to result in collapse of the delivery of local ecosystem services, on which the poor often directly depend. For example, increasing temperatures and lower rainfall thought to be associated with global-scale greenhouse gas emissions, add extra pressure to ecosystems in south-eastern Australia (Murphy and Timbal 2008) that have already suffered extensive degradation due to local pressures. These combined global and local-scale pressures have jeopardized commercial crop production and water quality in several areas and led to the bankruptcy of farmers (Pengelly and Fishburn 2002).

Propagation of shocks and management responses through increasing global connectivity

Increased connectivity enables local-scale processes to propagate upwards, generating impacts at continental to global scales (Peters, 2008). Disease epidemics are especially sensitive to connectivity. The spread of bubonic plague ('Black Death') in the 14th century was by local spatial diffusion, which effectively confined it to Europe. In contrast, growing connectivity in the age of air travel, means that disease epidemics that previously might have petered-out locally are now propagated around the globe, as in the case of the SARS and H1N1 outbreaks of the

past decade (Fraser *et al.* 2009, Vespignani 2009). Thus, if global pandemics are to be contained in the modern era, a highly effective system of early disease detection and rapid response is required.

Socio-economic systems are also susceptible to rapid contagion. The potential for the propagation of crises to distant SESs, can on their own, or in combination with global and local pressures push those systems below a critical level of service delivery. For example, the global financial crisis of 2008 propagated from failures in the US housing market, to the banking sector in the developed world, ultimately affecting the availability of credit globally, and impacting the poor in both developed and developing regions. In particular, while this crisis primarily affected banking sectors in high income countries, it substantially exacerbated levels of unemployment and poverty in low and middle income countries (Brunnermeier 2009; McCawley 2009; World Bank 2009).

Greater connectivity and enhanced feedbacks between systems furthermore increases the risk that management responses in one region become drivers of change in others. As the impacts of global drivers and propagated disturbances increase, decision-makers take action to mitigate the impacts of these crises in their constituencies. In a highly coupled world, actions in one region may add pressures to systems in other regions and create, or contribute to, crisis conditions elsewhere. For example, Adger et al. (2009) show how incentives for increased coffee production in Vietnam had the intended effect of increased well-being for some in Vietnam, but led to a reduction in global coffee prices, decreasing the livelihood security of communities dependent on coffee production in Mexico.

THE FOOD PRICE CRISIS: CONCATENATION AT WORK

The food price crisis of 2007 to 2008 is an excellent example of how policy responses by individual countries, combined with powerful global drivers in highly coupled systems, ultimately affected the entire globe. Between 2004 and 2008 the price of staples such as rice increased by 255%, and wheat by 81%, before falling again (Fig. 1) (Headey and Fan 2008). The increased food prices resulted in effective food shortages (as poorer people were no longer able to afford food) and to 'food riots' in a number of countries (Fig. 2), ultimately affecting over 100 million people worldwide. Prior to 2004, the real prices of staple foods had declined for nearly three decades and were at an all-time low (Headey and Fan 2008). However, from 2004 to 2008, the price of petroleum, coal and natural gas increased by an average of 127% (Headey and Fan 2008). Energy forms a large component of food production and transport costs. In 2003 the EU enacted pro-biofuel production policies (the USA followed in 2005), partly in response to the rising energy price, but also in response to security concerns and to some extent to mitigate climate change. From 2007 to 2008, the resulting conversion of land from food to biofuel production exacerbated inflationary pressure on global food prices, already higher from increasing energy and fertilizer costs. Some authors also point to the effect of droughts in key production regions in reducing food supplies as an additional cause of the price escalation (Garber 2008, Mitchell 2008). In dealing with the emerging food price crisis, a number of countries, starting with India but ultimately including Egypt, Vietnam, Argentina, Russia, India and China, enacted food export restrictions, bans and taxes, which further restricted food supply and exacerbated price increases at the global scale (Beattie 2008). For rice in particular, the export bans played a major role in the upsurge in price (Headey and Fan 2008). Moreover, globally connected financial markets have allowed the development of commodity derivatives including food. Investments in commodity derivatives are used as a hedge because returns in

the commodity sector are relatively uncorrelated with returns to other assets (FAO 2010). Although commodity derivatives were not the cause of the food price crisis, the derivative markets have probably amplified price volatility (Headey and Fan 2008, FAO 2010).

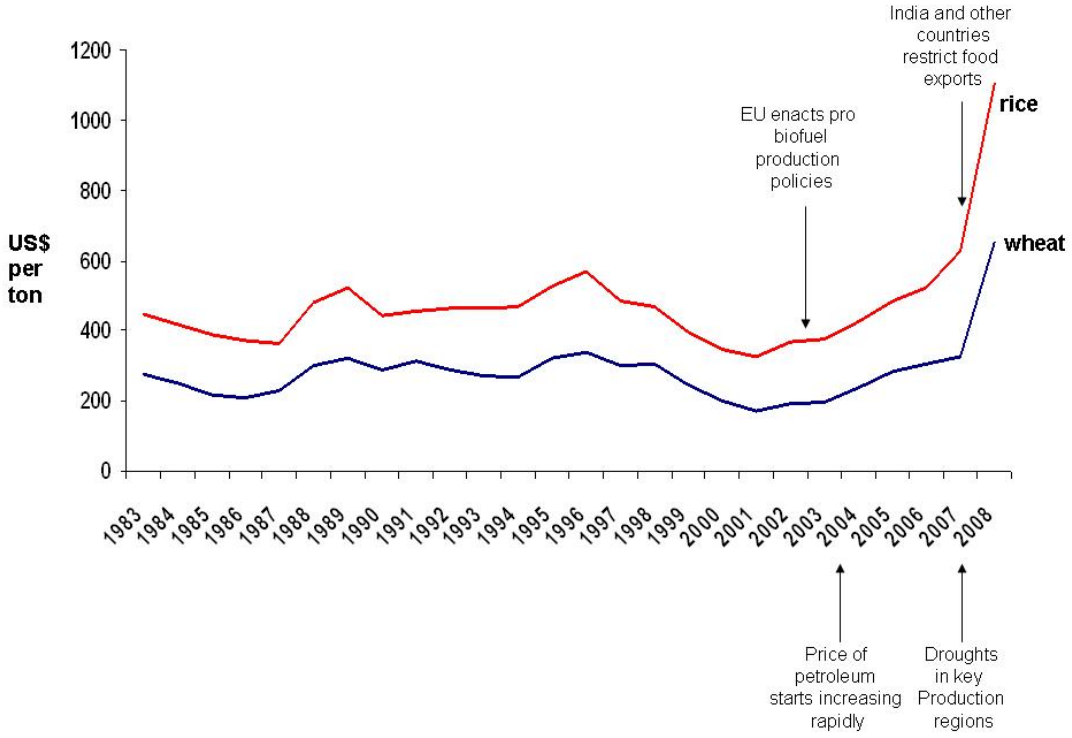

Figure 1. International prices of rice and wheat from 1983 to 2008 per ton in US$ and timeline of key events in the food price crisis. Data sources: Headey and Fan 2008, IRRI 2010

The food price crisis illustrates how a series of concatenated global crises interacted with different policy responses in a diverse range of countries to propagate the crisis throughout a highly connected global system. The rising energy prices were the global driver that underpinned the crisis. The national-scale pro-biofuel policies, a policy response from powerful high-income countries, contributed to the increase of food prices globally. The food export restrictions were a response by decision-makers in middle- and low-income countries to try to

avert crises within their constituencies. However, the highly coupled nature of global food markets resulted in drastic price increases because of the export restrictions. The result was food shortages and riots in many low-income countries in the Caribbean, Africa and Asia (Fig. 2).

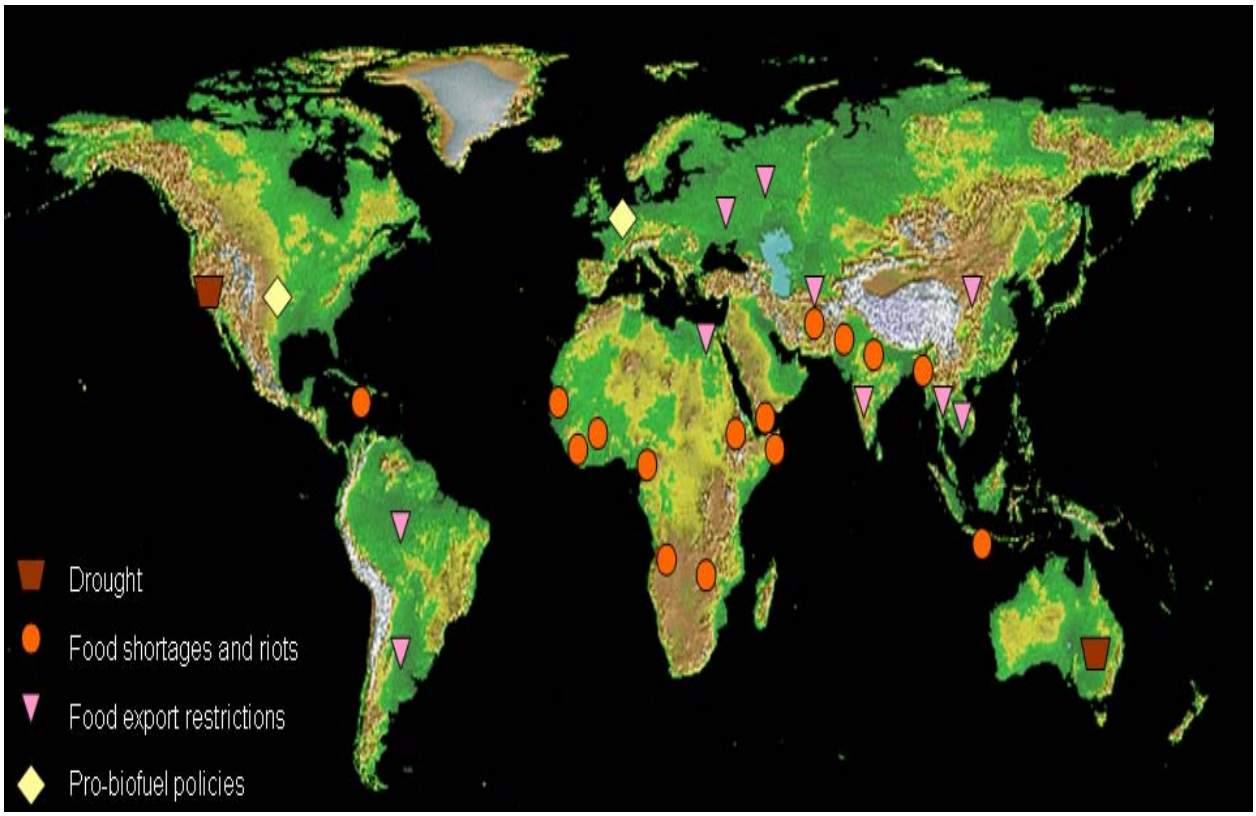

Figure 2. The interactive effects of global drivers and national scale policy responses led to the food price crisis of 2004 to 2008 with origins and impacts in far-removed regions and sectors of the globe. The crisis was exacerbated by droughts in key production regions.

The food price crisis also illustrates how vulnerable low-income communities are often most seriously affected by global crises. The population groups most vulnerable to higher food prices are those which spend a large proportion of their income on food, and have few coping strategies to rely on (Brinkman et al. 2009, Yngve et al. 2009). The 2007-2008 food price crisis was followed shortly by the global financial crisis which reduced exports, economic growth, levels of employment and government budgets for social support in many low and middle income countries (Brinkman et al. 2009). Although food prices dropped as a result of the financial crisis, the Food and Agricultural Organisation's Cereal Price Index was still 50% higher in January 2009 than in 2005. Simulations suggest that an additional 457 million people are therefore at risk of hunger and malnutrition (Brinkman et al. 2009).

COMPOUNDING EFFECTS AND NOVEL CRISES

Agricultural production provides a good example of how humans aim to suppress natural variation, in water availability and pest outbreaks for example, to create a stable environment for economic activity. The tendency to reduce natural variation in a highly connected world creates further possibilities for the emergence of entirely novel crises.

The compounding effect of suppressing natural variation

Humanity's tendency to damp down natural variation can reduce the buffering capacity of SESs to shocks. The policy of suppressing small wildfires, for instance in the western USA and southeast Australia, has led to large, high-impact conflagrations due to the build-up of fuel (Minnich 2001; Janssen et al. 2004). Repeated insecticide application has been associated with the periodic outbreak of insect plagues (Ludwig et al. 1978). This is because ecosystem components and suites of species that are adapted to the extreme values of environmental conditions are competitively disadvantaged when those conditions are not experienced, and are progressively lost from the system. Hence, in the first example, the plant communities become dominated by non-fire adapted species, which are overwhelmed by the intensity of the eventual fire. In the second example, when the insecticides fail, the natural mechanisms that limit insect outbreaks are no longer effective. In an analogous case, the canalization and structural modification of river systems have increased the amplitude and frequency of severe floods, as the natural buffering capacity against floods is reduced or completely removed (Criss and Shock 2001). Paradoxically, we tame the environment to promote stability, but this taming, may sow the seeds for later larger crises. The reduced buffering capacity of SESs to shocks increases the risk of transgressing dangerous thresholds; increased connectivity then propagates the failure elsewhere.

The emergence of novel crises

The food price crisis was a global emergency that stemmed from powerful global drivers, high levels of connectivity and reactive national policies. We may be able to predict, and mitigate against, the re-emergence of similar crises. However, complex systems of interdependent

networks can also behave in unexpected ways, leading to outcomes that are difficult, or close to impossible, to predict (Vespignani 2009, Buldyrev et al. 2010). In addition, it is very challenging to detect the approach of a critical threshold in a SES without actually crossing it (Biggs et al. 2009, Scheffer et al 2009). The timely and accurate prediction of large-scale system collapses resulting from concatenated crises (in which the transgression of critical thresholds, interconnectivity, and reduced buffering capacity to shocks interact) may be beyond our capacity, and once they emerge, our response strategies may be inadequate for such unprecedented situations.

ADVANCING UNDERSTANDING OF CONCATENATED CRISES

How can humanity deal with the uncertainty implicit in an era of novel concatenated crises? We propose the following research areas to further our understanding:

- Which local systems are particularly vulnerable to the pressures imposed by global drivers?
- What thresholds may exist at regional to global scale (planetary boundaries, *sensu* Rockstrom et al. 2009) that may lead to propagating crises?
- Under what circumstances are the effects of crossing local-scale thresholds likely to propagate upwards and outwards, due to connectivity and interdependence?
- What types of management response at local and regional scales are likely to have undesirable consequences for other regions?
- What types of actions can contain the spread of shocks once they occur (*sensu* Vespignani 2009), and at what scales are they effective?

The answers to these questions are currently unclear, except in unhelpfully general terms. Some of the uncertainty may be reducible through research and by applying advances in network theory and analysis (e.g. Buldyrev et al. 2010) and web-based tools for monitoring (e.g. Galaz et al. 2010). However, other aspects of the uncertainty surrounding concatenated crises are probably irreducible, since they result from fundamentally unpredictable processes. As society increasingly confronts such situations, there is a need to evolve responses suited to the realities of complex systems.

Humanity needs to learn to live within dynamic, diverse, and interconnected systems. Society's ability to deal with crises will be enhanced by our capacity to learn from experiences elsewhere and in the past (Pahl-Wostl 2006; Chapin *et al.* 2010). For example, awareness of the consequences of government inaction during the Great Depression of 1929 to 1933 enabled a concerted policy response by governments during the recent financial crisis (Wolf 2009). The EU's reduction in incentives for biofuels in response to the 2007/2008 food price crisis is another example of adaptive learning. Similarly, an increased tolerance of non-crisis level variation in SESs can reduce the risk of collapse when a system is exposed to larger shocks. Moreover, successfully coping with small disturbances has been shown to increase the resilience of individuals, organizations and communities to later crises (van Praag 2003; Cioccio and Michael 2007).

Recent developments in understanding how systems behave when they are close to transitions may offer new tools in dealing with the increased potential of unexpected changes. There is evidence of a variety of statistical signals prior to critical transitions (Scheffer et al. 2009). Systems close to a threshold appear increasingly volatile (Carpenter and Brock 2006) and

correlated (Ives 1995), both in time (Held and Kleinen 2004) and in space (Dakos et al. 2010). Although these signals do not provide the precise location of a threshold, they do give an indication of the proximity to a regime shift (van Nes and Scheffer 2007).

The same increased global connectivity that promotes the concatenation of crises also provides unprecedented opportunities to learn about emerging problems from other regions and coordinate a global response. For example, the World Health Organization uses web-crawlers to collect data that can help detect the outbreak of an epidemic (Weir and Mykhalovskiy 2006). Similar approaches can be combined with the early-warning methods mentioned above, to provide tools that may prevent the spread of concatenated crises in ecosystems and SESs (Galaz et al. 2010).

GOVERNANCE OF CONCATENATED CRISES

There is increasing evidence that a polycentric approach to governance builds adaptive capacity and creates more robust institutional arrangements to unexpected disturbances (Anderies et al., 2007, Ostrom 2010). In a polycentric approach, multiple governing bodies at a variety of scales have jurisdiction over specific issues and geographic regions (Ostrom et al. 1961). The combination of autonomy with the interaction with other governing bodies provides opportunities for experimentation and learning across multiple issues, arenas, and scales. Multiple independent governance arrangements provide both a diversity of approaches to a crisis and the redundancy to recover in cases of failure (Folke et al. 2005). Such flexibility and opportunities for learning contrast with top-down bureaucratic structures, designed to minimize change. Building networks of organizations committed to a process of continual inquiry, informed action, and adaptive learning is a more flexible and more robust strategy to cope with

disasters than the standard practice of establishing greater control over possible threats through inward-focussed administrative structures (Comfort 2005). A polycentric approach to governance may provide a mechanism through which both the coordinated learning and capacity building benefits of increased global connectivity, and the benefits of autonomy and regional experiments can be achieved.

However, polycentric systems of governance, while improving the capacity for experimentation and learning, still require two further shifts from traditional governance models for effective response to increasingly complex crises. The first shift requires individual jurisdictions to take advantage of the findings from across a polycentric system and allow for adaptive policymaking. Decision-makers – whether bureaucrats or businesspeople, politicians or the public – too often retain a perspective that views experimentation and revision based on new information as an acknowledgement of error and poor judgment, rather than as the only means of working through complex, nearly intractable problems. The second shift requires a diagnostic approach to governance (Ostrom, 2007). Similar to diagnostics in medicine, this approach systematically looks at a framework comprised of large numbers of relevant variables that affect patterns of interaction and outcomes for a situation without necessarily analyzing every causal relationship. Instead, in response to living in an ever-changing complex system that is only incompletely understood, the focus is on on-going analysis, experimentation, and adaptation rather than on finding ideal solutions and one-stop fixes.

In conclusion, we argue that the interaction of strong global drivers, increased potential for the propagation of disturbances across systems, and the heightened likelihood of policy responses in one region affecting other regions can lead to a concatenation of crises. Scientific capacity for

the early detection of dangerous and potentially propagating crises needs to be advanced, as does understanding and awareness of feedbacks and interdependencies that can lead to impacts spreading to other systems. Globally coherent strategies for the management of large crises, supported by a mindset that uses crises as an opportunity for learning, are required.

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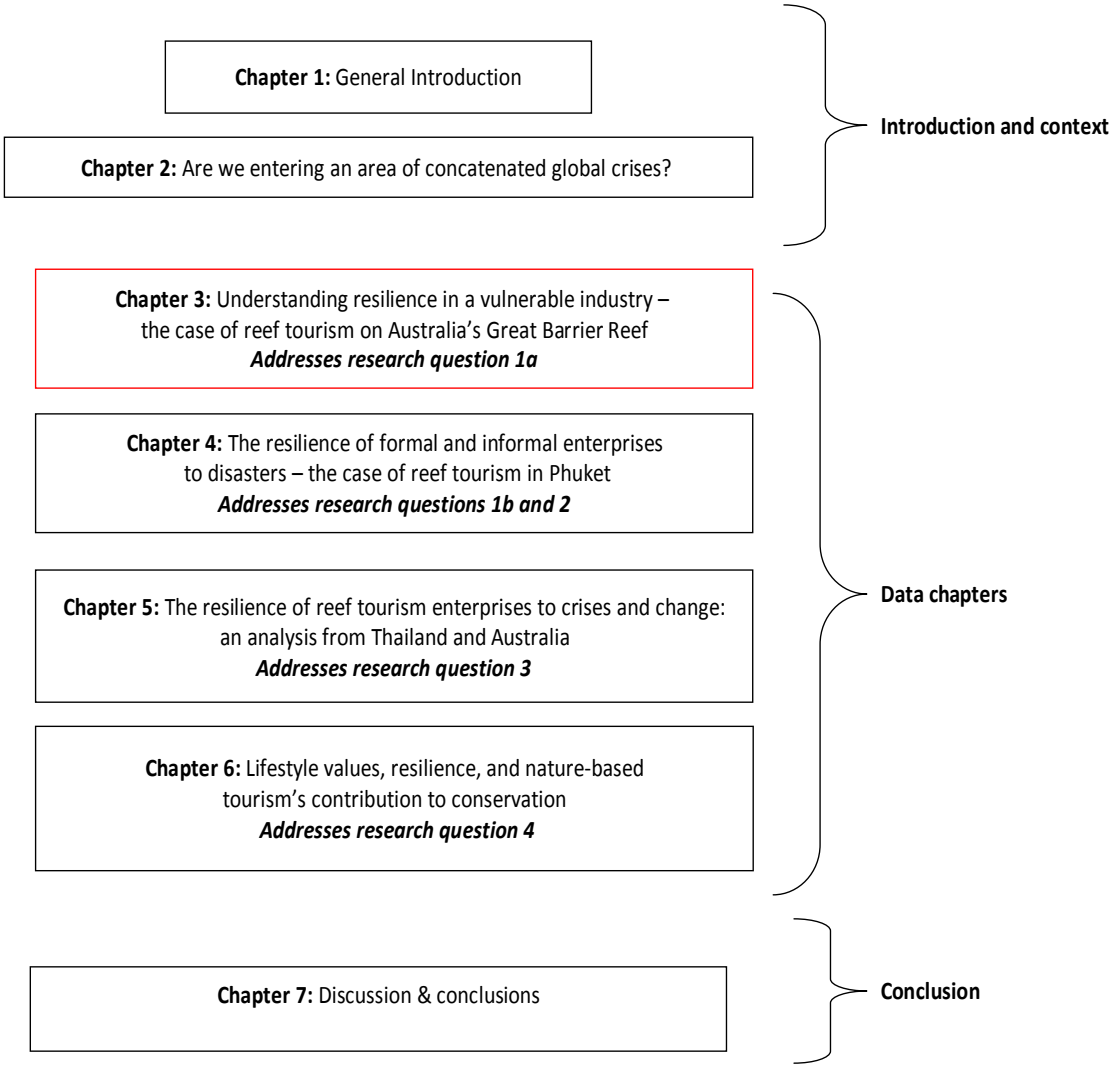
Chapter 3



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Research

Understanding Resilience in a Vulnerable Industry: the Case of Reef Tourism in Australia

Duan Biggs [1]

ABSTRACT. Understanding the resilience of vulnerable sectors of social-ecological systems is critical in an era of escalating global change. The coral reef tourism sector is highly vulnerable not only to ecological effects of climate change and other anthropogenic disturbances on reefs, but also to shocks such as economic recession and energy price escalation. Commercial tourism enterprises are key players in reef tourism in Australia and elsewhere. However, the factors that confer resilience to reef-based tourism enterprises, or the reef tourism sector more broadly, in the face of large disturbances have not been investigated to date. This paper empirically examines the perceived resilience of reef tourism enterprises on Australia's Great Barrier Reef to large disturbances or shocks. Binary logistic regression analysis of two measures of enterprise resilience demonstrates the importance of human capital in strengthening enterprise resilience. Lifestyle identity, measured as the extent to which owners and senior managers are active in reef tourism as a lifestyle choice, is positively related to enterprise resilience. Finally, reef tourism enterprises indicate that financial and marketing support are the most important actions that government can take to support enterprises in the face of a large shock.

Key Words: *coral reefs; disturbance; global change; resilience; shock; tourism; vulnerability*

INTRODUCTION

It has become increasingly important to understand and manage the resilience of vulnerable socioeconomic sectors. Continued climate change, deteriorating ecological conditions, and ongoing loss of global biodiversity have the potential to result in an escalating number of disturbances and shocks to social-ecological systems (Millennium Ecosystem Assessment 2005, IPCC 2007, Balmford et al. 2009, Rockstrom et al. 2009). These ecological disturbances occur against a backdrop of conventional drivers including economic, cultural, political, and institutional pressures (Marshall 2010). In addition, catastrophic events such as the recent BP oil spill in the Gulf of Mexico exemplify the type of large scale disturbance that can result from the use of increasingly sophisticated technology to access declining resources (Thomson 2010). Because of economic market linkages and flows of resources and people, impacts of crisis and shocks may spread rapidly in novel and unexpected ways (Adger et al. 2009). For example, international security concerns following the 2001 attacks on the United States and the SARS outbreak in Asia in 2003 affected travel globally (Hall et al. 2003). Similarly, the global financial crisis of 2008-2009 emanated from the U.S. housing market but quickly spread to affect availability of credit across most sectors of the global economy (Brunnermeier 2009). Interaction between probiofuel policies of western Europe and the USA, increasing energy prices, and droughts in key food production regions led to food riots and shortages across central America, Africa, and Asia (Beattie 2008). This increased uncertainty about timing of major disturbances, and how these disturbances may spread, is of particular concern to socioeconomic sectors that depend on the flow of people and money from distant parts of the globe such as the global tourism industry.

Although international flows of travelers are quite resilient to disturbances globally, e.g., tourism arrivals decreased only 4.2% during the global financial crisis of 2009 (UNWTO 2010), individual countries, destinations, and market sectors can be subjected to high levels of volatility in tourist demand in response to socio-political, economic,

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and natural resource crises. For example, from January to April 2009, tourism arrivals to Europe dropped by 10%, and the Middle East by 18% as a result of the global financial crisis. Similarly, the attacks in September 2001 resulted in sharp declines in outbound travel from the USA (Hall et al. 2003). Countries and destinations highly dependent on U. S. tourists were particularly affected. Because of ongoing global change, there is much uncertainty about which disturbances or crises may occur where, and when and how systemic and global effects of these disturbances may spread (Sheldon and Dwyer 2010). Sectors of the tourism industry that depend on a natural resource base highly vulnerable to global change such as coral reef tourism also face added pressure and uncertainty.

Coral reef tourism plays a growing role in the economies of many tropical maritime countries (Gössling 2003, Access Economics 2007, Andersson 2007), yet the threats to coral reef ecosystems are particularly acute and include coral bleaching, ocean acidification, overfishing, and fertilizer and sediment runoff (Bellwood et al. 2004, Hughes et al. 2003, Hennessy et al. 2007). There is concern over the impact of continued degradation of coral reefs on the future of reef tourism (Andersson 2007, Hennessy et al. 2007). The uncertainties facing reef tourism are, however, not restricted to the threats facing coral reef ecosystems. The reef tourism sector is also affected by socio-political and economic disturbances described above such as international security and health concerns, economic recessions and resource price shocks, as well as national and local level issues including the regulatory environment (Hall et al. 2003, Gössling and Hall 2006, Baker and Coulter 2007, Simpson et al. 2008, Adger et al. 2009, Hall 2010). Therefore, there is a need to understand the factors that enable the reef tourism industry to cope with, and make positive adaptations, in the face of increasing global change and associated shocks and disturbances. A resilience-based approach to understanding and managing reef tourism is useful as it considers the ability of a system to maintain its functional characteristics and identity in a coupled social-ecological system in the face of disturbances and ongoing often unpredictable change (Adger 2000, Gunderson and Holling 2002).

Coral reef tourism is therefore a good example of a vulnerable sector through which to understand resilience, yet the resilience of reef tourism to global change-related shocks has not been investigated to date. Indeed, the few studies on resilience in tourism systems provide conceptual perspectives on the value of the resilience concept to understanding tourism (Farrell and Twining-Ward 2004, Cochrane 2010) and qualitative applications of the concept to protected areas and community-based tourism (Strickland-Munro et al. 2010, Ruiz-Ballesteros 2011). The contribution of this paper is to quantitatively explore the components of perceived resilience of coral reef tourism enterprises on Australia's Great Barrier Reef to large shocks and disturbances. A secondary objective of this paper is to elucidate information from reef tourism enterprises on proposed government interventions to strengthen enterprise resilience in the face of large shocks. Enterprise resilience is defined and its components discussed in the remainder of the introduction and methods. The results, discussion, and conclusions follow thereafter.

Defining and measuring enterprise resilience

Direct measurement of resilience requires determining thresholds that separate alternate stable states in a social-ecological system (Carpenter et al. 2005). In a reef tourism system, at the scale of a small nation or city, society may shift from a stable state with an economy based mainly on reef tourism to a stable state in which the main form of economic activity is casino tourism or mining. Similarly, at the enterprise scale, a shift may occur from a condition of solvency to insolvency, or from a core business of reef tourism to casino tourism. However, it is difficult to detect a threshold without crossing it (Carpenter et al. 2005). Measuring present day or future resilience, in the absence of a historical analysis of a threshold-crossing event, requires the use of resilience surrogates (Carpenter et al. 2005, Cumming et al. 2005). Use of surrogates acknowledges that important aspects of resilience may not be directly observable and must be inferred. In this study, a resilient reef tourism enterprise is defined as one that is able to maintain its existing level of employment and income and stay operating in reef tourism in the face of a large disturbance or disturbances. Enterprise resilience was measured using both a composite scale and by a binary measure of whether an enterprise indicated it would stay in the reef tourism sector or not in a shock scenario (Table 1).

Table 1. List of independent and explanatory variables used in this study. The interviewees from enterprises were either owners or senior managers.

Variable	Variable description
Independent variables	
Enterprise Resilience composite scale	Composite scale of social resilience (see Table 3)
Enterprise Resilience – exit or not	Binary variable (1 = exit, 0 = not exit) of whether an enterprise indicates it will exit the reef tourism sector or not in the face of a shock scenario that leads to 50% reduction in tourist revenue to the enterprise for 12 months
Explanatory variables	
Enterprise size	The size of an enterprise measured by the natural logarithm of the number of equivalent full time employees
Enterprise age	The natural logarithm of the number of years an enterprise has been in operation
Enterprise shock experience	Binary variable (1 = past shock, 0 = no past shock) of whether an enterprise has experienced a slump of 25% or more in its tourism revenue for 3 months or more (beyond seasonal variation)
Condition of coral reefs	5 point Likert scale of an enterprise's perspective of the condition of the coral reefs that are the focus of an enterprise's tourist activities
Social capital	The average of an enterprise's a) expected extent of support from government, b) family and friends, and c) increased collaboration with other companies in a systemic shock scenario (all measured on 5 point Likert scales)
Access to finance in shock scenario	5 point Likert scale of an enterprise's expected ease of access to finance in a systemic shock scenario
Financial condition in shock scenario	The average of an enterprise's expected level of indebtedness, profit and revenue in a systemic shock scenario of a 50% reduction in tourist revenue to the enterprise for 12 months (all measured on 5 point Likert scales)
Human capital	5 point Likert scale of the confidence of owners and managers in the ability of the key staff in their enterprise to adapt successfully to future changes
Lifestyle identity	Composite scale of the extent to which the participation of owners and managerial staff in a reef tourism enterprise are driven by lifestyle decisions (Table 2)

Components of enterprise resilience

Diverse factors can strengthen the resilience of reef tourism enterprises and their capacity to innovate, reorganize, and adapt (Table 1). Access to finance, and healthy revenue and profit levels are integral to business survival and success (Bates 1990, Holtz-Eakin et al. 1994). A review of the tourism and enterprise survival literature identified the following factors as also important: (1) enterprise age, size, and experience, (2) ecological condition of reefs that enterprises visit with their clients, (3) levels of social and human capital, and (4) lifestyle values of enterprise owners and staff that motivate their participation in the tourism industry. These are discussed in turn.

An enterprise's age is generally positively related to its future survival because enterprises are more likely to close down in the first few years of their

operation (Dunne and Hughes 1994, Bosma et al. 2004, Hall and Williams 2008). Young enterprises suffer liabilities of newness involving both internal processes, such as coordinating and defining roles and developing trust and loyalty among employees, and external problems like acquiring financial capital and resources (Dunne and Hughes 1994). However, enterprise age and success may not exhibit a linear relationship. Older enterprises may display rigidity, and the lack of capacity to adapt (Fritsch et al. 2006). In addition, the size of an enterprise can be an important determinant of how enterprises respond to crises and change in general. This is because smaller and medium-sized enterprises in tourism are often as focused on maintaining the desired lifestyle of the owners as they are toward profit and growth (Ateljevic and Doorn 2000, Hall and Rusher 2004). Moreover, a lack of enterprise experience in dealing with crises is a contributing factor in 9 out of 10 enterprise failures (Kalleberg and Leicht 1991). Changes in the operational procedures of enterprises usually occur as a result of a novel experience which challenges existing norms and routines (Berkhout et al. 2006).

Experiences of tourists to nature-based attractions are influenced by the perceived quality of the feature of primary interest at a destination (Deng et al. 2002). Tourists are less likely to return to a reef destination after reef degradation or coral bleaching (Westmacott et al. 2000, Graham et al. 2001, Uyarra et al. 2005, Kragt et al. 2009) and they are willing to pay more to experience a reef that is perceived as more pristine (Cesar 2000). The perceived quality of coral reefs to which reef tourism enterprises take their clients is therefore potentially important in an enterprises' ability to be resilient to shocks. Importantly, although tourists to coral reefs are able to detect some levels of biological degradation in reefs, there is variation in the accuracy of their perceptions (Uyarra et al. 2009).

Human and social capital are important for enterprise survival and success. Human capital refers to the skills and human capacity of an enterprise (Bosma et al. 2004). Markets such as reef tourism require high levels of human capital to provide a quality product and a memorable experience to visitors, which is adapted and adjusted according to their needs (Burns 1997, Kaplan 2004, Smith 2005, Hall 2009). Social capital refers to the social bonds and norms of reciprocity and trust that enables groups and society to function (Pretty 2003). Social capital is important in enabling economic growth and development and for enhanced productivity (Uphoff and Wijayaratna 2000). Investment in building social capital is also important in fostering business growth and success and enables enterprise innovation (Bosma et al. 2004, Hall 2009). Furthermore, the capacity of individuals and groups to cope with uncertainty and surprise is strengthened through the bonds and support enabled by higher levels of social capital (Adger 2003, Folke et al. 2005). A broad conception of social capital includes the relationship between enterprises and local, state, and national government bodies. The relationship between enterprises and different levels of government are an important determinant of enterprise ability to adapt and innovate in response to pressures or change (Hall and Williams 2008, Hjalager 2010). Government institutions can foster innovation and support ongoing adaptation by enterprises, but at the same time, challenges to good governance that include power struggles, corruption, overregulation and institutional inertia can stifle attempts by enterprises to adapt and change (Hall 2009).

Small tourism entrepreneurs and suppliers, particularly in nonurban areas, are often strongly driven by noneconomic factors such as lifestyle (Williams et al. 1989, Ateljevic and Doorne 2000, Shaw and Williams 2004). Not infrequently, small tourism entrepreneurs in popular rural locations have been repeat visitors to those locations prior to settling in a chosen locale for lifestyle reasons that include a strong sense of place, and positive identity associated with operating an enterprise in a particular location (Williams et al. 1989, Ateljevic and Doorn 2000). Lifestyle considerations by small tourism entrepreneurs alter the entry and exit characteristics of enterprises operating in such rural tourism sectors beyond pure economics (Ateljevic and Doorne 2000). In addition, lifestyle entrepreneurs can play an instrumental role in fostering innovation and the delivery of new products in a tourism sector. Considerations of lifestyle, sense of place, identity, and associated cultural values thus have bearing on determinants of enterprise resilience in economic sectors such as reef tourism. In this paper, the term lifestyle identity is used to describe the extent to which the involvement of owners and senior managers in reef tourism are driven by considerations of lifestyle, sense of place, and identity, as opposed to purely profit motives.

METHODS

Study site

Australia's Great Barrier Reef (GBR) is the world's premier reef tourism destination (Seven Natural Wonders 2008). Tourists visiting the GBR contributed A$5.8 billion to the Australian economy per annum in 2005-2006 and sustained 55,000 jobs (Access Economics 2007). The GBR is located on Australia's tropical north-east coast in the state of Queensland. The reef extends north-south for more than 1200 km (Johnson and Marshall 2007) and is comprised of 2900 individual reefs and approximately 900 islands. The Great Barrier Reef Marine Park, created in 1975 to conserve the reef ecosystem, is 350,000 km² in extent. The majority of reefs on the GBR lie over 20 km offshore and require well-equipped boats to visit. This study therefore focuses on tourism enterprises that take visitors to offshore reefs. These enterprises are central to the continuation of reef tourism as an important socioeconomic sector in the GBR region.

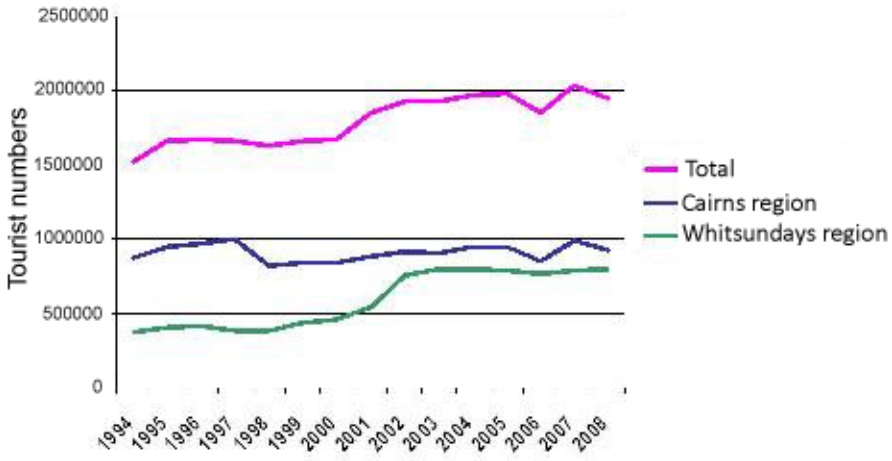
This study collected data in the Cairns and the Whitsundays regions, the two iconic and most important areas for reef tourism on the GBR and in Australia. Since 1994, an average of 88% of tourists who visit the Great Barrier Reef do so in the Cairns and Whitsunday regions (Fig. 1, GBRMPA 2009). The Cairns region has undergone extensive tourist infrastructure development since the early 1980s. This enabled an increase of tourist numbers from 400,000 in 1986-1987 to 1.3 million in 1996-1997 (Prideaux 2000). The majority of this increase was made up of international visitors, and was facilitated by construction of an international airport, marina, long distance coach facilities, and development of international standard hotels, shopping complexes, and golf courses (Prideaux 2000). Between June 2008 and June 2009, there were 2.2 million overnight visitors to the Cairns region, a 2% decline from 2007-2008 due to the global financial crisis (Tourism Queensland 2009*a*). The Whitsundays region consists of 74 islands in the central GBR and is a popular holiday destination. The main localities offering tourist accommodation are the mainland town of Airlie Beach, a popular backpacker's destination, and Hamilton Island. The Whitsundays region experienced a doubling in overnight visitor numbers from 464,000 in 1998 to 848,000 in 2002 (Moscardo et al. 2003, GBRMPA 2009). The Whitsundays region had 625,000 overnight visitors between June 2008 and June 2009. This represented a 15% decline from 2007-2008, following years of stagnation in numbers from 2002 onward. The drop in 2008-2009 was due to the global financial crisis and exacerbated by a reduction in the number of flights servicing the Whitsundays (Tourism Queensland 2009*b*).

Interview surveys

Surveys focused on enterprises whose dominant source of income is taking visitors to reef attractions to dive and snorkel. The author compiled a complete list of reef tourism enterprises that met this criterion in the study area. The Great Barrier Reef Marine Park Authority (GBRMPA), the agency responsible for conservation of the GBR, provided a list of Ecotourism Australia accredited tour operators. Because it is voluntary and therefore not all tourism enterprises have Ecotourism Australia accreditation, the list of accredited operators was expanded through contacting regional tourism agencies in each region, i.e., Tourism Whitsundays and Tourism Tropical North Queensland. The membership list of the Association of Great Barrier Marine Park Tourism Operators was also used. These lists were further augmented through internet searches on Google by using the terms "diving" and "snorkeling" and the names of the main tourist destinations within the study area. Furthermore, travel agents and tour booking offices in the tourism centers of Port Douglas and Cairns, both in the Cairns region, and Airlie Beach, in the Whitsundays region, were asked whether the list of reef tourism enterprises was complete. In total, 42 enterprises from the Cairns region and 34 from the Whitsundays region were identified.

The author personally conducted all surveys through semistructured interviews. A semistructured interview has a fixed list of questions, but respondents are able to provide more detail on any topic if they choose to (Bernard 2002). This enabled the collection of more nuanced and contextual information to support quantitative data collected. In some cases, certain pertinent quotes were recorded verbatim. Interviews varied in length from 25 to 90 minutes because of time availability of interviewees and extent of open-ended discussions during the interview. Open-ended questions were used to gain input on proposed government support measures in a shock scenario and obtain data on enterprise age and history. Enterprise age was

Fig. 1. Trends in visitors to the Great Barrier Reef and the Cairns and Whitsundays regions from 1994 to 2008. Source: GBRMPA 2009: Visitor data for Cairns to Cooktown Management Area and Whitsundays Planning Region http://www.gbrmpa.gov.au/corp_site/key_issues/tourism/management/gbr_visitation/numbers.



recorded in years, and the natural logarithm of enterprise age was used in the analysis. Similarly, enterprise size was measured by number of employees, and the natural logarithm of enterprise size was used in the analysis. An enterprise's experience of a past shock in this study was measured by whether or not an enterprise had experienced a slump of 25% or more in its tourism revenue for 3 months or more (Table 1). For all other variables and questions, either binary response options or a 5 point Likert scale were used (Likert 1967; Table 1). The Likert scale response statements were: 1 = strongly disagree (very bad), 2 = disagree (bad), 3 = average/indifferent, 4 = agree (good), and 5 = strongly agree (very good).

The average of three types of social capital were considered in this study (Table 1): first, the social capital that exists between the different levels of government and its subjects; second, the social capital that exists between family members, friends, and within a community; and third, the social capital that exists between actors in the reef tourism sector, which enables them to work together when necessary. Human capital was measured through reported confidence of owners and managers in the ability of the key staff in their enterprise to adapt successfully to future changes (Table 1). Enterprise owner's or manager's perceived access to finance in a systemic shock scenario and the average of the expected level of indebtedness, profit, and revenue in a systemic shock scenario was also measured (Table 1). Lifestyle identity was measured as the extent to which the participation of owners and managerial staff in a reef tourism enterprise is driven by lifestyle decisions (Tables 1 and 2).

Composite scales were developed as measures of enterprise resilience and lifestyle identity (Tables 2 and 3). Composite scales are created by combining two or more single-statement scales into one measure (Bernard 2002). Each single scale captures a component of the concept, and together they produce one measure of a more complex issue. Reliability analysis was used to ensure that only statements that contributed to the internal consistency of the composite scales were included (Zeller and Carmines 1980; Tables 2 and 3). The Cronbach's α score of the composite scales for both social resilience and lifestyle identity was above 0.7, indicating that both scales are reliable (Nunnaly 1978).

Prior to the main surveys, a pilot study (Czaja and Blair 2005) was conducted with 10 reef tourism enterprises in Airlie Beach in the Whitsundays

Table 2. Items in the composite scale for lifestyle identity measured on a 5 point Likert scale (1 = strongly disagree/negative, 5 = strongly agree/positive), Cronbach's $\alpha = 0.771$; n = 46.

Statement	Mean	SD	Corrected Item-Total Correlation	Cronbach's α if item deleted
I love working in reef-based tourism	4.630	0.532	0.648	0.774
I do not think that there is a better job or work environment than the reef-based tourism sector	3.957	0.942	0.623	0.769
I enjoy working in an industry where I share my knowledge and experiences of the reef and marine environment with others	4.44	0.779	0.546	0.787
I enjoy the lifestyle associated with working in the reef-based tourism sector	4.391	0.682	0.696	0.747
Working in the reef-based tourism sector is an important part of who I am and how I see myself	3.978	0.907	0.571	0.785

region to evaluate the survey tool and composite scales. After refinement of survey questions, the main surveys were administered between August and November 2008. Surveys were conducted with either owners or senior managers of a total of 48 enterprises, 27 from the Cairns region and 21 from the Whitsundays region. This represented all enterprises in the two regions willing to participate in an interview, amounting to 64% and 61% of active enterprises for the Cairns and Whitsundays regions, respectively.

Scenarios of large shocks were presented during the interviews in which respondents were asked to provide an indication of how they would respond and whether they would exit the reef tourism industry in the face of a 10%, 30%, or 50% slump in tourist revenue for a period of 12 months (based on an approach by Cinner et al. 2009). The interviewee responses for social capital, access to finance in a shock scenario, and financial condition in a shock scenario (see Table 1) used in the analyses were those given in the face of a 50% shock scenario, when access to social and financial capital is most important for enterprise survival. However, out of the 48 enterprises surveyed, eight indicated that they would exit the reef tourism industry if faced with a 30% slump scenario. For these eight enterprises, the social and financial capital scores were taken in the face of a 30% slump. Enterprises were also asked about the most important actions that government or an external agency could take to support companies in the reef tourism sector during a disturbance. Wherever possible, information was collected from representatives of enterprises that had left the reef tourism sector, and a time line of factors that led to their withdrawal from the reef tourism industry was established. Information was gained about three companies from the Whitsundays region that had left the sector or destination.

Analyses

The composite scale of enterprise resilience, and whether or not a company would exit reef tourism in the face of a large shock scenario, were the dependent variables in separate binary logistic regression analyses. The average score of respondents on the composite scale for enterprise resilience was collapsed from five categories to two. This was necessary because some categories in the 5 point scale had very few entries. A score of 1 was given if an enterprise displayed a high level of enterprise resilience (a score of 4 or 5 on the 5 point scale) and a score of 0 if an enterprise displayed a low or average level of enterprise resilience (a score of 1, 2, or 3; Table 4). SPSS® version 16 was used to process regression analyses. The backward

Table 3. Items in the composite scale for social resilience, measured on a 5 point Likert scale (1 = strongly disagree/negative, 5 = strongly agree/positive), Cronbach's $\alpha = 0.764$; n = 47.

Statement	Mean	SD	Corrected Item-Total Correlation	Cronbach's α if item deleted
My business is in a better position to cope with changes and stay in the reef-based tourism sector than others I know	3.872	0.849	0.565	0.736
I am confident things will turn out well for my business in the future	3.787	0.778	0.643	0.660
There are many options for my business to adapt to changes and stay working in the reef-based tourism sector	3.681	0.934	0.621	0.680
I do not think that my company will survive in this sector for much longer (negatively phrased)	4.04	0.690	0.415	0.758
There is no reason to believe that foreseeable changes will make my business go under	3.670	0.915	0.418	0.765

stepwise variable entry function using the likelihood ratio and the corrected Akaiki's Information Criteria (AICc; Burnham and Anderson 2002) was used. The Variance Inflation Factor for all variables was between 1.07 and 1.5, well below the 'cause for concern' level of 2.5 (Allison 1999). Stepwise removal of variables was continued until the most parsimonious model of best fit with the lowest AICc score was achieved. The regression was reanalyzed with the removal of the single very large enterprise with 500 employees (Tables 5, 6, and 7); results remained the same.

RESULTS

Enterprises surveyed had an average age of 13.2 years (Table 5), with considerable variation in enterprise size. Two enterprises had over 100 employees and 52% of enterprises had ten or less employees. Enterprises had an average of 32.7 employees and a median of 9.5. Enterprises indicated that the coral reefs that are the focus of their tourist activities were on average in good condition (average score 4.0). Human capital was considered to be good on average (average score 3.8), while social capital, financial condition in a shock scenario, and access to finance in a shock scenario scored lower (Table 5).

Thirty-seven (77%) of enterprises surveyed had not experienced a shock of 25% or more reduction in tourist revenue lasting at least three months (Table 4). Thirty-five (83%) of enterprises displayed a high score using the composite scale for enterprise resilience. Sixteen (33%) of enterprises indicated that they would not exit the reef tourism industry in the face of a shock of a 50% reduction in tourism revenue for 12 months.

The binary logistic regression analysis shows that human capital ($p = 0.015$) and lifestyle identity ($p = 0.02$) were positively related to the composite score of enterprise resilience (Table 6). Human capital ($p = 0.03$) was also positively related to whether enterprises would stay in the reef tourism sector after a shock scenario (Table 7).

Qualitative information on the three enterprises that had exited reef tourism supported the quantitative data. One enterprise exited the reef tourism sector earlier than it would have under better circumstances, but was looking to exit for personal and lifestyle reasons in any case, as reflected by this anonymous quote: "The owner wanted to exit the

Table 4. Absolute and relative frequencies for the binary variables.

Variable	Mean	Median	Std Dev	Min	Max
Enterprise age in years	13.19	11.50	9.31	0.75	35
Number of employees (enterprise size)	32.68	9.50	75.65	1.5[†]	500
Condition of coral reefs	4.02	4	0.91	1	5
Social capital	2.53	2.33	1.26	1	5
Access to finance in a systemic shock scenario	2.33	2	1.39	1	5
Financial condition in shock scenario	1.68	1.44	0.662	1	3.33
Human capital	3.79	4	0.80	2	5

[†]0.5 due to a part time employment

sector for lifestyle reasons anyway. The fact that one of his boats was destroyed in a storm, just made him do it faster."

Other companies exited reef tourism because of financial difficulties, caused by bad management or low levels of tourist demand: "The company was poorly managed, and they just did not have the cash to continue and had to sell out" and "The level of tourist demand we experienced was 70% less than expected, and we knew we had to either close down or move to another location."

Government interventions and support

The top six government interventions that reef-based enterprises felt would be valuable in a shock scenario are: financial (41%) and marketing (26%) support, temporarily reducing or suspending permit fees (13%), streamlining of regulations (9%), improving aviation access (9%), providing training (1%) and devaluing the Australian Dollar (1%; Fig. 2). Although only 8.7% of responses indicated that streamlining regulations is a key intervention, these respondents did express their concern over regulations becoming increasingly complex and inflexible. Two anonymous quotes from reef tour operators highlight this concern: "Due to the increasing regulations, reef tourism is no longer fun and it has become more and more difficult to find good staff, many of whom choose to work in this sector for lifestyle reasons" and "Scuba diving has its risks and sometimes people die. Dive tourism has now largely moved to Thailand as in Thailand you are allowed to die when diving. In Queensland, you are not allowed to die when diving."

DISCUSSION AND CONCLUSIONS

Although the importance of applying a resilience lens to tourism systems has been highlighted and investigated qualitatively (Farrel and Twining-Ward 2004, Cochrane 2010, Strickland-Munro et al. 2010, Ruiz-Ballesteros 2011), this is the only study that tries to quantify the determinants of enterprise resilience in the reef tourism sector. Elevated lifestyle identity among staff and a high level of human capital are the two strongest determinants of perceived resilience of reef tourism enterprises on the Great Barrier Reef.

The finding that lifestyle identity is positively related to enterprise resilience is consistent with research on small tourism firms elsewhere (Shaw and Williams 2004). Lifestyle choices are often a strong factor in decisions made by owners of small tourism firms, particularly in rural areas (Thomas

Table 5. Descriptive statistics for the single item quantitative and ordinal explanatory variables all measured on a 5 point Likert scale (1 = strongly disagree/negative, 5 = strongly agree/positive) other than enterprise age.

Variable	Mean	Median	Std Dev	Min	Max
Enterprise age in years	13.19	11.50	9.31	0.75	35
Number of employees (enterprise size)	32.68	9.50	75.65	1.5[†]	500
Condition of coral reefs	4.02	4	0.91	1	5
Social capital	2.53	2.33	1.26	1	5
Access to finance in a systemic shock scenario	2.33	2	1.39	1	5
Financial condition in shock scenario	1.68	1.44	0.662	1	3.33
Human capital	3.79	4	0.80	2	5

[†]0.5 due to a part time employment

et al. 1997, Ateljevic and Doorne 2000). Lifestyle-driven entrepreneurs, not solely driven by profit, are willing to absorb and tolerate poor financial performance and, in some cases, accept a greater degree of risk (Hall and Rusher 2004). There is variation in the extent to which lifestyle entrepreneurs aim to make at least some profit, are content with breaking even, or are willing to tolerate moderate financial losses. Some lifestyle-driven entrepreneurs operate on the verge of bankruptcy, content with the modest revenue their enterprise provides for living a chosen lifestyle (Ateljevic 2007). Furthermore, Getz et al. (2004) suggest that owner-operators of small tourism enterprises can develop an emotional attachment to their businesses. The associated sense of place and lifestyle makes them reluctant to abandon the enterprise in difficult times. Such lifestyle-driven entrepreneurs, measured in this paper through the lifestyle identity score, are therefore likely to stay in the reef tourism sector for longer periods, and under more trying circumstances, than businesses solely driven by profit.

This study showed that human capital is a vital component of enterprise resilience. In specialist markets such as reef tourism, human capital is considered essential in providing a quality product and a memorable experience to visitors (Burns 1997, Kaplan 2004). Furthermore, a tourism enterprise whose owners and staff have the capacity to be flexible and adaptive is able to anticipate and respond to crises (Irvine and Anderson 2004). In light of the importance of human capital, it is noteworthy that additional training and skills development was considered a low priority by enterprises as a government support mechanism in a shock scenario. This result is probably because in a shock scenario, enterprise owners and managers are more concerned with immediate financial survival than building skills and capacities to strengthen their resilience in the longer term. This finding suggests that times of stability and growth in the reef tourism sector may be the best times to conduct training and skills development programs aimed at strengthening the resilience of enterprises to future shocks. A valuable contribution of future research will be to analyze how different components of human capital, such as a flexible and adaptive mind-set and attitudes toward dealing with disturbance and change, measured in different ways, affect enterprise resilience. Additionally, this research's finding that enterprise age has a positive influence on whether enterprises indicated they would stay in reef tourism in a shock scenario is commensurate with the findings of more

Table 6. Logistic regression analysis of the explanatory variables for enterprise resilience (Corrected Akaike's Information Criterion score = 39.67).

Variable	B	S.E.	Wald	Sig.	Odds Ratio
Human capital measured as the confidence of owners and managers in the ability of an enterprise's key staff to successfully adapt to future changes	2.200	0.901	5.964	0.015*	9.021
Lifestyle identity	2.201	0.946	5.417	0.020*	9.034
Average of revenue, profit, and assets to liabilities ratio in systemic shock scenario	1.696	1.025	2.736	0.098	0.379
Ecological state of coral reefs	-0.970	0.693	1.960	0.161	5.450
Constant	-14.656	5.579	6.902	0.009	0.000

* = p value of < 0.05

widespread business and tourism research (Bosma et al. 2004, Cioccioa and Michael 2007).

Perceived reef condition was not a significant determinant of the resilience of reef tour operators in this study. However, most enterprises reported to have access to reefs that are in good condition (Table 4). The majority of studies elsewhere show decreased willingness to visit and decreased revenue from tourism to reefs following bleaching and degradation (Westmacott et al. 2000, Uyarra et al. 2005, 2009). However, one study showed that tourists who experience a decline in utility, i.e., enjoyment and satisfaction, after reef degradation were nonetheless still willing to visit (Andersson 2007). Clearly, more research is needed on how perceived reef quality affects tourist demand and the extent to which ecological metrics of reef condition are related to tourist perception of reef condition (Uyarra et al. 2009). The role of marketing, and how it may increase tourist demand, possibly even in the face of deteriorating ecological conditions of reefs, also requires investigation. The different market segments of reef tourism may also display differing levels of environmental awareness and responses to reef degradation. For example, specialist, experienced divers are likely to be more aware of reef condition, and more likely to specifically target destinations known for high quality reefs than first time or casual snorkelers.

Reef tourism enterprises on the GBR have to comply with overlapping regulations of numerous state and national agencies (Wilks and Davis 2000, Parker 2002). These include the Queensland Department of the Environment and the Great Barrier Reef Marine Park Authority who are responsible for the conservation of islands and the reef within the Great Barrier Reef Marine Park, respectively. Reef tourism enterprises need to abide by regulations of two state agencies, Maritime Safety Queensland and Queensland Workplace Health and Safety, and one federal agency, the Australian Maritime Safety Authority, that govern maritime and diving safety for operators and tourists. This bureaucratic complexity likely contributes to enterprise concerns over increasingly complex and inflexible regulations. Excessive regulation or overcompliance is a recognized concern of the Australian government (Regulation Taskforce 2006). In light of an increasingly competitive global market for reef tourism, effectiveness, costs, and benefits associated with regulations need to be considered with greater scrutiny.

Although the results of this study are from Australia's Great Barrier Reef, a high income part of the world, characterized by good governance and political and economic stability, the results presented are also of relevance to other regions. Human capital and lifestyle identity, the two most important variables in enabling enterprise resilience

Table 7. Regression model for enterprises that do not exit under a 50% systemic shock scenario (Corrected Akaike's Information Criterion score = 49.31).

Variable	B	S.E.	Wald	Sig.	Odds Ratio
Human capital measured as the confidence of owners and managers in the ability of an enterprises' key staff to successfully adapt to future changes	1.764	0.784	5.02	0.03*	5.79
Enterprise age in years (natural logarithm)	0.7081	0.413	2.93	0.09	2.03
Constant	-9.575	3.35	7.73	0.05	0.00

* = p value of < 0.05

in this study, are largely internal business issues. Because reef entrepreneurs in other countries are often attracted to reef tourism for the same reasons as in Australia, human capital and lifestyle identity are likely to also play a role in fostering enterprise resilience in other countries. Policies and actions by governments, including in low income countries, which strengthen the human capital in enterprises by, for example, allowing work permits for skilled foreign staff and recognizing lifestyle benefits, are likely to strengthen the resilience of the reef tourism industry.

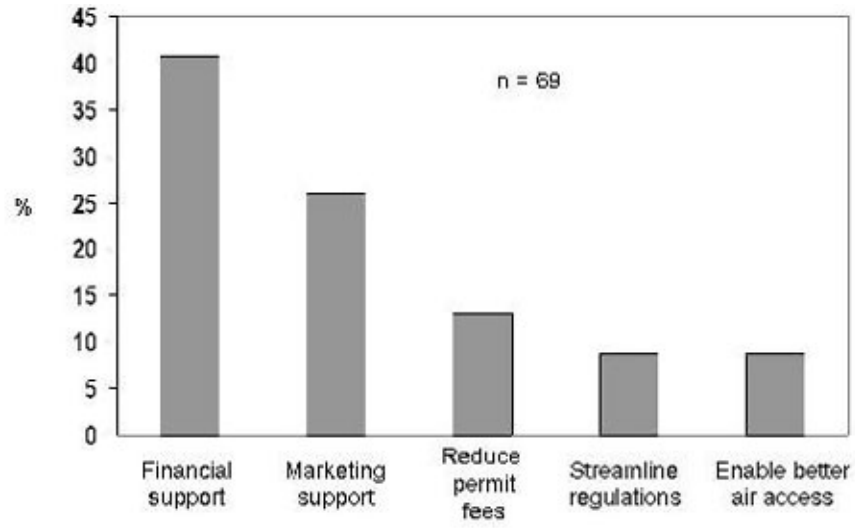
Directions for future research

Resilience is a complex concept and this paper represents only a starting point in our understanding of enterprise resilience in reef tourism. Studies of enterprise resilience in interactive social-ecological systems need to integrate resilience science with tourism and business research. This study has taken a first step toward that integration. A resilience lens contributes a more explicit consideration of dynamic interactions between social and ecological components of a system, and builds upon a quantitative, empirical tradition from the ecological sciences. The tourism and business literature on resilience and adaptation is largely qualitative and conceptual (e.g., Farrell and Twining-Ward 2004, Baker and Coulter 2007, Cioccioa and Michael 2007, Hall 2009, Cochrane 2010, Hjalager 2010). However, the tourism and business literature includes an extensive discussion of innovation that is pertinent to understanding the resilience of enterprises and the social-ecological systems in which they are actors.

Innovation within an enterprise can take place at different value creation points (sensu Hall 2009). Value creation points are areas of enterprise activity at which innovation is possible. Enterprises that are able to innovate and adapt across a wider range of value creation points are likely to be more resilient to crises and change (Hall and Williams 2008, Hall 2009). Literature on value creation points identifies three additional issues that require consideration in future research on enterprise resilience: first, the design, development, and distribution processes of services and products that an enterprise has to offer; second, marketing and communication of products, values, and expectations associated with an enterprise's brand; and third, the management of customer satisfaction, loyalty, and experience (Hall 2009). An understanding and measure of an enterprise's ability to innovate across a wider range of activities will provide a more nuanced understanding of enterprise resilience.

Internal processes within enterprises can enable or hinder innovation and adaptation (Hoffman et al. 2009, Hjalager 2010). Constraints to innovation such as barriers to learning can make enterprises more vulnerable to external crises as well as self-induced crises. An important issue for future research is how management systems within an enterprise can create or prevent their own crises (Smith 2005, de Sausmarez 2007). An enterprise

Fig. 2. Frequencies of suggested government interventions in a crisis scenario by reef tourism enterprises (41 enterprises, 69 intervention suggestions).



that is open to learning is more resilient and able to adapt in the face of an external crisis (de Sausmarez 2007).

Tourism enterprises are also embedded within destination and national systems that may or may not support and enable innovation (Hall 2009). Although this study has pointed to areas where government can play a stronger role in enabling enterprise resilience, future research could focus in more detail on how stronger regional and national innovation systems can be fostered. Such systems would entail a greater potential and support for innovation within and between enterprises, within civil society and government, and between civil society, government, and enterprises (Hall 2009, Hjalager 2010).

Integration of business research into resilience science can also advance understanding of the relationship between enterprise resilience and the broader social-ecological systems of which enterprises are one part. An example of a research question that can be addressed by integrating business and resilience research is to quantify the relationship between enterprise resilience and enterprise contribution to maintaining the health of a natural resource, e.g., coral reefs, on which they depend. An understanding of this relationship will shed light on the role of enterprises in enhancing the resilience of ecological systems.

Finally, enterprise resilience is a way in which actors in vulnerable economic sectors like reef tourism can be conceptualized and understood. An understanding of enterprise resilience will aid enterprises and policy makers to navigate a future of escalating global change and the associated crises and disturbances. This exploratory study represents a starting point for further research on the resilience of reef tourism and other similarly vulnerable economic sectors. In particular, future studies on the resilience of reef tourism in the aftermath of a large disturbance, and a comparison with the findings of this study, would be valuable. Finally, this paper provides a basis for policy makers in Australia and elsewhere to start actively considering lifestyle identity and human capital in establishing policies and regulations to enhance the resilience of the iconic reef tourism sector.

Responses to this article can be read online at:
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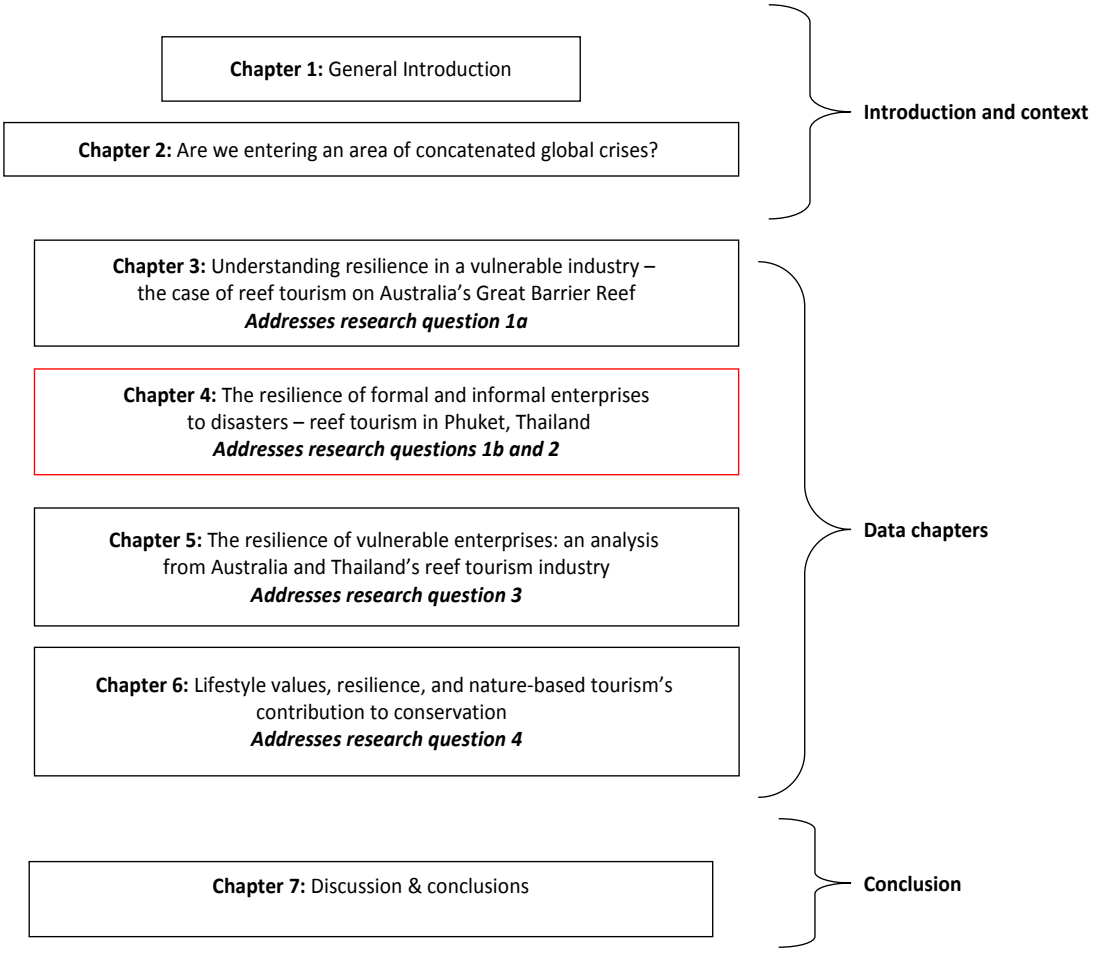
Chapter 4



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The resilience of formal and informal tourism enterprises to disasters – reef tourism in Phuket, Thailand

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Abstract:
This paper explores the resilience of vulnerable tourism sectors to disasters in a period of global change and interdependence. The coral reef tourism industry is highly vulnerable to natural disasters and economic and political shocks. The paper also explains why enterprise resilience is central to sustainable tourism management, for economic, socio-cultural, and environmental reasons. It extends the concepts of ecological and social resilience to that of enterprise resilience. Using scenarios and interviews with key enterprise staff, the study contrasts the levels of resilience of formal and informal reef tourism enterprises, and the factors associated with the enterprise resilience, in Phuket, Thailand, following the 2004 tsunami and 2008 political crisis. Informal enterprises reported better financial condition in a crisis scenario and higher levels of social capital in the form of government, family and community support than formal enterprises. Formal and informal enterprises both enjoy high lifestyle benefits from reef tourism, which supports resilience. Most formal enterprises had part foreign ownership/management (61%); no informal enterprise had any foreign ownership or management. Management policies supporting reef tourism should consider local nuances, the importance of lifestyle benefits for both formal and informal enterprises and take steps to enable enterprise flexibility and cost-cutting during crises.

Keywords: resilience, coral reefs, tourism, informal sector, enterprises, tsunami, crises, recession, political crisis

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Introduction

Concerns have been raised about the vulnerability of the tourism industry to threats including financial and economic instability (Henderson, 1999, Cohen & Neal, 2010, Ritchie et al., 2010), political crisis (Ritchie, 2004; Henderson, 2007; Cohen & Neal, 2010), the increasing price of oil (Yeoman et al., 2007; World Economic Forum, 2009), and accelerating global environmental change (Millenium Ecosystem Assessment 2005; Gössling & Hall, 2006; IPCC 2007; UNWTO & UNEP, 2008; Ritchie, 2008; Gössling et al., 2009; Rockstom et al 2009; Gössling et al., 2010). There is particular concern over how these threats may lead to crises and shocks to society (Hall, 2010). Due to environmental feedbacks, economic market linkages and the flows of resources and people these shocks may spread rapidly from the point of origin to distant parts of the globe and interact in novel and unexpected ways (Biggs et al., 2011. Ren, 2000; Adger et al., 2009; Hall, 2010). For example, global travel was affected by the international security concerns following the 2001 attacks on the United States and the SARS outbreak in Asia in 2003 (Hall et al., 2004). The global financial crisis of 2008/9 originated in the US housing market but quickly spread to affect the availability of credit across most of the global economy (Brunnermeier, 2008). The response options and the ability of vulnerable segments of the tourism industry to cope with the shocks and changes associated with global and regional change is therefore of growing importance (Henderson 1999; 2007; Hall et al. 2004; Ritchie, 2004, 2008, 2009;).

Coral reef tourism, a type of nature-based tourism, plays an important and growing role in the economies of tropical maritime countries (Access Economics 2007; Ahmed et al., 2007; Andersson, 2007). However, threats to coral reef ecosystems from anthropogenic environmental change are particularly acute, including coral bleaching and ocean acidification, over-fishing, fertilizer and sediment runoff, coastal development and poorly managed tourism activities (Hall,

2001; Hughes et al., 2003; Andersson, 2007). The dangers to coral reef ecosystems have raised concern over the future of the coral reef tourism. The uncertainties facing coral reef tourism are, however, not restricted to the threats facing reef ecosystems. As with other forms of tourism, reef tourism is also impacted by socio-economic crises such as international security concerns, economic recessions and resource price shocks (Adger et al. 2005, Gossling & Hall, 2006; Adger et al., 2009; Hall, 2010). Understanding the response characteristics and the ability of reef tourism to cope with disturbances is therefore of particular importance.

The resilience concept emerged from the ecological sciences (Holling, 1973; Gunderson and Holling, 2002), and has attracted increasing attention among tourism researchers as a framework for understanding society's ability to cope with crises, systemic shocks and change (de Sausmarez, 2007; Farrell & Twining-Ward, 2004; Smith & Henderson, 2008; Strickland-Munro et al., 2010). But the somewhat limited literature on resilience in tourism systems thus far, has included only conceptual and qualitative studies on the value of the resilience concept to understanding tourism (Farrel and Twining Ward 2004) and qualitative applications of the concept to protected area and community-based tourism (Strickland Munro et al. 2010, Ruiz Ballesteros, 2010). This paper presents an empirical investigation of the resilience of tourism enterprises, an innovative contribution to the literature.

Resilience is defined as the ability of a system to maintain and adapt its essential structure and function in the face of disturbance whilst maintaining its identity (Holling, 1973; Cumming et al., 2005). The resilience concept is thus useful for understanding how the tourism industry and its enterprises could respond effectively and adapt positively to increasing global change and disturbances (Farrell & Twining-Ward, 2004; Tyrrell & Johnston, 2008). This is particularly so because resilience theory recognizes the inherent uncertainty in predicting the impacts of global change, and

the complex and dynamic nature of how individuals, organisations, and society may respond to these impacts (Gallopin, 2006; Marshall, 2010).

The concept of social resilience is related to ecological resilience and is the ability of groups or communities to cope with external stresses and disturbances, while maintaining their functional characteristics and defined identity (Adger, 2000). The social resilience concept implies the existence of two or more alternative stable states, characterised and controlled by different structures, functions, and processes. It is a complex concept that encompasses uncertainty (Adger, 2000). The thresholds or tipping points that lie between different states are dynamic, and hard to pin point. For this reason, changes from one state to another often come as a surprise. The 'tipping point' or point of transition between two stable states is called a threshold – once a threshold into an alternative state is crossed a return to the earlier state can be difficult or impossible (Walker et al., 2004).

These alternative stable states occur at different scales. For example, at the scale of a small maritime country or province, society may shift from a situation in which the main form of economic activity is reef tourism, to a new stable state in which the main form of economic activity is casino tourism. Similarly, at the enterprise scale, an enterprise may shift from solvency to insolvency, or it may have the capacity to shift from one core business activity, such as reef tourism, to another. The concepts of ecological and social resilience can extend to that of enterprise resilience. At the scale of individual actors, a focus of increasing research on resilience (Gelcich et al., 2006; Marshall, 2010), organizations such as business enterprises are important subjects of study not only because of the need to improve understanding of their individual capacity to survive, but also because they are a core component of community resilience (Ahmed, 2006; Colussi, 2000).

This paper focuses on resilience at the scale of reef tourism enterprises. A *reef tourism enterprise* is an entity consisting of one or more individuals delivering a service to visitors to earn an

income and profit by taking visitors to visit and experience reef attractions by boat (Biggs, 2011). The paper focuses on enterprises that use boats to take visitors to reefs because of their central role in coral reef tourism. A resilient reef tourism enterprise is defined as one which is able to maintain or grow its existing level of employment and income and stay operating in reef tourism in the face of one or more shocks or crises. By this definition, an enterprise that stays operating in reef tourism, without drastically downsizing' is able to maintain its 'identity' (see Cumming et al., 2005). An enterprise that fails, drastically downsizes, or substantially diversifies the nature of its operation out the reef tourism is viewed in this study as changing its identity and not displaying enterprise resilience. This paper thus focuses on the enterprise as the scale of resilience analysis and an enterprise that closes down or shifts out of reef tourism has crossed a threshold or tipping point into an alternative stable state. A resilient enterprise is one which is able to remain in a stable state, maintaining or growing its income and employee numbers despite disturbance.

The resilience concept overlaps to a large degree with the concepts of vulnerability and adaptive capacity (Gallopin, 2006; Miller et al., 2010). Resilience, with its origins in systems ecology, has a more systems-oriented approach, whereas the concepts of vulnerability and adaptive capacity focus more on the actors and their response to change (Miller et al. 2010). Specifically, vulnerability is the susceptibility of a system to disturbances and is determined by exposure and sensitivity to perturbations and the capacity to adapt (Adger, 2006; Gallopin, 2006; Nelson et al., 2007). The more vulnerable an individual, enterprise or community is, the more extreme the impact of a given shock will be. If that individual, enterprise and/or community also has little adaptive capacity, then that shock is more likely to generate a sustained, permanent change of state. Hence, the link to resilience: if an individual, enterprise, or community is vulnerable and has little adaptive capacity, then a shock is more likely to shift it from one 'state' to another.

Specifically, this paper explores the resilience of formal and informal enterprises in Phuket, Thailand through asking following research questions: 1) What are the differences in the factors associated with resilience as identified through a literature review between formal and informal sector enterprises?; 2) Which of the factors associated with resilience as identified through a literature review can predict enterprise's stated response to a crisis scenario?; and 3) Are there differences between formal and informal enterprises in their response actions, and the factors that enabled their survival through the 2004 tsunami and the 2008 political crisis?

Phuket, Thailand is an ideal location to study the resilience of reef tourism: Phuket and Thailand have experienced a number of disasters over the last 15 years. The two most substantive crises in the past decade – and chosen for in-depth analysis here – were the 2004 tsunami (Cohen, 2009) and the political crisis of 2008 which temporarily closed Bangkok's Suvarnabhumi airport and exacerbated the effect of the global financial crisis and affected tourism through 2009 (Cohen and Neal 2010; Tourism Authority of Thailand, 2010). The 2004 tsunami led to over 5000 confirmed deaths in Thailand and 250 deaths on Phuket island. Property damage on Phuket was estimated at US$250 million (Phuket Picture 2005). The formal sector dive tourism industry on Phuket lost an average of 64 diving days (days with divers in the water) per enterprise (Main & Dearden, 2007). International tourism arrivals in Phuket fell by 67.2% in the first half of 2005, following the tsunami (Henderson 2007). Following the tsunami, seven out of 85 (8.2%) dive enterprises shut down completely, and sixteen (18.8%) drastically down-sized their operations (Main & Dearden, 2007). At the national scale, the tsunami led to a 1.5% drop in international tourism arrivals in 2005 (Tourism Authority of Thailand 2008). International arrivals to Thailand then increased by 20.0% in 2006 and 4.7% in 2007 (Tourism Authority of Thailand 2008). The political crisis of 2008 - 2009 led to a 3.5% decrease in international arrivals to Thailand during 2009 (ASEAN 2010)

Importantly, none of the studies on crises and tourism in Thailand, (or any other study of reef tourism) investigated the resilience of different types of reef tourism enterprises – arguably, the most important distinction being enterprises involved in the 'formal' and 'informal' sectors. The informal sector is primarily composed of small-scale self-employed entrepreneurs and enterprises (Macias and Cazzavillan 2009, Aguilar & Campuzano, 2009). An informal tourism enterprise is often the major source of cash income for a family, as part of a broader livelihoods strategy including subsistence agriculture or fishing (Tao & Wall, 2009). The informal sector is further characterised by easy market entry, family ownership, unregulated and competitive markets, intensive labour, and dependence on indigenous resources (Kermath & Thomas, 1992; Mead & Morrisson 1996). Informal tourism enterprises typically have lower capital investments, and are more likely to close down for short periods, and start up again (Mead & Morrison, 1996; Rogerson, 2008). The households involved are also likely to have diverse livelihood strategies, with tourism being one component (Tao & Wall, 2009). In contrast, formal sector enterprises (hereafter called formal enterprises) tend to be licensed, registered for taxation, officially enumerated, and often eligible for government subsidies. As economies develop, some informal tourism enterprises transition into the formal tourism sector. Yet studies of the informal sector are much less numerous than on the formal sector, and information on enterprise entry and exit characteristics are harder to obtain (Cukier & Wall, 1994).

The distinction between formal and informal enterprises is thus important in this context because (a) many of the livelihood benefits in low and middle income countries accrue through the informal economic sector (Dahles, 2002; Henderson & Smith, 2009; Nemasetoni & Rogerson, 2005; Liu & Wall, 2006; Meyer, 2008; Wahnschafft, 1982); and (b) formal and informal enterprises differ significantly in make-up and are thus likely to respond differently to crises. This research, therefore, also highlights differences between the resilience of formal and informal enterprises in Phuket's reef tourism industry to large external crises or disturbances.

The research presented in this paper is especially relevant to sustainable tourism management. It addresses the economic aspects of the triple bottom line of sustainable development, an area often omitted by researchers in sustainable development (Dwyer, 2005, Weaver & Lawton, 2007, Stensland & Baardsen, 2012). It is closely linked to the use of tourism as a tool for social and cultural conservation and regeneration, for poverty alleviation and for the support of environmental conservation - in this instance, coral reef conservation (Coghlan, 2012).

Literature review

Prior research on crises in Phuket and Thailand

Because of the importance of tourism to the Phuket and Thai economy, there have been numerous studies of tourism crises (McDowall & Wang, 2009; Zhang, et al., 2009), although most have not sought to explicitly differentiate between the responses of formal and informal tourism enterprises to such crises (Henderson and Smith (2009) being a significant exception). The impacts of the Asian financial crisis were examined by Henderson (1999) and Prideaux (1999). Rittichainuwat and Chakraborty (2009) studied the perceived effects of terrorism, SARS and bird flu on Thailand's hospitality industry, while the tourism related effects of the 2004 tsunami attracted considerable attention (for example see: Calgaro & Lloyd, 2008; Cohen, 2008, 2009; Gurtner, 2006; Kelman et al., 2008; Main & Dearden, 2007). Cohen and Neal (2010) explored the interrelationships between different forms of crisis and their effect on Thai tourism. Studies of the effects of crises on specific formal tourism sectors include the convention and meetings industry (Campiranon & Arcodia, 2007; Sangpikul & Kim, 2009) and gaming policy (Jitpraphai et al., 2006). There are limited studies on the vulnerability and resilience of informal small-scale tourism enterprises to the 2004 tsunami (Calgaro (2005) and Calgaro and Lloyd 2008 are notable exceptions). The studies on the vulnerability and resilience of the informal sector more broadly in south-east Asia, in the aftermath of the 2004 tsunami, focus on traditional livelihood strategies such as fishing and farming (Larsen et al. 2008; Thomalla et al. 2008).

Several studies specifically examine the effects of crises at Phuket, especially post tsunami. Ichinosawa (2006) noted the potential secondary impact of "reputational disaster", although Rittichainuwat's (2008) study of post-tsunami changes in visitor motivation suggests that these were not as great as feared. Henderson (2005, 2006) provided insights into the recovery responses of the hospitality sector and Main and Dearden (2007) into the tsunami's impact on the dive industry. Henderson and Smith (2009) noted the resilience of the informal sector following the tsunami and the potential contribution of informal commerce to resort success. Kontogeorgopoulos (2009) argued that ecotourism activities such as kayaking was one of several contributing reasons for the continuing growth of tourism in Phuket despite natural disasters and political instability.

Enterprise resilience

As noted earlier, the concepts of vulnerability, adaptive capacity and resilience are linked: enterprises which are less vulnerable and have more adaptive capacity are likely to be more 'resilient'. Based on the factors associated with the resilience of reef tourism enterprises in Australia (Biggs 2011), and a literature review, we identified the factors associated with the adaptive capacity, vulnerability and resilience of enterprises. We indicate how each factor has been incorporated into this study.

Enterprise age and experience

An enterprise's age positively affects its likelihood of future survival because enterprises are more likely to close down in the first years of their operation (Bosma et al., 2004; Hall & Williams, 2008). Young enterprises face many challenges when starting up, such as gaining access to customers, coordinating and defining roles and developing trust and loyalty among employees, and acquiring financial capital and resources (Hall & Williams, 2008). Older enterprises are more likely to have dealt with a systemic shock in the past, and have therefore developed the experience, skills

and self-confidence to better plan for and manage future shocks (Kalleberg & Leicht, 1991). However, older enterprises may also display rigidity, and lack capacity to adapt (Fritsch et al., 2006). A direct measure of enterprise age was used in this study due to the limited knowledge on the relationship between age and survival of informal sector enterprises.

Social capital

A high level of social capital can provide a buffer for both formal and informal enterprises in the face of crises. The core idea of social capital is that the social networks of individuals and enterprises, underpinned by shared norms, trust, and reciprocity, can provide support to enterprises in difficult times (Jones, 2005). Investment in building social capital is also important in fostering business growth and success (Bosma et al., 2004; McGehee et al., 2009). We consider four different types of social capital. First, the social capital that exists between the different levels of government and its subjects; second, the social capital which exists between family members and friends; third, the social capital that exists between reef tourism enterprises and local community groups; and fourth, the social capital that exists between enterprises in the reef tourism industry, which enables them to work together during a crisis.

Financial condition and access to finance

Access to finance and a healthy financial condition are integral to enterprise survival and success. However, the understanding of financial condition, and the measurement of profit is inconsistent between formal and informal enterprises (Aguilar & Campuzano, 2009). Informal enterprises often do not include the cost of their own labour or family members, or the depreciation of working capital in their calculation of profit. Access to finance is often more difficult for informal enterprises because they do not have legal recognition and often little to offer for loan collateral. This study used an enterprise owner's or manager's perceived access to finance and their expected annual income in a crisis scenario as measures of financial capital.

Human capital

Skills and human capacity are integral to the success of an enterprise (Bosma et al., 2004). Informal tourism enterprises are characterised by a lower level of formal training and managerial skills relative to formal sector enterprises (Liu & Wall, 2006; Petersen, 2007). Human capital in this study is defined as the skill-sets and capacity of individuals to respond and adapt to change. Human capital was measured through the reported confidence of owners and managers in their ability (and the ability of key staff, where they have staff) to adapt and manage successfully in crises.

Lifestyle benefits

Small tourism entrepreneurs, particularly in non-urban areas, are often driven by lifestyle considerations that alter the entry and exit characteristics of enterprises beyond pure finance/profit (Ateljevic & Doorne, 2000; Shaw & Williams, 2004). Often, tourism entrepreneurs in the formal and informal sectors of popular tropical reef tourism locations have visited those locations prior to settling there for lifestyle reasons (Williams et al., 1989; Collins, 2008) and may therefore be willing to receive lower amounts of income in order to continue to engage in an activity that delivers lifestyle benefits to them. We used a number of single item questions to measure the extent to which lifestyle considerations were important to enterprise owners and managers.

Methodology

Phuket and its reef tourism enterprises

The island province of Phuket is situated in the Andaman sea and is historically Thailand's main centre for reef and dive tourism. Reef tourism in Phuket grew quickly during the 1980s and 90s – from fewer than ten commercial dive enterprises in 1980 to 85 enterprises in 2002 (Main & Dearden, 2007). Although new Thai dive destinations such as Krabi, Koh Tao and Khao Lak have

emerged over the past decade, Phuket still dominates the reef tourism and dive market and has the most dive enterprises. Tourism in Phuket is distinctly seasonal, driven by the south-western monsoon which brings rainy, stormy and unpredictable weather from May to late October. Phuket's high season for reef tourism typically falls between October and late April. Many of formal and informal enterprises down-size or close down for the low season.

The formal sector enterprises usually own or have the capacity to lease one or more larger boats, or speedboats which can cover substantially greater distances than the longtail boats used by informal enterprises. Formal enterprises typically have part foreign ownership or management. The owners and managers of formal enterprises often return to their home country during the off season. Formal enterprises tend to have a storefront and numerous agents that they market through, in addition to websites and international marketing networks and travel markets.

The informal enterprises base their longtail boats at a range of popular tourist beaches, primarily on Phuket's west coast, and they rely largely on walk-in customers. Some have small self-made signs advertising their services. The staff of the formal enterprises are mostly able to communicate in one or more international language (e.g. English, German, Japanese), whereas international language skills are limited among informal enterprises. The informal entrepreneurs typically augment their income during the low season through fishing, farming, or a second job. However, evidence from nearby Khao Lak suggests that rapid tourism development can erode the availability of alternative income sources as land available for agriculture reduces due to tourist developments and individuals become more reliant on their income derived from tourism (Calgaro 2005).

Construction of the survey instrument

The survey tool was based on an interview questionnaire developed by the primary author for reef tourism operators on Australia's Great Barrier Reef. It was adjusted for the Thailand context

after discussion with enterprises and researchers in Phuket. The survey was designed to collect information about (a) each of the key factors identified within the literature review as being likely to affect enterprise resilience (e.g. age; social, financial, human capital; lifestyle benefits) and (b) the actions taken and factors which different types of enterprises felt contributed to or enabled their survival of the 2004 tsunami and 2008 political crises. A copy of the survey instrument used for the formal sector can be found as an appendix on the on-line version of this paper; the informal sector instrument is very similar, and has been omitted for space reasons.

The survey was translated into Thai to interview enterprises in which the interviewers spoke only Thai. The Thai language questionnaire was piloted by the research assistants and the responses were discussed to counter interviewer bias and ensure response consistency, and comparison with the formal sector interviews. Interviews typically took 30 to 40 minutes but varied from 20 to 90 minutes

All types of 'capital' were measured on a 5-point Likert scale (Likert, 1967), where respondents were asked to indicate the extent to which they had access to different indicators of capital (e.g. access to finance, managerial expertise, social capital). The Likert scale responses in response to statements were: 1 = strongly disagree, 2 = disagree, 3 = average/indifferent, 4 = agree and 5 = strongly agree. Enterprise age was recorded in years.

Scenarios of systemic shocks were also presented during the interviews, in which respondents were asked to provide an indication on how they would respond and whether they would exit the reef tourism industry in the face of 10%, 30% and a 50% slump in tourist revenue for a period of 12 months. Enterprise resilience was measured with a binary variable of whether or not enterprises would stay in the reef tourism sector in the face of the largest systemic shock scenario – i.e. that associated with the 50% reduction in tourist revenue. A lack of enterprise resilience was also measured with two variables using a 5 point Likert scale: "I am looking for opportunities to

move out of the reef-based tourism sector" and "Life has become more difficult in the reef-based tourism sector". Open ended questions were used to collect information about the affects of the 2004 Tsunami and the combined effects of the global financial crisis and the Thai political crisis and airport closures in 2008 and 2009. Enterprises were also asked to comment on factors which they thought had enabled them to survive the associated slumps in tourism and the actions they took in the face of these crises.

Locating and contacting enterprises

A complete list of all the reef tourism enterprises in the formal sector in Phuket was compiled. An initial list of enterprises was obtained from Sakanan Platong, a researcher at Prince of Songkla University in Hat Yai. This list was checked and augmented through internet searches using the Google and Yahoo search engines by searching for the enterprise name and by using the terms "diving" and "snorkelling" and the names of the main tourist destinations within the study area. The list was further corroborated through membership lists of the Thailand Dive Association, the Greenfins Thailand project (http://www.greenfins.net/thailand), and the Professional Association of Diving Instructors (PADI) website. Further checks were made for accuracy and completeness by the interviewees. In an attempt to sample the entire formal enterprise population, each listed enterprise was contacted at least three times by email and telephone, to enquire about their willingness to participate, and to establish a time for an interview. Of the 68 formal enterprises listed and contacted, 46 enterprises (68%) agreed to participate in the study.

The informal enterprises were contacted by Thai researchers from Prince of Songkla University and the Phuket Marine and Coastal Resource Conservation Centre. Interviewers visited each of the beaches where informal enterprises are based on Phuket's south and west coast, until all those present had been interviewed. A total of 57 informal enterprises were surveyed. According to local expert judgement, the informal enterprises surveyed were representative of the total population of

informal enterprises operating in Phuket during the high season (S. Plathong and P. Buapet, Prince of Songkla University, personal communication).

Interviews

All surveys were conducted through semi-structured face to face interviews by the primary author and four Thai research assistants. The interviews had a fixed list of questions, but respondents were able to provide more detail on any topic if they chose (Bernard, 2002, Jennings 2005), thus enabling the collection of both qualitative and quantitative data. Interviews were conducted at the end of the 2009 high season; responses were recorded on custom-made forms.

Analysis

Three separate analyses were undertaken – each addressing one of the key research questions: Mann Whitney U tests were used to test for differences in variables associated with factors identified in the literature as influencing vulnerability, adaptive capacity (and thus, enterprise resilience) across different tourism enterprises (those in the formal and informal sector) (Research question 1). Binary logistic regression was used to address research question 2 and to explore the relationship between the stated response of an enterprise (exit or stay in the industry) to a hypothetical, substantial and systemic 'shock' and the other factors identified in the literature as influencing enterprise resilience. The 50% shock scenario was selected for analysis, because in such scenarios access to social and financial capital is most important for enterprise survival. The independent variables included the age of the enterprise, and the (likert) 'scores' associated with social, financial, and human capital. A backward stepwise variable entry function using the likelihood ratio and the corrected Akaiki's Information Criteria (AICc) was used for the regression analysis (Burnham & Anderson, 2002). The stepwise removal of variables was continued until the most parsimonious model of best fit with the lowest AICc score was achieved. The Variance Inflation Factor for all the variables used in the regression analysis was between 1.04 and 1.33, well below the 'cause for concern' level of 2.5 (Allison, 1999). Three different regression analyses were performed,

one for the informal enterprises, one for the formal enterprises and one for all the enterprises combined. Finally, the largely qualitative responses of enterprise owners to questions about the 2004 tsunami and the political crisis of 2008-9, were coded and grouped into similar categories enabling comparisons across enterprise types (Research question 3).

Results

Background: Characteristics of Phuket's formal and informal reef enterprises

Formal enterprises had between three and 150 employees with a mean of 17.4 (n = 43), between 1 and 30 boats (mean 4.36, n = 33) and total client capacities of between 10 and 200 per day (mean = 36.4, n = 24). Informal enterprises were substantially smaller, with a maximum of two employees, who were frequently employed on a part time basis only. Informal enterprises had between one and three longtail boats with a mean of 1.13 (n = 55) and total client capacities of between 5 and 21 per day (mean = 8.5, n = 56). The majority of formal enterprises had part foreign ownership or management (61%), whereas no informal enterprise had any foreign ownership or management.

(1) Differences in factors associated with resilience

Mann Whitney U Tests revealed significant differences between formal and informal sector enterprises. More enterprises in the formal sector felt that life in the reef tourism industry was becoming harder than informal enterprises (Table 1). Enterprises in the formal sector expressed a stronger inclination to look for opportunities to move out of the reef-based tourism than enterprises in the informal sector (Table 1). Informal enterprises felt more confident about their financial condition in a shock scenario than formal enterprises. Informal enterprises had higher lifestyle benefit scores on three different measures than formal enterprises (Table 1). Informal enterprises reported higher levels of social capital than formal enterprises expressed as a higher level of expected support in a shock scenario from government, family and friends and local community groups (Table 1).

Table 1: Comparison of single item statements between formal and informal enterprises (1 = strongly disagree/very poor, 5 = strongly agree/very good)

Statement	**Formal (n = 46)**	**Informal (n = 57)**	**Mann-Whitney U**	**Sig. (2-tailed)**
Social capital				
To what extent do you think the support from the following groups will be important in you surviving these shocks?				
Government support in shock	1.46	2.23	828.500*	0.001
Family and friends support in shock	2.37	2.93	959.000*	0.016
Local community group support in shock	1.47	2.73	440.500*	<0.000
Increased collaboration with competing enterprises in shock	2.54	2.29	1180.000	0.448
Social Capital average	1.97	2.56	752.500*	<0.000
Financial and human capital				
Expected ability to access additional finance in a crisis scenario	2.44	2.47	1085.500	0.531
Expected annual income in a crisis scenario	1.28	1.63	865.500*	0.004
Human capital measured as the average of the statements: a) The management and key staff in my business have the necessary skills to deal with future changes in reef tourism, and b) The management and key staff of this business have the self-belief and determination to adapt to and survive future changes in the reef tourism sector	4.089	4.052	1254.000	0.837
Lifestyle benefits				
I love working in reef-based tourism	4.41	4.82	883.500*	<0.000
I enjoy the lifestyle associated with working in the reef-based tourism sector	4.23	4.79	718.500*	<0.000
Working in the reef-based tourism sector is an important part of who I am and how I see myself	4	4.76	693.500*	<0.000
Lifestyle benefits average	4.20	4.76	547.000*	<0.000
Measures of a lack of enterprise resilience				
I am looking for opportunities to move out of the reef-based tourism sector	2.15	1.68	1018.500*	0.036
Life has become difficult in the reef-based tourism sector	3.85	3.42	966.500*	0.014

*p<0.05

(2) Factors associated with the stated response of an enterprise to a hypothetical, substantive, 'shock'

For informal enterprises, social capital, and access to finance were positively related to respondent perceptions of the whether or not they would remain active in reef tourism in a systemic shock scenario (Table 2).

The binary logistic regression analysis of enterprise survival in a crisis for formal sector enterprises and for all enterprises (formal and informal) combined was non-significant.

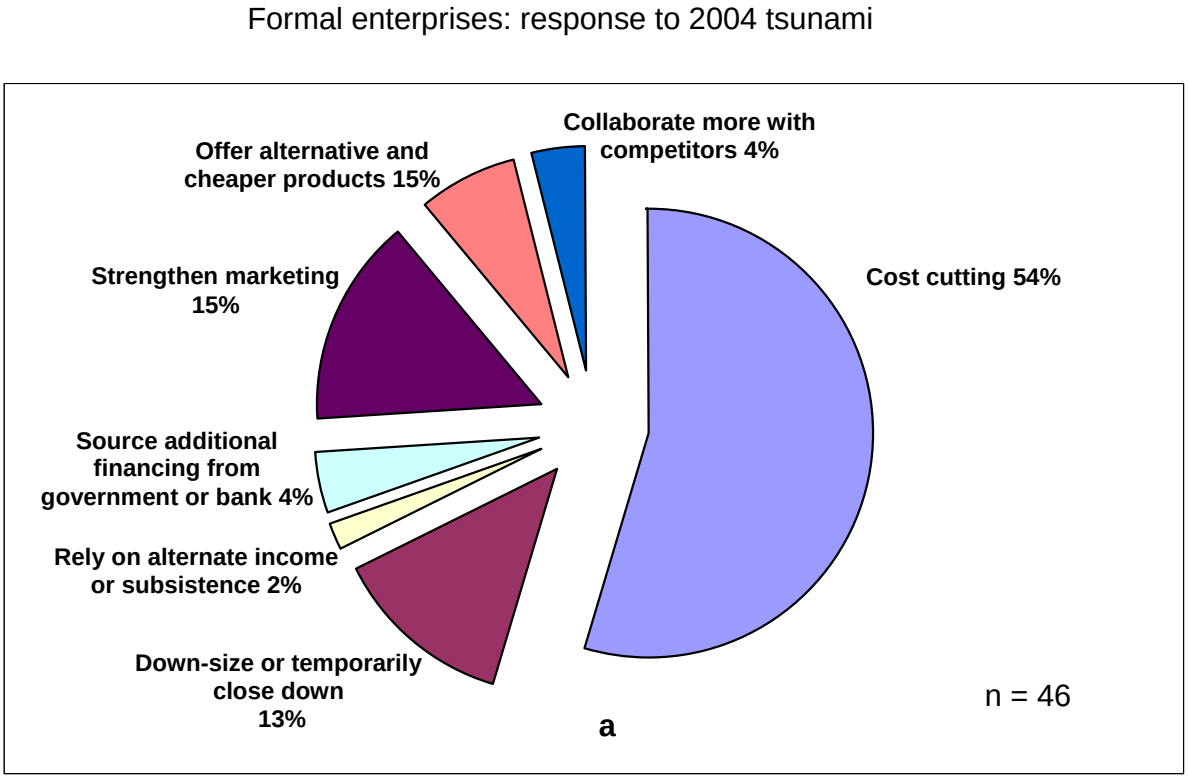
Table 2: Regression model for informal enterprises that do not exit exit reef tourism under a 50% systemic shock. The regression model for formal enterprises was not significant

Variable	B	S.E.	Wald	Sig.	Odds Ratio
Access to finance in shock scenario	1.058	0.411	6.619*	0.010	2.881
Social capital average score	1.043	0.431	5.848*	0.016	2.838
Constant	-5.27	1.70	9.578	0.002	0.05

*p <0.05

(3) Enterprise response to and survival of the 2004 tsunami and 2008 political crisis

Formal and informal enterprises differed in how they responded to past shocks and in the factors that they perceive enabled their enterprises to survive past shocks. After the 2004 tsunami, the three most common responses by formal operators were cost-cutting and streamlining (54%), strengthened marketing (15%) and down-sizing or temporarily closing down (13%) (Figure 1a). The top three responses by informal enterprises were down-sizing or temporarily closing down (39%), relying on a second job or subsistence food production (30%), and sourcing additional funding through government support or a loan (17%) (Figure 1b). Formal and informal enterprises differed in the factors that they perceived enabled their survival of the 2004 tsunami. The three most important survival factors reported by formal enterprises (n = 25) were commitment and hard work to maintain the lifestyle and enterprise (32%), the availability of past savings to draw on (12%) and the ability to cut costs (12%). The three most important survival factors reported by informal enterprises (n = 31) were commitment and hard work to maintain the lifestyle and enterprise (58%), government or NGO support through loans or other means (13%) and the ability to rely on a second source of income or subsistence (10%).



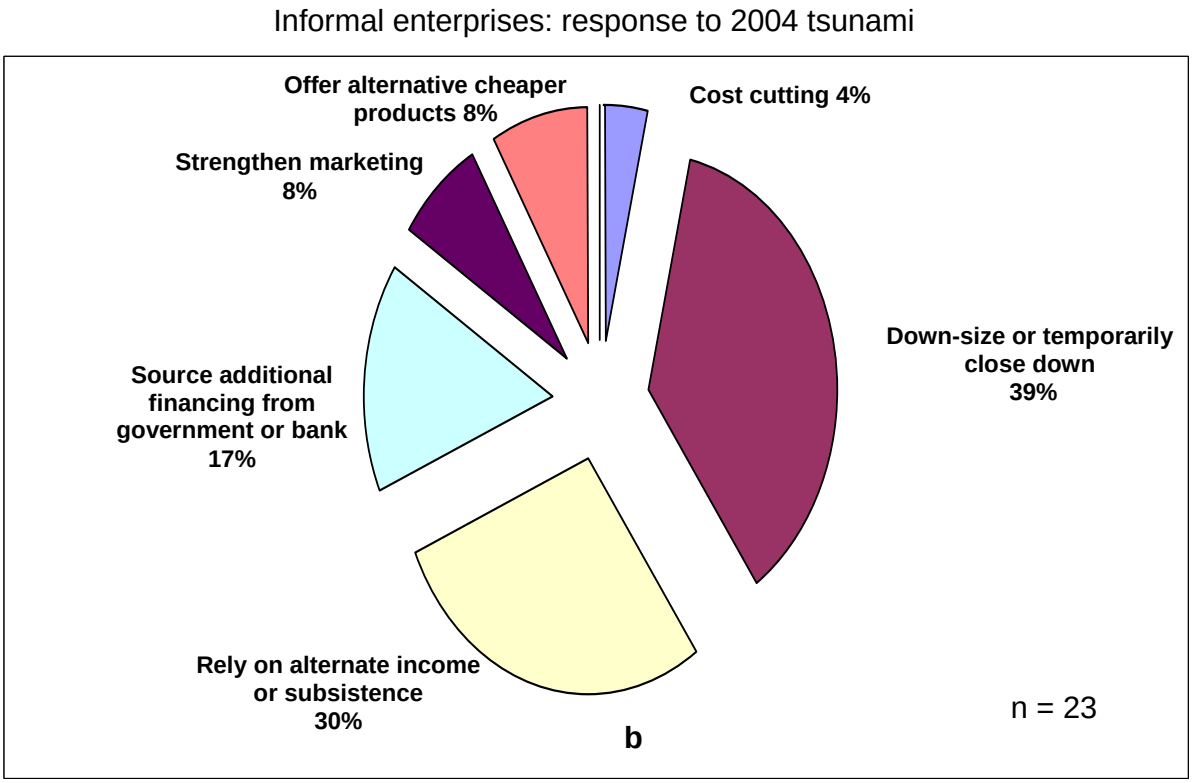


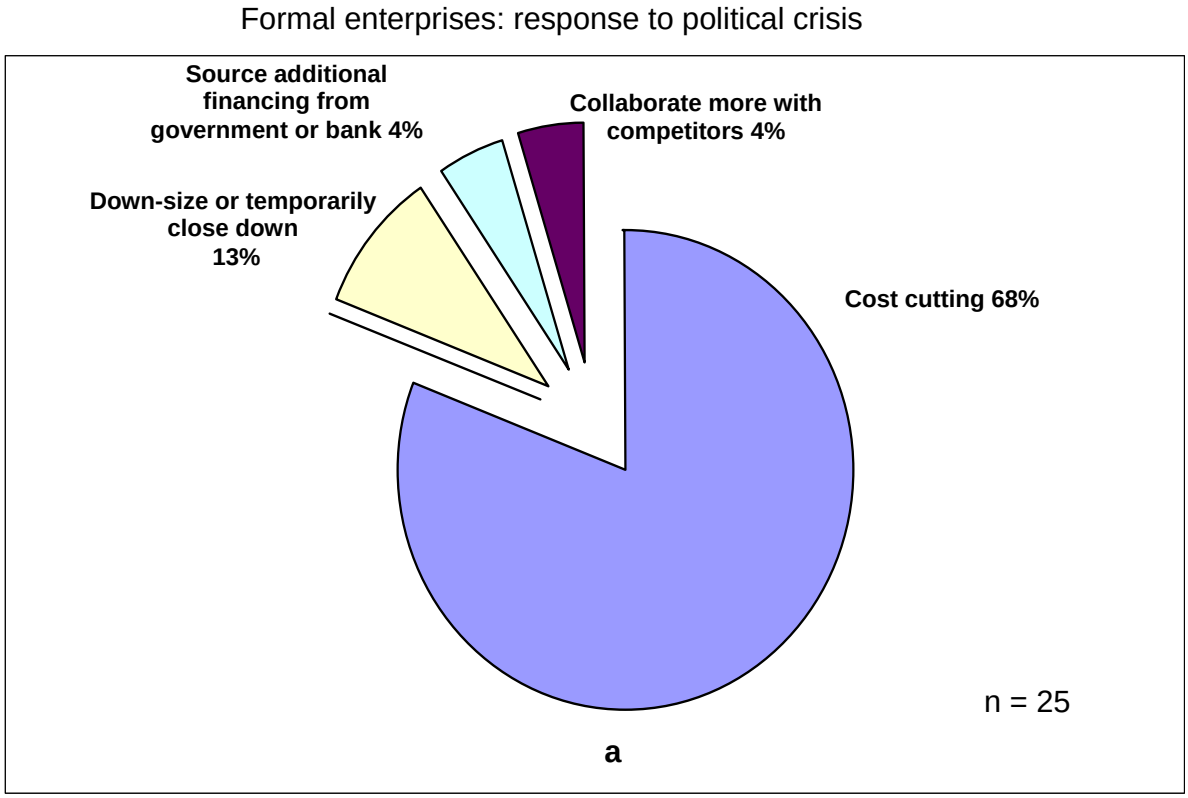
Figure 1. Actions taken by formal enterprises (a) and informal enterprises (b) in response to the 2004 tsunami

Following the political unrest and airport closures in 2008, which were exacerbated by the global financial crisis, the two most common actions taken by formal enterprises were cost-cutting (68%) and down-sizing or temporarily closing down (13%) (Figure 2a). Other responses included sourcing additional financing (4%) and collaborating more closely with other reef tourism enterprises (4%) (Figure 2a). The three actions taken by informal enterprises in the face of the 2008/9 crisis were, relying on a second job or subsistence food production (46%), down-sizing or temporarily closing down (39%) and cost-cutting (15%) (Figure 2b). Formal and informal enterprises differed in the factors that they perceived enabled their survival of the political crisis. In addition, although it was not specifically asked, a number of formal enterprises complained about worsening bureaucratic complexities and regulations, in particular in relation to the application and renewal of visas for foreign workers that added a significant cost and management time burden.

The most important survival factors reported by formal enterprises (n = 14) were commitment and hard work to maintain the lifestyle and enterprise (14%), the availability of past savings to draw on (14%) and the ability to cut costs (14%), the advantages of being a well-established enterprise (14%) and a strong marketing network (14%). The survival factors reported by formal enterprises are reflected in the following quote given in response to the question, 'what enabled you to survive the political crisis of 2008 to 2009?'

'……70% repeat clients have been important, no real debts - we own everything, business sense and good customer relations'

The most important survival factors reported by informal enterprises (n = 14) were the ability to rely on a second source of income or subsistence (50%), commitment and hard work to maintain the lifestyle and enterprise (29%) and the ability to cut costs (14%).



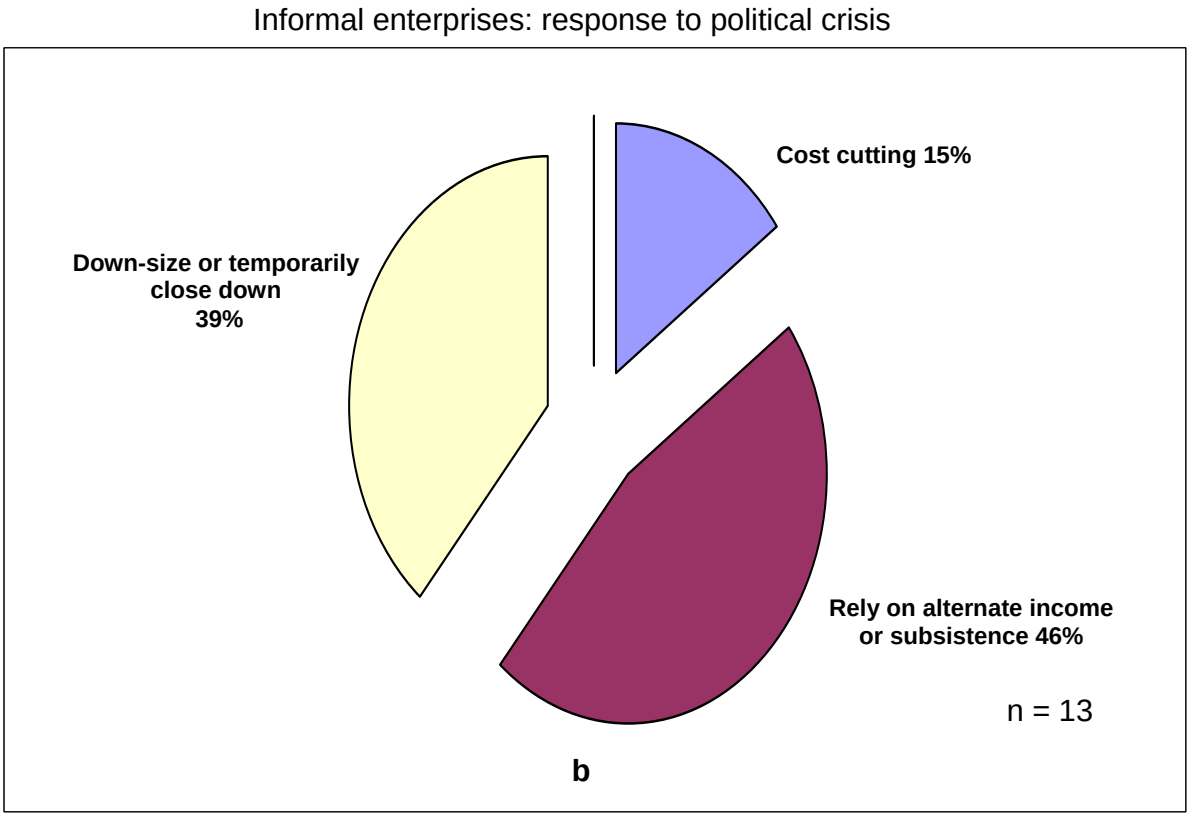


Figure 2. Actions taken by formal enterprises (a) and informal enterprises (b) in response to the 2008 political crisis

Discussion

This is the first empirical study of enterprise resilience in the reef tourism industry, and one of the few empirical studies on the resilience of tourism enterprises generally. Informal enterprises reported higher scores in three components of resilience than formal enterprises: financial capital, social capital, and the level of reported lifestyle benefits. A higher proportion of formal enterprises felt that life in reef tourism is becoming harder than informal enterprises. Formal enterprises also expressed a stronger inclination to look for opportunities to move out of reef tourism. Thus, our tentative finding is that informal enterprises seem to display a higher level of resilience, and report higher scores in the components of resilience than formal enterprises in the face of crises.

Enterprise financial condition

Informal enterprises reported expectations of a higher relative level of income than formal enterprises in a crisis scenario (Table 1), perhaps because, for them, a large drop in income for an extended period of time is less critical due to their low levels of capitalisation and lesser requirements for a steady and continuous income flow relative to formal enterprises. The latter may also explain why 50% of informal enterprises indicated their ability to survive the 2008 political crisis by relying on alternative sources of income or subsistence. Higher levels of capitalisation and investment in buildings, office / boat rentals by formal enterprises meant high ongoing monthly expenses were a problem if income dropped sharply.

Social capital and government support

Informal enterprises perceived that government support during a crisis would be more likely and would be more important in enabling their survival than formal enterprises (Table 1). A higher proportion of informal enterprises indicated that government support enabled their survival of the 2004 Tsunami .This contradicts the literature on the informal sector and studies elsewhere which point to a lack of government support as a constraint on informal sector enterprises relative to their

formal sector counterparts (Wahnschafft, 1982; Mead & Morrisson, 1996; Dewhurst & Horobin, 1998). This positive perception by informal enterprises may be because small amounts of support can make a substantive contribution to the survival of informal enterprises (Aguilar & Campuzano, 2009). Our finding of lower expectations of government support by formal enterprises echoes the findings of Main and Dearden (2007) post the 2004 tsunami and highlights an area of concern for formal sector enterprises. Evidence from nearby Khoa Lak suggests that although government tsunami recovery funds were available the claim limits were too low to make a substantial difference to formal sector enterprises and suffered bureaucractic obstacles, and corrupt practices (Calgaro & Lloyd 2008).

Informal enterprises reported higher levels of social capital in the form of expected support from friends and family and their community in a crisis scenario (Table 1). This may be because Thais, as opposed to foreigners in the case of the formal sector, manage all the informal sector enterprises. This reflects observations by Ringmar (2005) of the importance of Thai family networks as a response to difficult social and economic conditions. Dahles (2002) also noted the capacities of micro-entrepreneurs to maximise the power of kinship and social networks in Indonesia.

Formal enterprises reported lower levels of social capital and because of their foreign links and management, they are more likely to move to another country (or to their home country) and are not as tied to the location. Social capital can indicate the embeddedness of businesses and individuals within a community, which enables a work environment that delivers lifestyle benefits (Granovetter 1985; Baubock & Faist 2010; Williams & Hall 2000) .

Lifestyle benefits

Both formal and informal enterprises reported high lifestyle benefit scores from participation in reef tourism, although informal enterprises' scores were slightly higher (Table 1).

Hard work and commitment associated with maintaining their enterprise and lifestyle were important factors reported by both formal and informal enterprises in surviving the 2004 and the 2008 crises. The lifestyle factors driving tourism entrepreneurs in high-income countries like the U.K. and New Zealand are well-documented (Williams et al., 1989; Ateljevic & Doorne, 2000). The literature on lifestyle values for informal tourism enterprises in low/middle income countries is sparse (Morrison et al., 2008). The high lifestyle benefit scores of informal enterprises is therefore noteworthy, since participation in the informal economy is often seen as an income generating measure of last resort for individuals unable to gain formal sector employment (Cukier & Wall, 1994; Losby et al., 2002). The strong lifestyle benefits noted in both informal and formal sectors are relevant to agencies aiming to support reef tourism enterprises. Authorities may have greater success supporting people to stay in reef tourism enterprises during difficult times than trying to support a switch to alternative activities with lower lifestyle benefits.

Crises and managing perception

The perception and expectation of prospective travellers is important for the resilience of enterprises at a destination, particularly during and after crises (Henderson, 2007). The active marketing and management of perceptions in source markets is particularly important in situations such as the 2004 tsunami and the 2008 political crisis (Cohen 2007; Henderson, 2007; Ritchie, 2009). Whereas larger formal sector enterprises have greater capacity to promote their businesses on a global stage, informal enterprises are largely dependent on walk-in customers who are in Phuket already. Enterprises with established global marketing networks can source clients through direct client contact (Main & Dearden, 2007). Enterprises without those marketing networks are dependent on the perceptions of prospective tourists from other parts of the world, perceptions that may be quite removed from the realities of tourist experience on site. Enterprises with established international marketing networks thus have an additional source of resilience to crises that smaller enterprises that depend on walk-in customers do not have (Calgaro and Lloyd, 2008).

Promotions for and 'perception management' of a destination by tourism bodies for Phuket and Thailand are therefore of particular importance to enterprises dependent on walk-in customers, because they do not have the networks or rapport to convince agents or prospective clients that a situation is stable and favourable for visitation.

Enterprise resilience, vulnerability, and adaptive capacity and study limitations

Due to the overlap between the concepts of resilience, vulnerability, and adaptive capacity at the individual actor scale, the findings in this study are also pertinent to enterprises' adaptive capacity and vulnerability. The resilience concept however explicitly implies the existence of multiple stable states separated by thresholds or tipping points (Miller et al., 2010; Walker et al., 2004). The research presented here with the reef tourism enterprise as a unit of analysis has therefore reported on the ability of enterprises to remain in a desirable state (i.e. maintain and grow income and employment) in the face disturbance, rather than transition to an undesirable state of bankruptcy or closure.

The actor-based resilience approach has, however, limitations, and needs additional research using alternative frameworks to understand the ability of the reef tourism sector to survive and adapt to crises and change. A number of different interpretations of tourism systems exist (Hall, 2008). Calgaro and Lloyd's (2008) adaptation of Turner et al's (2003) framework provided a useful way to analyse the vulnerability of Khao Lak to the 2004 tsunami, and emphasised the importance of a resilient market base and robust marketing strategies in reducing a destination's overall vulnerability. In contrast, our study drew more on tourism system models that give significant emphasis to the role of tourism businesses as significant actors in the system (Hall and Page, 2010; Leiper, 2000; Leiper et al., 2008), as well as the government and community that were also identified by Calgaro and Lloyd (2008). A thorough understanding of a tourism system's resilience to crises and

change will require multiple approaches, including in depth-studies into economic, political and other issues, including innovation (Biggs, 2001; Hall and Williams, 2008).

Policy Recommendations

Our findings demonstrate the importance of a deep understanding of the local context of vulnerable tourism sectors, in establishing policies to enhance resilience to major crises. Policies and actions to support formal and informal enterprises in Phuket's reef tourism industry that do not have a nuanced understanding of the local formal/informal dichotomy may have limited success. Our key recommendations include:

1. Facilitate easy entry and exit from reef tourism over short time frames, by minimising entry and exit barriers, procedures and costs.
2. Promote complementary income-earning activities for individuals in informal enterprises.
3. Support both formal and informal enterprises in accessing additional financing during difficult times, noting the lack of access to finance expressed by formal enterprises.
4. Understand the lifestyle benefits experienced by entrepreneurs in both sectors when designing and implementation regulations and incentives.
5. Aid enterprises in existing marketing efforts and deliver a coordinated marketing effort to manage negative perceptions of crises, and draw tourists to the region for enterprises dependent on walk-in customers. The Andaman Tourism Recovery Plan exemplifies best practice here (Calgaro & Lloyd 2008).

Finally, this paper is one of the first attempts to contrast the resilience to, and responses of, the formal and informal sector enterprises of a vulnerable nature-based tourism destination to major disturbances. The paper tentatively concludes that on average informal enterprises display higher levels of resilience in the face of crises than formal enterprises. In addition, our results draw

into question some commonly held beliefs about enterprises in both the formal and informal tourism sector. Our findings are a basis for researchers and policy-makers in Thailand, and elsewhere to advance a nuanced understanding of resilience in both formal and informal sector and enterprises to openly question traditional beliefs about both sectors in the planning and execution of policy and management interventions for tourism.

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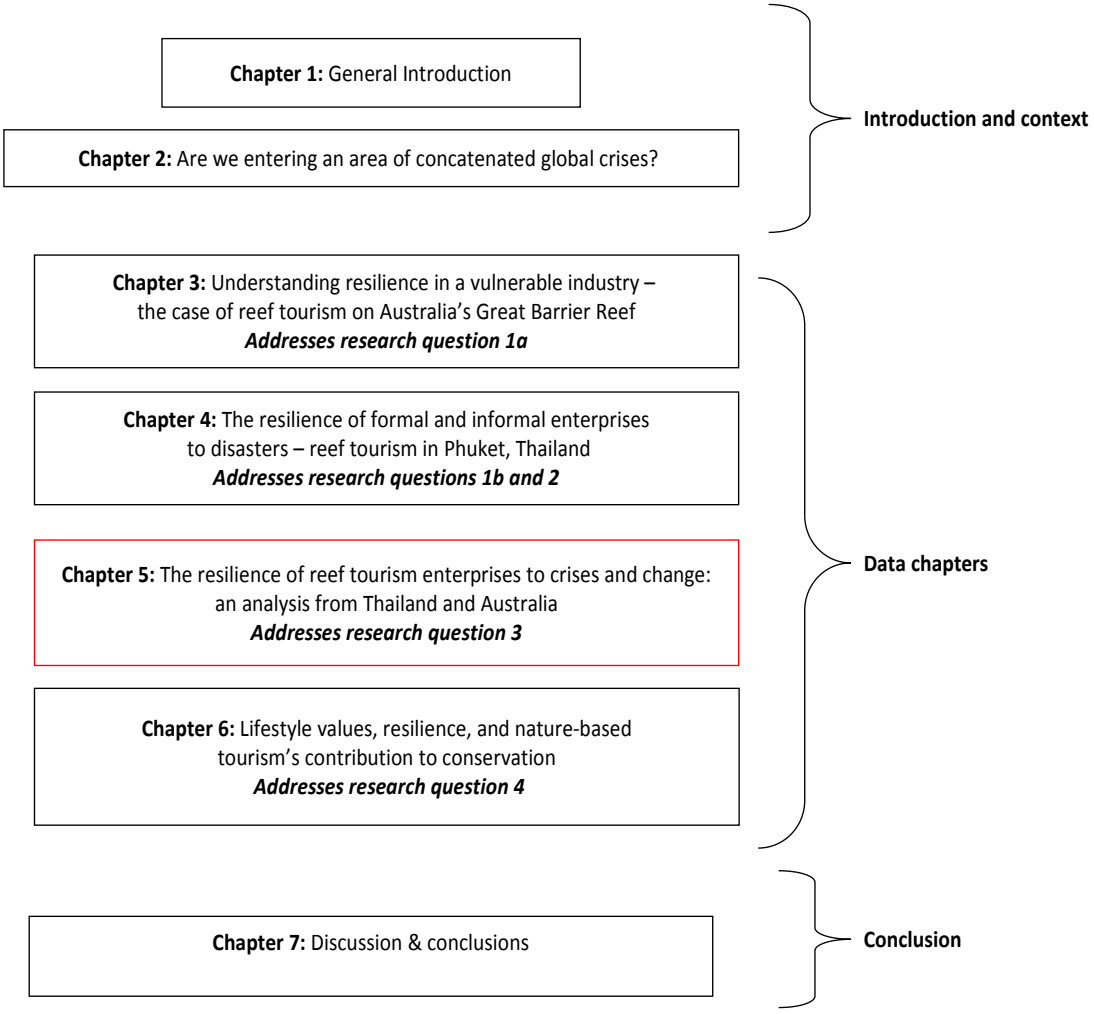
Chapter 5



Publication

Biggs, D.; Hicks, C.; Hall, C.M.; Cinner, C. The resilience of reef tourism enterprises to crises and change: an analysis from Thailand and Australia. In review with *Annals of Tourism Research.*

The resilience of vulnerable enterprises: an analysis from Australia and Thailand's reef tourism industry

Abstract

Rapid and accelerating global change may have severe consequences for tourism. Thus, understanding the ability of tourism, and sectors within tourism, to cope with, and adapt to change is paramount. This paper examines how the socioeconomic and governance context influences the resilience of enterprises in the coral reef tourism sector across formal and informal enterprises in Phuket, Thailand and enterprises on Australia's Great Barrier Reef. Redundancy analysis, a technique that combines ordination with regression, was used to explore the association between characteristics of tourism enterprises and their resilience to a crisis scenario. There are differences between the sectors, but lifestyle factors, human capital, perceived reef condition, and government support are associated with the resilience of enterprises across all three sectors. Our study suggests that the lifestyle benefits to enterprises should be actively considered, and that a nuanced understanding of the resilience of tourism enterprises in different contexts is required.

1. Introduction

Global scale changes to interconnected social, economic, and environmental systems may have profound impacts on tourism (Gössling et al., 2010; Gössling & Hall, 2006; Hall & Lew, 2009). Manifestations of global change, and the associated crises, that can have deleterious effects on the demand for travel and host destinations include: accelerating global environmental change (Gössling & Hall, 2006; Gössling et al., 2010; IPCC, 2007; Millenium Ecosystem Assessment, 2005; Rockstrom et al., 2009; UNWTO & UNEP, 2008); economic and financial instability (Cohen & Neal 2010; Ritchie et al., 2010); increasing oil prices (World Economic Forum, 2009; Yeoman et al., 2007); and political crises (Cohen and Neal, 2010; Henderson, 2007; Ritchie, 2004). Moreover, the increasing pressure on ecosystems around the world, coupled with a highly inter-connected global society may lead to the emergence and spread of entirely novel shocks and crises (e.g. Biggs et al. in press). Due to high levels of global connectivity and feedbacks, crises are now spreading more rapidly from the point of origin to distant parts of the world in novel ways (Adger et al., 2009; Hall, 2010; Ren, 2000). For example, the global financial crisis of 2008-9 originated in the USA's housing market but quickly propagated to affect the availability of credit globally (Brunnermeier, 2008) and its effects are still reverberating around the global financial system. The food price crisis of 2008 resulted from the interaction of pro-biofuel policies in Europe and the USA, increasing energy prices, and droughts in key production regions (Beattie, 2008). Global travel suffered both as a result of 2003 SARS outbreak in China, and due to the security concerns following the 2001 attacks on the United States (Hall et al., 2004). The increased uncertainty over the timing of major disturbances, and how they may spread is of particular concern to the tourism industry because of its dependence on the international flows of people, money and resources (Simpson et al., 2008). Hence, there is a growing urgency to understand the factors that enable the tourism

sector, and agents within it to cope with and positively adapt to, global change and crises (Hall et al., 2004; Henderson, 1999; Laws et al., 2007; Ritchie, 2009). Our paper contributes to this understanding through an empirical investigation of the factors that are associated with the perceived resilience of coral reef tourism enterprises in Australia and Thailand to hypothetical major perturbations and change.

To date, the majority of studies assessing the effects of crises and disturbances on the tourism industry have assessed the impacts on the demand for tourism, and to a lesser extent the response of the tourism industry or the ability of the tourism industry to adapt. These studies can be grouped into four broad overlapping categories (Hall, 2010). First, a group of studies have focused on the impacts of specific large crises, such as the global financial crisis or the SARS outbreak, on tourism arrivals at the national, regional or global scale (Kuo et al., 2008; Ritchie et al., 2010). A second group comprises modelling and scenario-based analyses, varying from highly theoretical (Casagrandi & Rinaldi, 2002) to studies focussed on specific issues like the impact of climate change on tourist flows (Hamilton et al., 2005). Third, a category of studies has broadly focussed on how environmental change may affect the tourism industry and the potential for adaptation (Gössling & Hall, 2006; Petrosillo et al., 2006). Such studies often focus on the ski industry (Elsasser & Burki, 2002; Hoffmann et al., 2009; Steiger & Mayer, 2008), or the response of tourists to coral reef degradation (Cesar 2000; Graham, 2000; Westmacott et al., 2000; Uyarra et al., 2005; Andersson, 2007). Finally a fourth category consisting of mostly qualitative case studies, has focussed on the response of tourism-dependent communities to disasters or shocks (Baker & Coulter, 2007; Cioccioa & Michael, 2007; Gurtner, 2006; Irvine & Anderson, 2004; Laws et al., 2007; Smith & Henderson, 2008). What is currently lacking is an

empirical investigation of the factors that may enable tourism enterprises to survive or adapt to crises and change.

Resilience theory (e.g. Folke 2006) has attracted increasing attention from tourism researchers as a way to understand tourism's ability to cope with, and adapt to perturbations and change (Farrell & Twining-Ward, 2004; Sausmarez, 2007; Hall, 2008; Simpson et al., 2008; Strickland-Munro et al., 2010). Coral reef tourism provides an excellent lens through which to explore resilience because it is exposed to a range of environmental and socio-economic threats. The environmental threats to reef ecosystems are particularly acute; and include coral bleaching, ocean acidification, over-fishing, fertilizer and sediment runoff, coastal development and poorly managed tourism activities (e.g. Hall, 2001; Hughes et al., 2003; Ahmed et al., 2007). In addition, socio-economic and political crises can affect reef tourism at both the destination and origin of tourist generating regions (Pelling & Uitto, 2001; Nunn, 2009; Bischof, 2010; Bohensky et al., 2010).

Reef tourism generally requires the use of a boat to visit offshore reefs. Therefore, enterprises that take tourists to enjoy reefs by boat are key players in the reef tourism industry. An enterprise is an entity, consisting of one or more individuals, that delivers an income generating service to visitors. Reef tourism is characterised by a continuum of enterprise sizes. On one end of the continuum are the large commercial enterprises, with substantial investments in boats, offices, marketing and equipment, they employ hundreds of people. On the other end of the continuum are the small informal enterprises and individual or family-owned businesses that do not own their own boats, but rent boats or space on boats when they have clients. In contrast to formal enterprises, informal enterprises consist of small-scale self-

employed entrepreneurs that are typically not officially licensed or registered for taxation (Aguilar and Campuzano, 2009).

This paper empirically investigates the factors that are associated with perceived resilience in coral reef tourism enterprises in three different contexts. Our study investigates commercial enterprises on Australia's Great Barrier Reef (GBR), commercial enterprises in the formal tourism sector in Phuket, Thailand and informal enterprises in Phuket, Thailand. In particular, our study identifies: 1) The characteristics associated with the resilience of enterprises in Australia, formal sector enterprises in Thailand, and informal longtail boat enterprises in Thailand; 2) The differences in the levels of resilience between formal sector enterprises in Thailand's longtail boat enterprises, and enterprises on Australia's GBR; 3) The theoretical and management implications of the commonalities and differences between the three reef tourism sectors for strengthening enterprise resilience.

2. Literature Review

2.1. Resilience theory

The resilience concept emerged from the ecological sciences and is a measure of the ability of a system to recover from and adapt to perturbations without fundamentally changing structure and function (Berkes & Folke, 2000; Gunderson & Holling, 2002; Holling, 1973). A resilience-based approach is useful because it considers the ability of a system to maintain and adapt its essential structure, identity, and functioning in the face of often unpredictable change and crises (Adger, 2000; Cumming et al., 2005; Holling, 1973). Resilience theory recognises the inherent uncertainty in predicting the complex and dynamic ways in which individuals, organisations, and society may respond to disturbances and change (Gallopin, 2006; Marshall,

2010). The growing but limited literature on resilience in tourism to date consists mainly of conceptual pieces on the potential value of the resilience concept (Cochrane, 2010; Farrel & Twining Ward, 2010) and qualitative applications to protected area and community-based tourism (Ruiz Ballestros, 2010; Strickland-Munro et al., 2010). For example, Ruiz Ballesteros (2010) conducted a three year ethnographic study in an Ecuadorian community using participant observation and in-depth interviews to develop a qualitative perspective of the social-ecological resilience of a lagoon system. Yet, to date, there has been no quantitative, empirical study on the determinants of resilience among actors in tourism such as tourism enterprises.

Resilience is closely related to the concepts of adaptive capacity and vulnerability. Vulnerability is the susceptibility of a system to disturbances and is determined by exposure and sensitivity to perturbations and the capacity to adapt (Adger 2006, Gallopin 2006, Nelson 2007). The adaptive capacity of social systems can be defined as the capacity of a system, from the individual to humankind, to increase (or at least maintain) the quality of life of its members (Allison & Hobbs, 2004; Anderies et al., 2006; Kinzig et al., 2006; Smit & Wandel, 2006). The determinants of adaptive capacity are both local (e.g. strong social networks) and larger scale (e.g. national socio-economic and governance frameworks (Smit & Wandel, 2006). The resilience concept incorporates many elements of vulnerability and adaptive capacity. A resilient community, organisation, or enterprise by definition has the capacity to adapt to the stressors and change it is exposed to, hereby reducing its vulnerability.

2.2. Conceptualising enterprise resilience

A resilient organisation or community is one that is able to maintain and adapt its essential structure, identity and functioning in the face of crises and change (Adger 2000; Cumming et al.,

2005; Gunderson & Holling, 2002). The resilience concept implies the existence of two or more alternative states characterised by different structures, functions, and identities (Adger, 2000). Once in an alternative state, return to the earlier state can be made difficult or impossible (Walker et al., 2004). Alternative states exist at different scales. At the scale of a small country or region, an economy may shift between sectors, for example from one based on agricultural production (such as sugar cane) to being based on tourism. Alternatively, an economy may shift within sectors, such as a changes in the type of tourism, (e.g. from reef tourism to casino tourism). At the enterprise scale, an enterprise may shift from a solvent state to an insolvent one, or may switch from reef tourism as its core business to another form of tourism. A resilient reef tourism enterprise is able to maintain or grow its existing level of employment and income and stay operating in reef tourism in the face of crises and change (Biggs 2011). An enterprise that becomes insolvent, closes down, drastically downsizes, or substantially shifts its core business away from reef tourism is defined in this study as non-resilient.

2.3. Factors that enable enterprise resilience

The factors that confer resilience to enterprises comprise lifestyle values and social, human, financial and natural capital. These factors are discussed briefly below. A more detailed discussion of each factor can be found in Biggs (2011) and Biggs et al. (in press).

2.3.1. Lifestyle values

Small and medium-sized tourism entrepreneurs, particularly in non-urban areas, are often driven by lifestyle considerations that change their entry and exit characteristics (Ateljevic & Doorne, 2000; Hall & Rusher, 2004; Biggs in press). Entrepreneurs and staff are frequently attracted to an area, and want to maintain a desired lifestyle associated with working in that

particular location (Ateljevic & Doorne, 2000; Bensemann & Hall, 2010; Getz & Carlsen, 2000; Lynch et al., 2009; Roberts and Tribe, 2008). Several authors (Getz et al., 2004; Hall & Rusher, 2005; Lynch et al., 2009) have suggested that owner–operators of lifestyle tourism enterprises can develop an emotional attachment to their businesses and the associated sense of place, personal identity and lifestyle, making them reluctant to abandon the enterprise and the location in difficult times.

2.3.2. Social capital

Social capital can provide a supporting buffer to enterprises in the face of a crisis (Adger, 2001; Norris et al., 2008). The central idea of social capital is that the networks of enterprises and individuals that are characterised by shared norms, trust and reciprocity can provide support to enterprises in difficult times and aids in business growth (Cooke, 2007; Jones, 2005; McGehee et al., 2009). Social capital includes the capital that exists between the different levels of government and its subjects, between family and friends, and between enterprises, that enables effective collaboration. Economic relations and actions of enterprises are embedded within social structures of places. 'Social embeddedness' (Granovetter 1985: 490) refers to how the actions and attributes of people are conditioned by their location within networks of 'concrete, ongoing personal relations'. Regional differences in economic development can be explained by differences in social capital derived from the embeddedness of firms in regional webs of social relations (Rutten & Boekema, 2007). Such local ties allow entrepreneurs to draw on local social capital, as well as other forms of capital, in improving firm performance relative to businesses that are not as embedded in their locale (Schutjens & Völker, 2010). As Cooke (2007) demonstrated, such 'relational embeddedness' is an important indicator of the performance of small and medium enterprises. There is also growing evidence that high

levels of social capital and being embedded in thick networks of social and economic relations, allows greater access to various forms of capital and imparts higher levels of resilience in the face of external change (Adger, 2001; Curran, 2002; Forbes et al. 2009; Norris et al., 2008)

2.3.3 Human capital

Human capital refers to the skill-set and capacity of individuals to respond and to adapt to change. Informal enterprises such as longtail boat operators usually have lower levels of formal training and managerial skills than larger formal sector commercial enterprises (Main & Dearden, 2007; Smith & Henderson, 2008). Enterprise age and experience are components of human capital, as older enterprises are more likely to have dealt with crises and change in the past, and have the self confidence and skills to plan for, and manage future crises (Kalleberg & Leicht, 1991; Hall & Williams, 2008)

2.3.4. Financial capital

Healthy profits, income levels, and access to finance are integral to enterprise survival and prosperity.

2.3.5. Natural capital

The conditions of coral reefs that visitors experience are a central element of the natural capital that reef tourism enterprises rely on and which contribute to the attractiveness of a reef tourism destination for lifestyle entrepreneurs and visitors alike. Depending on their knowledge and expectations, tourists appear to be less likely to visit a reef after degradation or coral bleaching and are willing to pay more to experience a reef that is perceived to be more

pristine (Cesar, 2000; Gössling, 2004; Kragt et al., 2009; Uyarra et al., 2005; Westmacott et al., 2000).

3. Methods

3.1. Study sites

Phuket, Thailand and Australia's GBR were chosen as study sites because of the contrast of contexts that they present. Thailand is a middle-income country with moderate governance scores that has been plagued by political instability over the past decade (Worldwide Governance Indicators 2010b). Thailand received 14.5 million foreign visitors in 2007 with a total expenditure of US$20.6 billion (UNCTAD, 2010). Tourism in Thailand contributes to 6.0% of the total GDP (Tourism Authority of Thailand 2010). Phuket and Thailand have suffered from a number of disasters over the last 15 years, most notably the 2004 tsunami and the political crisis of 2008 and 2009 (Cohen, 2009; Biggs in review).

Australia is a high income country with a high HDI score, good governance, and is characterised by political and socio-economic stability (Worldwide Governance Indicators 2010a). Tourism plays a lesser role in the Australian national economy although it is extremely important for some regional economies (Hall, 2007). Australia received 5.6 million international visitors in 2007 with a total expenditure of US$29.1 billion (UNCTAD, 2010). Tourism contributes 4.6% of Australia's national GDP (Australian government 2010). Expenditure per international visitor is thus substantively higher in Australia than in Thailand. Although the tourism industry on the GBR has been affected by cyclones and the global financial crisis, the extent of impact on the industry is substantially less than in Phuket (Biggs in review).

3.1.1. Phuket

The island province of Phuket is situated in the Andaman Sea and is historically Thailand's main centre for reef and dive tourism. Reef tourism in Phuket grew quickly during the 1980s and 1990s. In 1980, there were fewer than ten commercial dive enterprises in Phuket and by 2002 there were 85 (Main & Dearden, 2007). Phuket still dominates reef tourism in Thailand, although new Thai dive destinations such as Krabi, Koh Tao and Khao Lak have emerged over the past decade. Tourism in Phuket is distinctly seasonal, driven by the south-western monsoon which brings rainy, stormy and unpredictable weather from May to late October. Phuket's high season for reef tourism typically falls between October and late April. Many formal and informal enterprises down-size or close down for the low season.

This study included both formal sector enterprises and informal sector enterprises that operate with longtail boats (Figure 1). Formal enterprises typically own or have the capacity to lease at least one speed or dive boat, or spaces on these boats. The boats used by formal enterprises can cover substantially greater distances than the boats used by informal enterprises. The majority of formal enterprises have a storefront and numerous agents that they market through, in addition to websites and international marketing networks and travel markets. The informal enterprises base their longtail boats at a range of popular tourist beaches, primarily on Phuket's west coast, and rely to a large extent on walk-in customers (Biggs et al in review). The staff of the formal enterprises are mostly able to communicate in one or more international language (e.g. English, German, Japanese), whereas international language skills are limited among informal enterprises.

Figure 1. Longtail boats in Phuket.

3.1.2. Australia's Great Barrier Reef

The GBR is promoted as the world's premier reef tourism destination (Natural Wonders, 2008). The GBR is located along Australia's tropical north-east coast in the state of Queensland and extends north-south for more than 1200 kilometres (Johnson & Marshall, 2007). The majority of reefs on the GBR lie over 20km offshore and necessitate the use of well-equipped boats to visit. This study collected data in the Cairns and Whitsundays regions - two iconic areas for reef tourism on the GBR. Since 1994, an average of 88% of tourists who visited the GBR did so in these two regions (GBRMPA, 2010).

3.2. Data collection

3.2.1. Interview surveys

The surveys focussed on enterprises whose dominant source of income was derived from taking visitors to dive and snorkel at coral reef attractions. A complete list of all the commercial enterprises that met these criteria was compiled through a combination of tourism association and conservation agency websites and lists, Google searches, and key informant discussions. A list of 68 formal enterprises was compiled for Phuket and 76 for the GBR. The informal longtail boat enterprises in Phuket were contacted with the assistance of Thai researchers from Prince of Songkla University and the Phuket Marine and Coastal Resource Conservation Centre. Interviewers visited all the beaches on Phuket's south and west coast where longtail boat enterprises operate. Interviewers visited the beaches until all the informal enterprises present during the time of the data collection in 2009 had been interviewed (see Biggs et al. in review for details).

Surveys were conducted by the primary author (GBR and Phuket's commercial enterprises) and four Thai research assistants (Phuket's commercial enterprises and longtail boat enterprises). Semi-structured interviews were used – in which interviews had a fixed list of questions, but respondents could provide more detail on any topic if they chose to (Bernard, 2002). The survey was translated into Thai to interview the longtail boat enterprises. The survey tool was piloted by the primary author with enterprises on the GBR and the translated survey tool was piloted by Thai research assistants in Phuket to ensure consistency in response and allow for comparison between the commercial enterprises in Phuket and the enterprises on the GBR. Interviews took between 25 and 90 minutes to complete due to the differences in the extent of open-ended discussion. All variables were measured on a 5 point Likert scale (Likert, 1967), other than the response to a crisis scenario which was measured with a binary variable.

The Likert scale responses in response to statements were: 1 = strongly disagree, 2 = disagree, 3 = average/indifferent, 4 = agree and 5 = strongly agree.

We collected data on eight dependent variables, including four measures of perceived resilience and four measures of a perceived lack of resilience. The measures of perceived resilience were: 1) the perceived ability of their enterprises to **endure change** (variables measured are indicated in **bold**)**; 2)** levels of **confidence** in their enterprise; 3) the perceived levels of enterprise **adaptability;** and 4) the ability to **maintain options** within the industry (Table 1). The measures of a perceived lack of resilience were: whether enterprises were currently **looking to close down or exit** reef tourism , whether life was becoming **increasingly difficult**, whether interviewers felt that their enterprise was **unlikely to survive** for much longer and how they would respond to a crisis (Table 1). Response to a crisis was measured by a binary variable of whether respondents indicated their enterprise would exit the reef tourism industry in the face of a 50% slump (**will exit in a 50% shock**) in tourist revenue for 12 months (adapted from Cinner et al. 2009) (Table 1).

Variable	**Variable description**
Measures of perceived resilience	
Endure change	There is no reason to believe that foreseeable changes will make my business go under
Confidence	I am confident that things will turn out well for my business in the future
Adaptability	My business is in a better position to adapt to changes and stay in the reef-based tourism sector than others I know
Options	There are many options for my business to adapt to changes and stay working in the reef-based tourism sector
Measures of a perceived lack of resilience	
Looking to exit	I am looking for opportunities to move out of the reef-based tourism sector
Unlikely to survive	I do not think that my enterprise will survive much longer
More difficult	Life has become increasingly difficult in the reef-based tourism sector
Will exit in a 50% shock	Binary variable of whether respondents indicated their enterprise would exit the reef tourism industry in the face of a 50% reduction in tourist revenue for 12 months

Table 1: Measures of perceived enterprise resilience and lack of resilience. Unless otherwise indicated all variables were measured on a 5 point Likert scale (1 = strongly disagree, 2 = disagree, 3 = average/indifferent, 4 = agree, 5 = strongly agree).

In addition, five characteristics were hypothesised as being associated with enterprise resilience; including lifestyle values, social capital, human capital, financial capital, and natural capital (Table 2). Three questions were asked on different components of lifestyle values (Table 2): the extent of the importance of **identity** and attachment (**love**) associated with their participation in reef tourism; and the extent to which enterprises felt that knowledge and experiences of coral reefs (**sharing knowledge**) delivered lifestyle benefits. Respondents indicated the extent to which they expected support to their enterprises during a 50% slump scenario from family and friends (**family**), government or an NGO (**Gov/NGO support**) , and through **collaboration** with competing enterprises in reef tourism (Table 2) as measures of social capital. One question was used to elicit enterprises levels of human capital. **Financial capital** of enterprises was measured by calculating the average of the five-point Likert scale scores for revenue, profits, assets to liabilities, and access to finance during a scenario of a 50% slump for 12 months (Table 2) (adapted from Cinner et al. 2009). Enterprises were asked about their perception of the condition of the reef/s (**reef condition**) that they visit with their clients as a measure of natural capital.

Hypothesised factors associated with enterprise resilience	
Lifestyle values	
Identity	Working in the reef-based tourism sector is an important part of who I am and how I see myself
Love	I love working in reef-based tourism
Share knowledge	I enjoy working in an industry where I share my knowledge and experiences of the reef and marine environment with others
Social capital	
Family and friends support	The extent of support to your enterprise from your family and friends during a scenario of a 50% slump in tourist revenue for 12 months
Gov/NGO support	The extent of support to your enterprise from government or an NGO during a scenario of a 50% slump in tourist revenue for 12 months
Collaboration	The extent to which increased collaboration with competing reef tourism enterprises enables enterprise survival during a 50% slump scenario.
Other	
Human capital	My business has what it takes to be able to deal with future changes in the reef-based tourism sector
Financial capital	Average score of revenue, profits, assets to liabilities ratio and access to finance in a 50% slump scenario
Natural capital measured through perceived reef condition	What is the current condition of the coral reefs that are the focus of your tourist activities (1 = very bad to 5 = very good)

Table 2: Factors associated with enterprise resilience. All variables measured on a 5 point Likert scale (1 = strongly disagree, 2 = disagree, 3 = average/indifferent, 4 = agree, 5 = strongly agree)

3.3. Analysis

A Kruskal Wallis test was used to test whether the three groups of enterprises surveyed had significant differences in the levels of perceived resilience, lack of resilience, and the characteristics hypothesised to be associated with enterprise resilience. Monte Carlo significance values were calculated for the Kruskal Wallis test (Field 2009). Data were normalised in PRIMER to ensure that all the variables were on the same scale. Normalisation was achieved by subtracting the mean of the variable and dividing by the standard deviation (Clarke and Warwick 2001). A cluster analysis was conducted to ascertain whether the grouping of resilience and lack of resilience responses were consistent across interviewees (Legendre & Legendre, 1998).

A redundancy analysis (RDA), which effectively visualises a multiple regression, was conducted to see how the factors hypothesised to be associated with resilience, associated with our

measures of enterprise resilience, lack of resilience and response to a crisis. A separate RDA analysis was conducted for the Thai longtail boat enterprises, the Thai commercial enterprises, and the enterprises on Australia's GBR. An RDA analysis was also conducted for all the enterprises together. An RDA analysis looks for associations between groups of variables by combining multiple regression analysis with ordination (Cinner et al. 2011, Legendre and Legendre 1998, ter Braak and Smilauer 2002). Factors associated with resilience were assigned as predictor variables and perceived enterprise resilience, and perceived lack of resilience, the response variables in the analysis.

4. Results

4.1. Descriptive statistics for measures of enterprise resilience

There was broad similarity in measures of resilience and lack of resilience across the three groups of enterprises. All three groups of enterprises had an average score of above 3 on a five point Likert scale (1 = strongly disagree to 5 = strongly agree) on the measures of resilience, although there were significant differences across the three enterprises in their perceived **adaptability**. Australia's GBR enterprises had a higher '**adaptability**' score than the two groups of enterprises in Thailand (Table 3).

Variable	All enterprises		Longtail boats		Thai commercial		GBR commercial		Kruskal Wallis test statistic
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	
Measures of perceived resilience									
Endure change	3.61	0.988	3.63	1.19	3.63	0.711	3.62	0.937	0.509
Confidence	3.84	0.831	3.89	0.838	3.89	0.849	3.75	0.812	0.819
Adaptability	3.61	0.878	3.40	0.923	3.59	0.805	3.87	0.850	7.121*
Options	3.66	0.812	3.63	0.747	3.70	0.756	3.65	0.956	0.560
Measures of a lack of resilience									
Looking to exit	2.01	1.064	1.68	0.909	2.15	1.229	2.27	0.984	13.161*
Unlikely to survive	1.87	0.886	1.77	1.035	1.85	0.816	1.96	0.743	3.720
Increasingly difficult	3.62	0.979	3.42	0.944	3.85	0.918	3.67	0.990	5.980*
Hypothesised factors associated with enterprise resilience									
Lifestyle values									
Identity	4.24	0.820	4.67	0.476	3.63	0.826	3.94	0.932	26.803*
Love	4.64	0.581	4.82	0.428	3.70	0.717	4.63	0.531	12.767*
Share knowledge	4.43	0.615	4.44	0.501	3.89	0.544	4.40	0.798	0.229
Social capital									
Family and friends support	2.523	1.331	2.93	1.083	2.370	1.289	2.087	1.473	15.018*
Gov / NGO support	2.118	1.409	2.232	1.265	1.457	0.862	2.625	1.746	14.866*
Collaboration	2.546	1.504	2.286	1.317	2.544	1.531	2.875	1.658	3.319
Other									
Human capital	3.73	0.805	3.68	0.848	3.59	0.673	3.79	0.798	0.696
Financial capital	2.00	0.744	2.257	0.782	1.736	0.661	1.774	0.630	14.593*
Natural capital measured through perceived reef condition	3.50	0.904	3.21	0.861	3.33	0.732	4.02	0.911	25.609*

*$p < 0.05$

Table 3: Descriptive variables measured on a 5 point Likert scale. 1 = strongly disagree to 5 = strongly agree

Overall, 38% of enterprises indicated that they would exit the reef tourism sector when faced with the scenario of a 50% slump in tourism for 12 months (**will exit in 50% shock**). This result varied between the groups, and only 26% of longtail boat enterprises and 32% of Phuket's commercial enterprises indicated that they would exit in the face of 50% slump for 12 months. In contrast, 60% of the enterprises on the GBR reported that they would exit the sector when presented the scenario of a 50% slump for 12 months. A Spearman rank correlation cluster analysis confirmed the conceptual grouping of the measures of enterprise resilience and lack of resilience used (Figure 2).

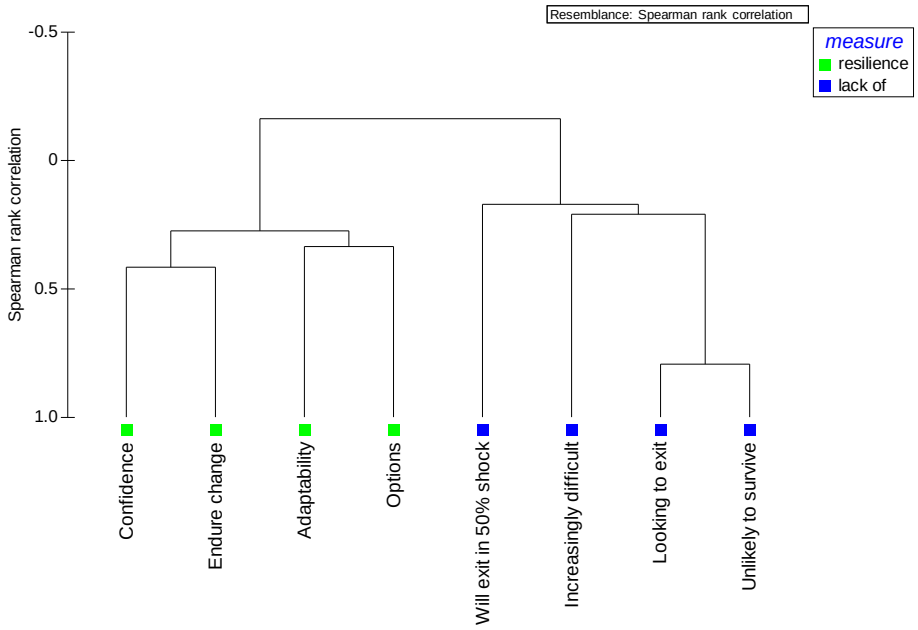


Figure 2: Cluster analysis. The figure shows how the measures of all enterprise resilience and non-resilience cluster together

4.2. Descriptive statistics for measures of a lack of enterprise resilience

All three groups of enterprises had an average score below of 3 on a 5-point Likert scale on two measures of a lack of resilience, i.e. whether they were **looking to exit** and felt they were **unlikely to survive**. Phuket's longtail boat enterprises on average scored significantly lower in the **looking to exit** variable than the formal sector enterprises in Phuket or in Australia (Table 3). All three groups on average scored above 3 on a 5 point Likert scale in response to the statement, 'life is becoming more difficult in the reef-based tourism sector' **(increasingly difficult**), although there were significant differences in the values assigned. Phukets longtail boat enterprises scored lower on this variable, with Phuket's commercial enterprises scoring the highest (Table 3).

4.3. Descriptive statistics for factors associated with enterprise resilience

On average all enterprises scored above 3 on a 5 point Likert scale on the lifestyle value statements measures of **identity**, **love**, and **share knowledge**. Similarly, on average all enterprises scored above 3 on a 5 point Likert scale for **human capital** and perceived **reef condition**. Response to **identity**, **love** and perceived **reef condition** differed significantly across enterprises (Table 3). Phuket's longtail boat enterprises had the highest average score on the lifestyle measures of **identity** and **love** followed by enterprises on Australia's GBR and then the formal sector enterprises in Phuket. Enterprises on Australia's GBR perceived the **reef condition** to be better than both groups of enterprises in Phuket.

All three groups of enterprises scored below 3 on a 5 point Likert scale measure of **financial capital** and the three items measuring social capital: extent to which support from family and friends (**family**), government or an NGO (**Gov/NGO support**), or collaboration with competing enterprises (**collaboration**), would enable survival through a crisis. The average scores for **financial capital**, levels of support felt from both family and friends during a crisis, as well as government or NGO support differed significantly across enterprises (Table 3). Phuket's longtail boat enterprises scored the highest on support from family and friends (**family**) during a crisis scenario, and enterprises on the GBR scored the lowest. However, enterprises on the GBR scored the highest on support from government or NGOs (**Gov/NGO support**) during a crisis and Phuket's commercial operators scored the lowest. Longtail boat enterprises had the highest score for **financial capital** during a crisis scenario (Table 3).

4.4. Results of Redundancy Analysis: factors associated with enterprise resilience

RDA diagrams are interpreted by the length and direction of the arrows for each of the variables in the diagram (Figures 3 to 6). Variables with arrows in the same direction, indicate that those variables cluster together (i.e. are associated with each other). The strength of the variable is a combination of the length of the arrow, the angle between the arrow and the axis and the variation explained by that axis. A two dimensional ordination is unlikely to capture all the variation where many variables are represented, the percent explained by the first and second axis each axis gives us an idea of how much of the total variation is captured in the diagram.

4.4.1. Thai longtail boat enterprises

The variables identity, human capital, government and NGO support, and perceived reef condition are most closely associated with the measures of enterprise resilience among Phuket's longtail boat enterprises. In particular government and NGO support, human capital, and identity cluster closely with 'endure change', and perceived good reef condition clusters together 'adaptability' and 'options'. 53% of the variation across all variables is captured by the first canonical (horizontal) axis for the Thai long tail boat enterprises (p=NS) (Figure 3).

Thai Long tail, P= 0.13, F= 1.24, C1= 53.5, C2= 16.8

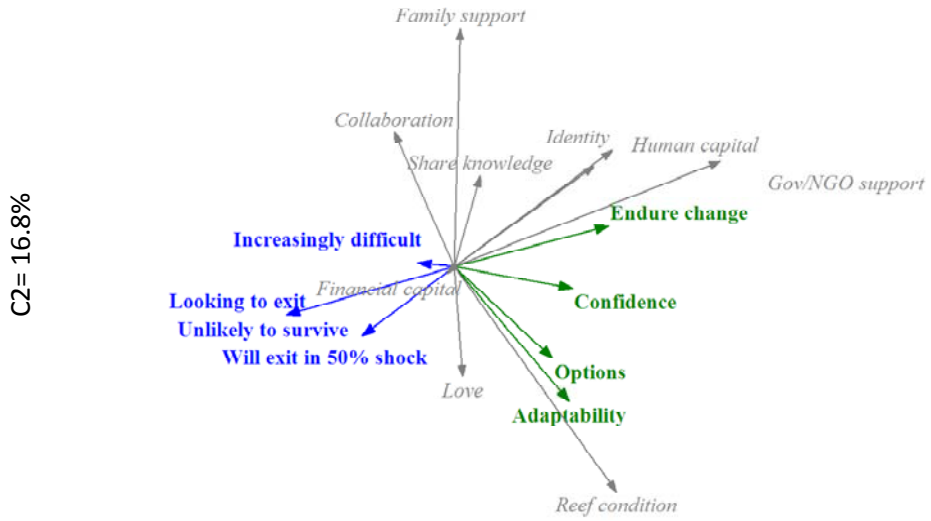
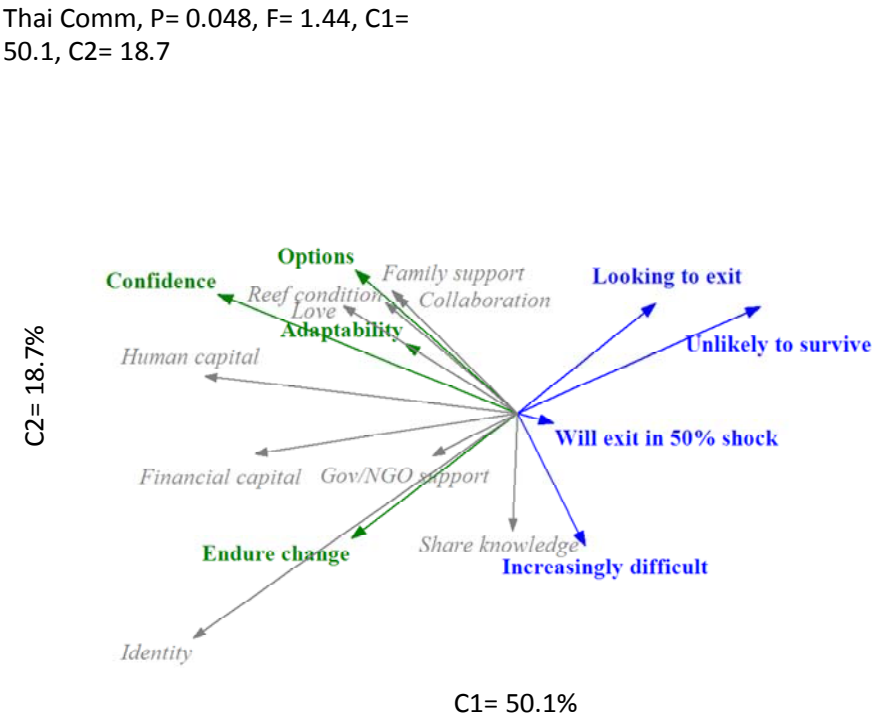


Figure 3. RDA diagram for Phuket's longtail boat enterprises

4.4.2. Thai commercial enterprises

Human capital, attachment to reef tourism (measured by the variable 'love'), perceived good reef condition, and two measures of social capital (support from family and friends during a crisis scenario and collaboration with other reef tourism enterprises during a crisis scenario) clustered together with three measures of resilience: options, adaptability, and confidence. The variable 'identity' was clustered closely with 'endure change' as was financial capital.

50% of the variation across all variables is captured by the first canonical (horizontal) axis for the Thai commercial enterprises ($p<0.05$) (Figure 4).



Figure`4. RDA diagram for Phuket's formal sector enterprises

4.4.3. GBR commercial enterprises

Human capital, support from government or an NGO during a crisis scenario, and attachment to the reef tourism industry (measured by the variable 'love') clustered together with the measures of enterprise resilience (Figure 5). Government and NGO support during a crisis scenario and 'identity' also clustered in the same direction as the measures of resilience, but the influence of these two variables was weaker indicated by the short arrows representing them. 68% of the variation across all variables is captured by the first canonical (horizontal) axis for the GBR commercial enterprises ($p<0.05$) (Figure 5).

GBR, P= 0.002, F= 2.6,
C1= 67.7, C2= 11.7

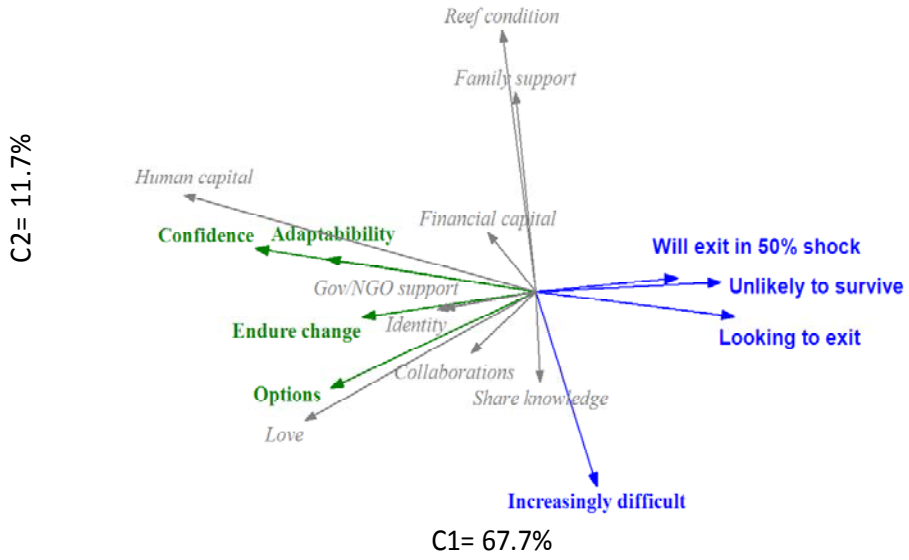


Figure 5. RDA diagram for enterprises on Australia's GBR

4.4.4. All enterprises

Government and NGO support during a crisis and human capital are closely associated with three measures of resilience: endure change, adaptability, and options (Figure 3). Financial capital clusters more closely with 'confidence' and 'options'. The lifestyle values measures 'identity' and 'love' are more closely clustered with confidence. 65% of the variation across all variables is captured by the first canonical (horizontal) axis for all enterprises ($P<0.05$) (Figure 6). Measures of resilience are separated from the measures of lack of resilience along this axis.

Figure 6. RDA diagram for all enterprises

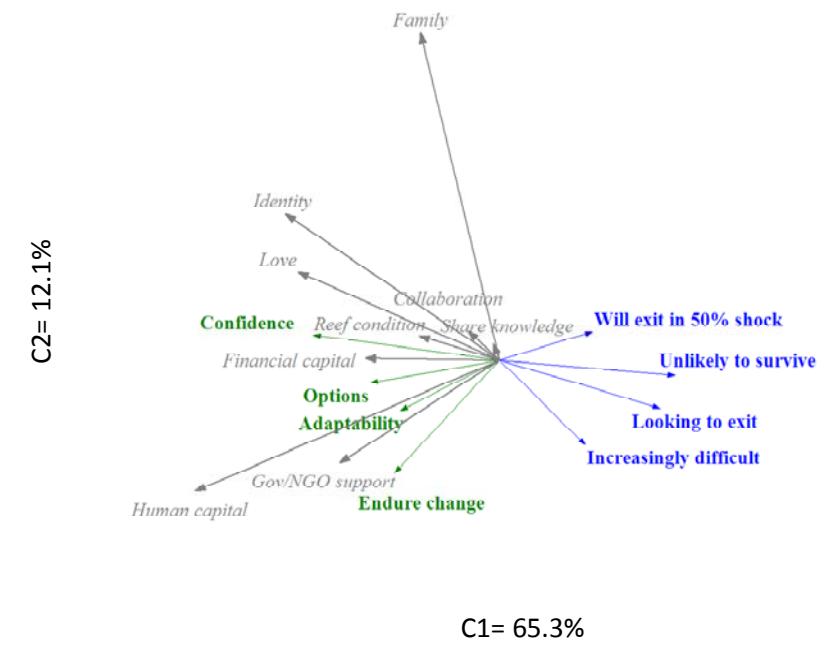


Figure 6. RDA diagram for all enterprises

5. Discussion

This paper set out to explore the characteristics associated with the resilience of three different groups of enterprises. Across the three groups of enterprises, the characteristics that are most strongly associated with resilience were not the same (Figures 3 to 5), suggesting that resilience is indeed context dependent. Human capital was the only characteristic strongly associated with resilience across all three enterprises. Overall, human capital, financial capital, the social capital measure of government and NGO support and lifestyle values of love and identity, were the characteristics most closely associated with our measures of resilience across all three groups of enterprises (Figure 6). The importance of human capital for enterprise success is widely recognised in the literature on enterprise success (Bosma et al., 2004).

There are also differing levels of resilience between the three groups of enterprises. A lower proportion of longtail boat enterprises and commercial enterprises in Phuket, Thailand are likely to exit the reef tourism industry when faced with a scenario of 50% slump than enterprises on Australia's (GBR). This is probably because enterprises in Thailand have suffered a number of crises approaching the 50% slump magnitude over the past decade (Cohen & Neil, 2010). Enterprises on the GBR have not suffered similar levels of decline since an airline strike in 1989 and the collapse of Ansett airlines in 2001 (Leiper, 2002). The prospect of such a crisis is therefore more daunting. The importance of past experience in dealing with crises for building resilience to future crises is well established in the broader literature (Folke, 2003; Norris et al., 2008; Wybo, 2004). There is also the possibility that in Thailand, enterprises that are less able to deal with crises have already closed down.

5.1. Lifestyle values and enterprise resilience

Lifestyle values are important for the resilience of enterprises on the GBR, and in the formal and informal sector enterprises in Phuket. Entrepreneurs driven by lifestyle motivations are willing to absorb and tolerate poor financial performance and accept a greater degree of risk (Getz et al., 2004; Hall & Rusher, 2004, 2005). Some lifestyle entrepreneurs operate on the verge of bankruptcy, content with a modest revenue and profit margin associated with living a chosen lifestyle (Ateljevic, 2007). However, the majority of studies on the lifestyle associated motivations of tourism entrepreneurs come from high-income countries (Williams et al. 1989, Ateljevic and Doorne 2000, Morrison et al. 2008) and there is only a sparse literature on informal tourism enterprises in low and middle-income countries. Participation in the informal tourism economy is frequently viewed as a livelihood option of last resort (Aguilar & Campuzano, 2009; Losby et al., 2002; Petersen, 2007). Yet, studies of subsistence fishers in low-income countries have shown the important of lifestyle motivations in fisher decision-making (Pollnac et al. 2001). This paper shows that lifestyle values are also important motivating factor for informal reef tourism enterprises and contribute to enterprise resilience.

However, lifestyle values may also cause an inertia to transform. For example, changing socio-economic or ecological circumstances may mean that an enterprise, or the reef tourism sector in a region may becoming unviable. Yet, very strongly held lifestyle values, associated with a very strong sense of place among reef tourism enterprises may create a maladaptive inertia to transform (Barnett and O'Neill 2010).

5.2. Coral reef condition and enterprise resilience

Reef condition is associated with the measures of resilience for Phuket's longtail boat enterprises and commercial enterprises in Phuket, but not for enterprises on the GBR. The lack

of importance of reef condition to enterprise resilience on the GBR is possibly because all enterprises on the GBR have access to healthy reefs. According to the ecological literature, coral reefs on the GBR are in better condition than the reefs around Phuket (Wilkinson 2008).

The majority of studies show a lower willingness to visit reefs, and decreased revenue from tourism to reefs, following bleaching and degradation (Uyarra et al. 2005; Uyarra et al. 2009; Westmacott et al. 2000). However, tourists who visit a reef site, before and after degradation, are still willing to visit, and tourists are often unaware that a reef is bleached or ecologically degraded (Gössling, 2004; Uyarra et al. 2009). More research is needed that investigates how ecologically measured and perceived reef condition affects tourist demand and the mediating role marketing may play in this relationship.

Furthermore, the importance of healthy reefs to visitors may differ between Phuket's longtail boats and formal sector enterprises in Thailand and Australia. A study from Egypt shows that the composition of visitors to reef sites changes from experienced divers and snorkellers on less degraded reefs to inexperienced snorkellers with less knowledge of reef biology on more degraded reefs (Leujak and Ormond 2007). The longtail boat enterprises are restricted to reefs accessible from Phuket; therefore, the ecological condition of the reefs they can access is likely to be poorer given higher use levels and closer proximity to coastal development and pollution. However, the experienced and special interest clientele who aim to visit the sites with the best reef condition, are less likely to patronise longtail boats because of their a-priori knowledge of the more distant reefs they want to visit. It is likely therefore, that longtail boat enterprises are supported by a clientele who are willing to visit closer reefs with higher levels of human impact and reef degradation.

5.3. Social capital and enterprise resilience

Government and NGO support feature most strongly as part of the resilience cluster for longtail boat enterprises (Figure 4). This is striking because informal sector enterprises, such as longtail boats, are generally viewed in the literature to have limited access to government support (Aguilar & Campuzano, 2009; Mead & Morrison, 1996). The low expectation of government support among Phuket's commercial enterprises (Table 3), together with the clustering of government support with the resilience measures in the RDA plot (Figure 4), suggests that the lack of government support may be a key constraint to enterprise response to crisis recovery. The higher expectation of government support by enterprises in a crisis on the GBR is in keeping with the nature of governance and government intervention in Australia and a history of support to tourism enterprises during crises (Hall, 2007).

The RDA plot for Phuket's longtail boat enterprises (Figure 3) shows that support from family and friends during a crisis clusters further away from the measures of resilience. This contrasts with the widely held notion that social capital in the form of support from family and kinship networks is important for informal sector enterprises like longtail boats (Ashley, 1998; Rogerson, 2005). However, if one considers that longtail boat enterprise owners may be part of the wealthier segments of their community and families, they may be seen as providers of support to their families and kinship networks rather than receivers. Thus, the longtail boat enterprise owners and staff may be supported with food and shelter if their enterprise has to shut down, but they may be able to garner only limited support towards the survival of their enterprise. The role of the support from family and friends in enterprise resilience is another indication of

the extent to which economic relations and actions are embedded within social structures of places (Granovetter 1985).

Phuket's commercial enterprises is the only group of enterprises where collaboration with other reef tourism enterprises during a crisis is associated with the measures of resilience (Figure 5). Indeed, among Thai longtail boat enterprises it is more closely associated with a lack of resilience (Figure 3). This reflects a competitive environment in which some enterprises only collaborate as a last resort to prevent bankruptcy or closing down. This trend of 'collaborating with competitors as a last resort' has been demonstrated in studies on enterprises elsewhere (Slywotzky & Hoban, 2007). The importance of collaboration to the resilience of Phuket's commercial enterprises is perhaps an indication of the pressure that this group of enterprises is under following the 2004 tsunami and the 2008/9 Thai political crisis. Research on collaboration and dealing with crises elsewhere suggests that when conditions become really difficult, individuals and groups can find ways of working together that seemed difficult or impossible prior to the crisis (Ritchie, 2008, 2009). The crises that Phuket's commercial enterprises have suffered from may therefore have led to innovation in the form of collaboration (Gunderson & Holling, 2002; Hall, 2009a; Hall & Williams, 2009; Hjalager, 2010). An example of this collaboration among Phuket's formal sector enterprises is that only a few of the large enterprises own their own boats – the smaller enterprises rent space on the larger boats when they have clients. In contrast, all the enterprises surveyed on Australia's GBR own their own boats.

5.4. Financial capital and enterprise resilience

Financial capital is strongly associated with the measures of resilience only among Phuket's commercial enterprises (Figure 4). The weak association of financial capital with the resilience variables on the GBR, suggests that decisions to stay in the reef tourism industry on the GBR may be driven more by lifestyle motivations such as love of the job (see lifestyle discussion above, Figure 6). The longtail boat enterprises score the highest on financial capital during a crisis scenario, which may be because a large drop in income for an extended period of time is less problematic than for larger commercial enterprises. Informal enterprises, such as longtail boat enterprises, have lower levels of capitalisation and exposure to financial risk and therefore potentially possess the ability to survive without a steady flow of income for long periods of time (Aguilar & Campuzano, 2009; Biggs et al in review).

5.2. Implications for management

The most pertinent implication for management from this study is that lifestyle values are important for the resilience of all three groups of enterprises. Hence, government support of enterprises during times of crisis should recognise the importance of lifestyle values because individuals will respond differently to policy, economic and environmental change, if their participation in an industry and their relationship to place delivers high lifestyle benefits (Biggs et al in review, Getz et al., 2004; Hall & Rusher, 2005; Pollnac et al. 2001). For the individuals that own or work in Phuket's longtail boat enterprises for example, government and NGOs are likely to have greater success supporting enterprises to stay in the reef tourism industry in difficult times than trying to support individuals to switch to alternative occupations that deliver lower lifestyle benefits. Moreover, the authorities responsible for regulating reef tourism should carefully consider the potential impact of new and existing regulations on the lifestyle benefits that accrue to enterprises (Biggs 2011). A policy or tax that reduces the lifestyle

benefits that enterprise owners and staff experience may unintentionally undermine the resilience of reef tourism enterprises. Although regulations are essential to the sustainability of the reef tourism industry, the industry-wide benefits should be weighed up against the loss of lifestyle values to individual enterprises. Furthermore, government and tourism authorities should ensure that regulations and norms should not unnecessarily restrict enterprise capacity to adapt to change. Enterprises should have the flexibility to cut costs and streamline their activities, and regulatory and governance processes should support this (Biggs 2011). In addition, small enterprises should be able to close down temporarily and re-open later when conditions improve, with minimal transaction costs and barriers to entry and exit (see Ayyaagari et al. 2007 for evidence from the manufacturing sector).

The importance of human capital to enterprise resilience suggests that policies that enable enterprises to strengthen their levels of human capital may enhance enterprise resilience. For example, growth of human capital in reef tourism can be supported by a simple, fast, and easy process for enterprises to apply for and obtain work permits for skilled workers. Support for skills development within enterprises should also be continued and enhanced. In addition, enterprise ability to access finance should be supported across all enterprises – it is not only important to those larger commercial enterprises in the formal sector.

Furthermore, a core part of an enterprise's resilience is its ability to innovate and adapt in the face of ongoing change (Hjalager, 2010; Biggs 2011). Yet, tourism enterprises are also embedded within destination and national scale tourism systems which may or may not support and enable innovation (Hall, 2009a, b; Hall & Williams, 2008; Hjalager, 2010). For example, appropriate education and training programmes increase knowledge and skill levels. Although

this study has pointed to issues such as the role of lifestyle considerations, future research should focus on how stronger destination scale, and national scale innovation systems can be fostered to support enterprise resilience.

In addition, governments and tourism bodies can play a key role in supporting enterprise resilience by seeking to influence the perceptions of potential visitors through marketing campaigns and educational programmes. Such activities are particularly important during and after crises such as the 2004 tsunami and the 2008 political crisis in Thailand, when the perception and expectations of prospective travellers is critical (Cohen, 2008; Cohen & Neal, 2010; Henderson, 2007). Larger enterprises have a greater capacity to promote their businesses on a global stage, whereas smaller enterprises, and informal enterprises such as longtail boats in particular, often have a very limited global marketing reach (Main & Dearden, 2007). Enterprises without established global marketing networks, or well-developed networks of direct client contact, are dependent on the perceptions of prospective tourists from other parts of the world that may be far-removed from the realities of the on-site tourist experience. Thus, there is a clear and important role for government and tourism associations to support enterprise resilience through coordinated marketing efforts to manage the negative perceptions associated with crises.

6. Conclusion

This paper is the first to explore the commonalities and contrasts between the factors that are associated with the resilience of enterprises in three different contexts of the vulnerable reef tourism market. Human capital and lifestyle values of love and identity are closely associated with the resilience of all enterprises. The paper also reinforces the importance of

understanding the social ties and social and economic resources available to businesses and entrepreneurs (Curran, 2002). The importance of lifestyle benefits to the resilience of informal tourism enterprises has received little attention in the literature and this study makes a novel contribution in this regard.

This study is a starting point for further research on the resilience, vulnerability and adaptive capacity of reef tourism, and other vulnerable tourism sectors. The findings presented in this paper are a basis for policy-makers and researchers to actively consider the lifestyle benefits of tourism enterprises in a broader context. Finally, the commonalities and differences in the factors associated with enterprise resilience in different contexts reinforces the importance of the nuanced understanding and management of tourism enterprises in different settings.

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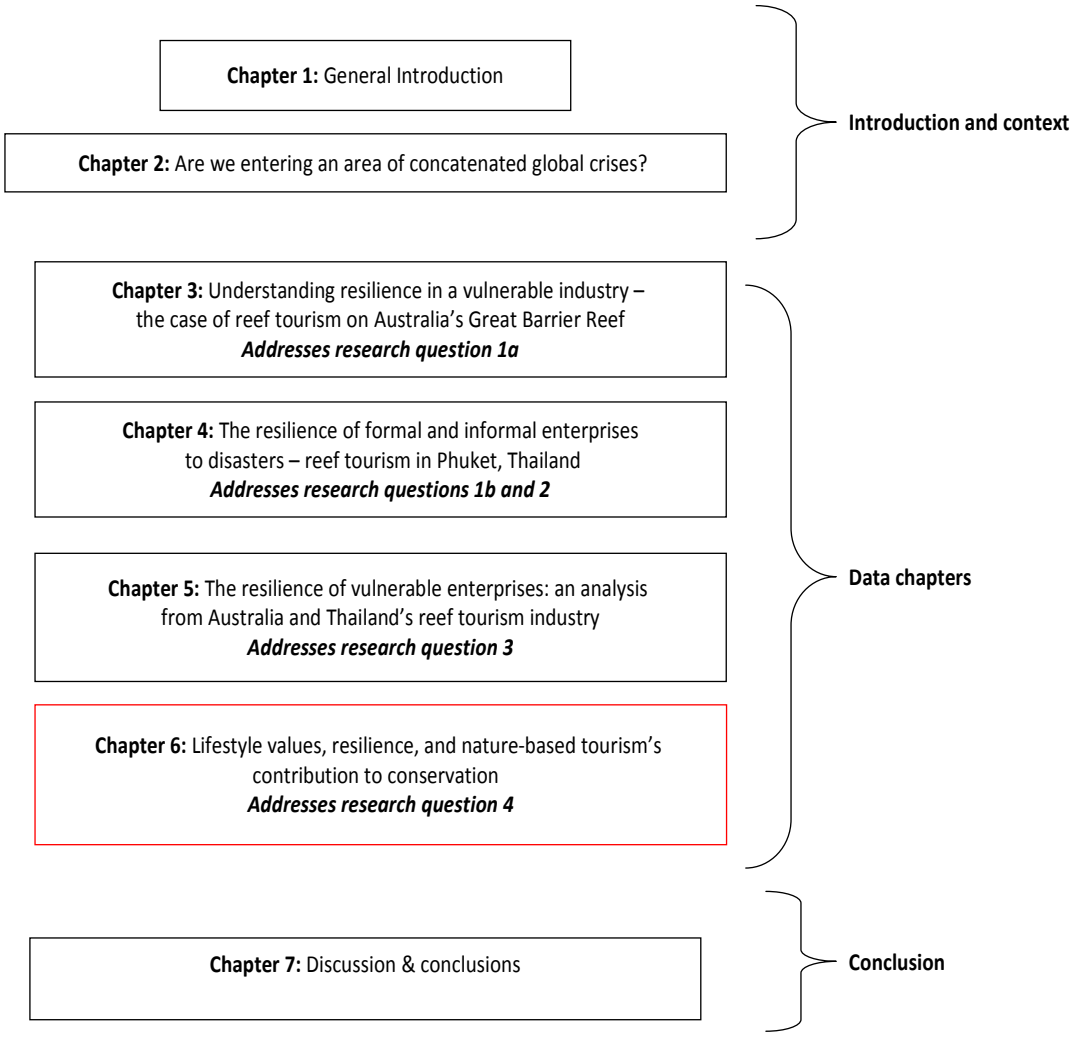
Chapter 6



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Lifestyle values, resilience, and nature-based tourism's contribution to conservation

SUMMARY

The biodiversity crisis is worsening. Innovative partnerships for conservation are required to raise awareness of the importance of biodiversity and to stem the tide of continued ecosystem degradation. Nature-based tourism is one such partnership. Yet the natural attractions that nature-based tourism depends on are under increasing threat. Because of their dependence on international visitors, nature-based tourism enterprises are under additional pressure from socio-economic and political crises in a globalised world. Recent research shows that lifestyle values – the motives that entice owners and staff of tourism enterprises to live and work in a chosen natural attraction – strengthens the resilience of enterprises to crises. This paper empirically explores the relationship between the lifestyle values of nature-based tourism enterprises and their support of, and contribution to, conservation of Australia's Great Barrier Reef. We conducted semi-structured interviews with 48 enterprises and found that those that reported high lifestyle values have higher levels of conservation ethic and participate more extensively in conservation actions. Enterprises with high lifestyle values had higher resilience to crises and were more likely to support conservation efforts. Bureaucratic, regulatory, and cost constraints, and a lack of knowledge of appropriate practices, limit enterprise participation in conservation. Conservation and management agencies can work to reduce these constraints to ensure that conservation benefits from nature-based tourism enterprises are maximised.

INTRODUCTION

For conservation to succeed in the 21st century, innovative partnerships to conserve biodiversity are urgently needed (Vermeulen & Sheil 2007; Kubo & Supriyato 2010; Rands *et al*. 2010). Nature-based tourism has been much-cited as providing one such partnership (Goodwin & Swingland 1996; Balmford *et al.* 2009; Hall 2010) because it can harness economic and human values to contribute to conservation (Diamantis 1999; Kiss 2004; Naidoo & Adamowicz 2005). The individuals, organisations, and societies that rely on a nature-based tourist attraction have an interest its conservation, otherwise their income-base and livelihoods are at risk (Buckley 2009; Hall 2010).

Nature-based tourism can contribute to conservation through three mechanisms. First, agglomerations of tourism enterprises can make a significant regional economic contribution, leading to policy support for biodiversity conservation initiatives that attracts tourists, such as national parks and protected areas (Rotherham *et al*. 2005; Buckley 2009; Frost & Hall, 2009). Second, nature-based tourism enterprises that provide on-site interactive services (e.g., nature guiding) can take direct conservation action to improve their local environment and generate environmental awareness (Carlsen *et al*. 2001; Curtin & Wilkes 2005; Russell *et al*. 2008), thereby mitigating against and minimising the negative impacts of tourism activities on the environment (Buckley 2009). These actions include responsible wildlife-viewing practices, minimising energy and water use, and offsetting carbon emissions. Finally, tourists may improve their environmental behaviours as a result of positive visitor experiences and become 'ambassadors' for conservation initiatives (Powell *et al*. 2008), for example by contributing to an international outcry if a resource is under threat (e.g. Dobson *et al*. 2010).

However, nature-based tourism enterprises are under increasing pressure as the biodiversity they promote to visitors continues to degrade, as well as from crises that stem from global change (Gössling & Hall 2006; Marshall *et al*. 2010; Biggs 2011). Recent research suggests that the lifestyle values of nature-based tourism enterprises may be important in building the resilience of enterprises to crises (Biggs 2011). A resilient enterprise is defined as one that can maintain or grow its income and employment in the face of crises and change (Biggs 2011).

Lifestyle values refer to the desire of enterprise owners and staff to live in a particular location because of its amenity values. Lifestyle values, are a type of tacit value and closely related to the 'sense of place' and 'attachment to place' concepts (Davenport & Anderson 2005; Anthony *et al*. 2009). Sense of place and place attachment refer to the way in which people assign meanings to places and derive meaning in their lives from places (Davenport & Anderson 2005). Some place meanings translate into strong emotional bonds that influence attitudes and behaviours within places.

Tacit values, such as lifestyle values, are the most influential in determining stakeholder participation in efforts such as conservation, because they both derive from and shape individual experiences and beliefs (Anthony *et al*. 2009). A community comprised of lifestyle-oriented entrepreneurs, like the reef tourism sector, may therefore lead to the emergence of a community of practice for reef tourism and reef conservation (Barthell *et al.* 2010). A community of practice refers to a group, or groups, of people who share a concern for something that they do and learn how to do it better through regular interaction (Cundill *et al.* in press). Such a community of practice in reef tourism, enabled by shared lifestyle values, can foster social learning for the management of reef tourism and conservation (Tidball *et al.* 2010)

Thus, the emotional attachments of the owners and staff of lifestyle tourism enterprises to their local environment and community, creating a community committed to a location and its conservation (Carlsen *et al*. 2001; Davenport & Anderson 2005). These enterprises are also likely to be reluctant to abandon the enterprise and location during difficult times (Getz *et al*. 2004; Roberts & Tribe 2008). Lifestyle-driven entrepreneurs are therefore likely to stay in a nature-tourism sector for longer, and under more trying circumstances, than businesses solely driven by profit (Getz *et al*. 2004; Biggs 2011), and participate in a community of practice for reef conservation (Anthony *et al*. 2009; Barthell *et al.* 2010; Davenport & Anderson 2005)

The purpose of this paper is to empirically explore the relationship between lifestyle values of nature-based tourism enterprises, the conservation ethics of enterprises, enterprise participation in conservation actions, and enterprise resilience to crises. In this paper, the phrase 'lifestyle values of enterprises', refers to the lifestyle values of the owners and staff of enterprises. We focus on reef tourism enterprises on Australia's Great Barrier Reef (GBR) as a case study because of the reef's global significance for biodiversity (McCook *et al* 2010) and nature-based tourism (Natural Wonders 2008). Specifically, we address the following questions: (1) Are lifestyle values of tourism enterprises related to a higher level of enterprise support for conservation? (2) Are there differences in the extent of support for conservation between more resilient and less resilient enterprises? (3) What are the barriers and opportunities for tourism enterprises to contribute to conservation?

METHODS

Study area

The GBR extends for more than 1,200 kilometres along Australia's north-east coastline (Johnson and Marshall 2007) and contains 2,900 individual reefs and approximately 900 islands. The Great Barrier Reef Marine Park, created in 1975 to manage and preserve the reef ecosystem, is managed by the Great Barrier Reef Marine Park Authority (GBRMPA). The GBRMPA is an Australian government statutory authority and reports to the Australian Government Minister for Environment Protection, Heritage and the Arts. The GBRMPA aims to manage the GBR to enable sustainable multiple use and to maintain the GBR's diversity of species, habitats, and its ecological integrity – it is thus both a management and a conservation agency (GBRMPA 2011a). In addition, there are other government and civil society bodies that are active in the management and conservation of the GBR – these include the Great Barrier Reef Foundation, local conservation groups such as the Low Isles Preservation Society, and industry groups such as the Association of Marine Park Tourism Operators. In this paper, 'conservation agencies' refer to all the organisations (government, private sector, and civil society) that are active in the conservation of the GBR.

Tourism to the GBR contributes AU$5.8 billion (AU$1 = US$1.07, May 2011) to the Australian economy per annum and sustains 55,000 jobs (Access Economics 2007). The majority of reefs on the GBR lie over 20km offshore and require well-equipped boats to access. Tourism enterprises that take visitors to offshore reefs are therefore central to the functioning of reef tourism (Biggs 2011). Reef tourism enterprises on the GBR also pay an Environmental Management Charge to GBRMPA of AU$5.50 per tourist per day (GBRMPA 2010). The Environmental Management Charge was introduced in 1993, primarily to recoup a percentage of the cost of managing the Great Barrier Reef Marine Park. In 2007, the Environmental

Management Charge contributed over AU$7 million (18.5%) to GBRMPA's annual budget for use in management, research, and education (GBRMPA 2011b).

The GBR is characterised by a strong relationship between reef tourism enterprises and reef management agencies (Harriot 2002). The contribution of tourism enterprises to control outbreaks of coral-feeding crown-of-thorns-starfish (*Acanthaster planci*) provides an example of this relationship. Since the 1960s, outbreaks of crowns-of-thorns starfish have led to mass mortality of corals (Brodie *et al*. 2005; De'ath & Fabricius 2010). Large-scale crowns-of-thorns starfish outbreaks are a recent phenomenon probably related to a combination of fishing pressure and high nutrient loads from terrestrial run-off (Jackson *et al*. 2001; Brodie *et al*. 2005). The tourism industry has made large investments to preserve areas of living reef from crowns-of-thorns starfish around tourist facilities by actively monitoring and removing individuals (Harriot 2002). Furthermore, GBRMPA encourages conservation practices by allowing enterprises with Advanced Ecotourism certification with Ecotourism Australia to obtain an extended permit of 15-years for operating tours to certain areas on the GBR. Advanced Certification with Ecotourism Australia is awarded to enterprises that commit to achieving best practice in resource use, ecological sustainability, and the provision of quality ecotourism experiences (Ecotourism Australia 2010).

Interviews

Semi-structured interviews with owners and senior managers (n=48) were conducted in the Cairns and the Whitsundays regions, two iconic areas for reef tourism on the GBR. Since 1994, approximately 88% of tourists visiting the GBR do so in these regions (GBRMPA 2010). Our interviews targeted enterprises whose dominant source of income was taking visitors to reef

attractions to dive and snorkel. Reef tourism enterprises that met this criterion were compiled using the GBRMPA list of Ecotourism Australia accredited operators, internet searches and meetings with local tourism offices (Biggs 2011) (n=76). All 76 enterprises were contacted and all enterprises willing to be interviewed were included in this study. We interviewed enterprise owners and senior managers because they play a leading role in determining the fate of particularly small and medium-sized enterprises. We therefore assumed that the responses of the interviewees represented the response of the enterprises. One interview was conducted per enterprise using Likert scales (Likert 1967). In some cases, pertinent quotes were recorded verbatim. Interviews varied in length from 25 to 90 minutes and not all enterprises responded to all the survey questions.

Conservation ethics and action

We measured the conservation ethic of enterprises, their participation in conservation actions, their perceptions about climate change, and the barriers that enterprises face in participating in conservation. Conservation ethic of enterprises was measured with a five-point Likert scale (Table 1). We selected the conservation actions from discussions with key informants in reef tourism and conservation, and through a review of relevant literature. The extent of enterprise participation in conservation actions was recorded in three categories in response to the question, 'to what extent does your enterprise participate in an action?' The response categories varied from 0 = no participation, to 2 = extensive participation. Whether enterprises have energy conservation and carbon emissions reduction programs, and the extent to which enterprises recycled materials, participated actively in public education on reef conservation issues, and participated in crowns-of-thorns starfish eradication programs was recorded (Table 1) (based on method used by Trumbo and O'Keefe 2001). Respondents were

asked to provide details of their actions to illustrate their participation in conservation actions. In addition, we measured the extent to which enterprises perceived climate change as important for their future well-being. We used open-ended questions and discussion to obtain information from enterprises on the perceived barriers and constraints in their contributions to conservation.

Variable	Description	n	mean	SD	Range
Measures of conservation action					
Conservation ethic	Extent of agreement the statement, 'Our business considers the conservation of the reef and the maintenance of its health, of utmost importance, no matter how difficult and dire the situation for our business may be'.	47	4.70	0.55	2
Recycle	Extent of enterprise recycling of materials in boats and offices	34	1.59	0.70	2
Crown-of-thorns-starfish eradication	Extent of participation in crown-of-thorns-starfish eradication	27	1.74	0.66	2

Donate	Extent of enterprise donations to conservation agencies measures as an average of: 'Is your company a member of any voluntary reef or general conservation organisation' and 'Does your company donate money to any reef or general conservation agencies'?	37	1.14	0.76	2
Carbon	Extent to which enterprises mitigate and offset carbon emissions measured as an average of the following five questions all commencing with, 'Does your company: 1. Offset its carbon emissions?, 2. Have specific targets for energy conservation and minimal fuel use for the boats? 3. Have energy reduction targets for your offices? 4. Provide information to guests on how to offset carbon from their trip to Australia and with your company? 5. Provide information to your guests on increasing energy efficiency and reducing or offsetting emissions when back home?'	38	0.78	0.57	2
Education	Extent of enterprise education of guests on reef conservation issues Extent to which enterprises make their boats or spaces on their boats available for environmental education?	38	1.78	0.39	1.5
Measures of enterprise resilience and lack of resilience					
Enterprise resilience scale	A five- item composite scale including measures of enterprise perception of: 1) ability to adapt 2) confidence for the future, 3) availability of options, 4) would be forced to close down soon (inverse) , 5) belief in ability to endure future changes (Biggs 2011)	47	3.77	0.63	2.6
Exit now	Extent of agreement with the statement, 'I am looking for opportunities to move out of the reef-based tourism sector'	47	2.28	0.99	4

Table 1. Descriptive variables for the importance of conservation and enterprise resilience. All the conservation measures other than conservation ethic were classified into 3 categories (0 = no participation, to 3 = extensive participation). Measures of enterprise resilience and lack of resilience were measured on a five- point Likert scale (1 = strongly disagree to 5 = strongly agree)

Enterprise resilience

To gauge enterprise resilience, we developed a composite scale using five items, each measured with a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The five items addressed interviewee's perceptions of: 1) their enterprise's ability to adapt to change, 2) confidence for the future, 3) availability of options to stay working in reef tourism, 4) likelihood of staying in the reef tourism industry in the future, and 5) ability to endure future changes in the industry (detailed in Biggs 2011). We also measured the extent to which the owners and senior managers indicated that they were seeking opportunities to exit the reef tourism industry, as a measure of a lack of resilience, on a five-point Likert scale (Table 1). Enterprise lack of resilience was measured further by whether enterprises indicated they would exit the reef tourism industry in the face of a 50% collapse in tourist demand for 12 months.

Lifestyle values

We developed another five-item composite scale to assess the extent to which lifestyle values motivate the participation of owners and senior managers in reef tourism enterprises (Table 2, see Biggs 2011 for a more detailed discussion of the lifestyle values scale). Each item was measured with a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). The survey items addressed respondent's: 1) love for the industry, 2) perception of reef tourism as the best working environment, 3) level of enjoyment from sharing experiences and knowledge of coral reefs with visitors, 4) enjoyment of the lifestyle of reef tourism, and 5) their perspective on how important participation in reef tourism is for their personal identity (Table 2).

Extent of agreement with statements:	**Mean**	**SD**	**Corrected Item-Total Correlation**	**Cronbach's α if item deleted**
'I love working in reef-based tourism'	4.630	0.532	0.648	0.774
'I do not think that there is a better job or work environment than the reef-based tourism sector'	3.957	0.942	0.623	0.769
'I enjoy working in an industry where I share my knowledge and experiences of the reef and marine environment with others'	4.44	0.779	0.546	0.787
'I enjoy the lifestyle associated with working in the reef-based tourism sector '	4.391	0.682	0.696	0.747
'Working in the reef-based tourism sector is an important part of who I am and how I see myself'	3.978	0.907	0.571	0.785

Table 2. Items in the composite scale for lifestyle identity measured on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree), *Cronbach's $\alpha = 0.771$; n = 46*

Analyses

Analyses were conducted using PASW® version 18. We analysed the structure of the relationship between our measures of enterprise resilience (and lack of resilience), conservation ethic, and lifestyle values, using a Categorical Principal Components Analysis (PCA) with variable

principle normalization (Muelman & Hueser 2009). We coded and summed responses to the open-ended questions on barriers to enterprise participation in conservation. Because enterprise size can be an important determinant of enterprise behaviour (Hall & Williams 2008, Biggs 2011), we excluded one large enterprise from the analysis. This enterprise was nearly five times the size of the next largest enterprise measured by the number of employees.

RESULTS

Conservation support and action

Enterprises had high conservation ethic scores (out of a maximum score of 5: 21% scored 4, and 75% scored 5, n = 47) (Table 1) and participated to varying extents in different conservation actions. Scores for enterprise participation in conservation action ranged from 0 = no participation to 2 = extensive participation. The majority of enterprises participated in recycling extensively (71%, n = 34), contributed to crowns-of-thorns starfish control (85%, n = 27) and reef education (71%, n = 38). Fewer enterprises donated money to conservation (28% scored 2, n = 37) (Table 1). Thirty-seven enterprises (79%) felt that climate change is very important for their future due to adverse impacts on reefs. However, enterprises scored lowest overall on average in their mitigation and offset of carbon emissions (13% scored 2, n = 38) (Table 1). The majority of respondents (28/48 = 58%) mentioned participation in reef conservation as a critical part of their enterprise and its success during open discussion. Furthermore, enterprises felt that their clients want environmentally-conscious operations, as indicated by the following quote from an enterprise owner, “I contribute to conservation because it is my passion, it is the right thing to do and it makes sense for my business”.

Enterprise resilience

The different measures of enterprise resilience (and lack of resilience) showed that enterprises were confident about their futures, other than in the face of a large crisis. The mean score on the composite scale for enterprise resilience was 3.77 (out of a maximum of 5, SD = 0.63, n = 47,) (Table 1). The mean score in response to the statement, 'I am looking for opportunities to move out of the reef-based tourism sector' was 2.28 (out of maximum of 5, SD = 0.99, n = 47, Table 1).However, thirty-two enterprises (68%) indicated that they would exit the reef tourism industry in the face of a 50% reduction in tourism revenue for 12 months.

Lifestyle values

The owners and senior managers of enterprises reported high lifestyle values associated with their participation in reef tourism (mean = 4.16, out of a maximum 5, SD = 0.55, n = 48). Respondents reported that the most valued aspects of being involved in reef tourism included enjoying the natural marine environment, contributing to conservation, introducing tourists to the wonders of the reef, and providing information and education on ecology and conservation. The 'natural beauty' of the GBR and surroundings, 'people you meet, interact and share the wonderful experience of the reef with', and 'lifestyle' were the most common top two responses to the question: "What are the best things about being involved in reef tourism?"

Relationship between enterprise resilience, lifestyle values, and contribution to conservation

The structure of the relationship between enterprise resilience, lifestyle values, and support of conservation is illustrated by a bi-plot from a Categorical PCA analysis (Fig. 1). The categorical PCA analysis yielded a solution with two dimensions that accounted for 59% of the variance. Dimension one accounted for 38% of the variance (Fig. 1). The axis of dimension one can be interpreted as a gradient of enterprise resilience from non-resilient (the variables 'exit

now' and 'exit in shock') to resilient measured by the composite variable 'resilient scale'. The Cronbach's alpha score was 0.82 for dimension one, indicating that it is reliable (Nunnaly 1978). Dimension two accounted for 21% of the variance, and is harder to interpret. The axis of dimension two may represent a clustering of enterprises that are willing to engage in conservation actions with a higher cost burden (i.e. the variables 'donate' = donations to conservation, and 'carbon' = reduction and offset of carbon emissions). Dimension two had a Cronbach's alpha score of 0.59 which means that is a less reliable scale.

A high conservation ethic was associated with high enterprise lifestyle values and with high scores on the composite scale for enterprise resilience (Fig. 1). Enterprise contribution to the eradication of crown-of-thorns starfish clustered most closely with conservation ethics and lifestyle values. Enterprise contribution to public education on coral reefs and to recycling also clustered in the same direction as conservation ethic and lifestyle values but with lower factor loading scores (Fig. 1). Enterprise donation to reef conservation agencies and reduction and offset of carbon emissions clustered furthest away from lifestyle values and conservation ethic which indicates a lower of level association.

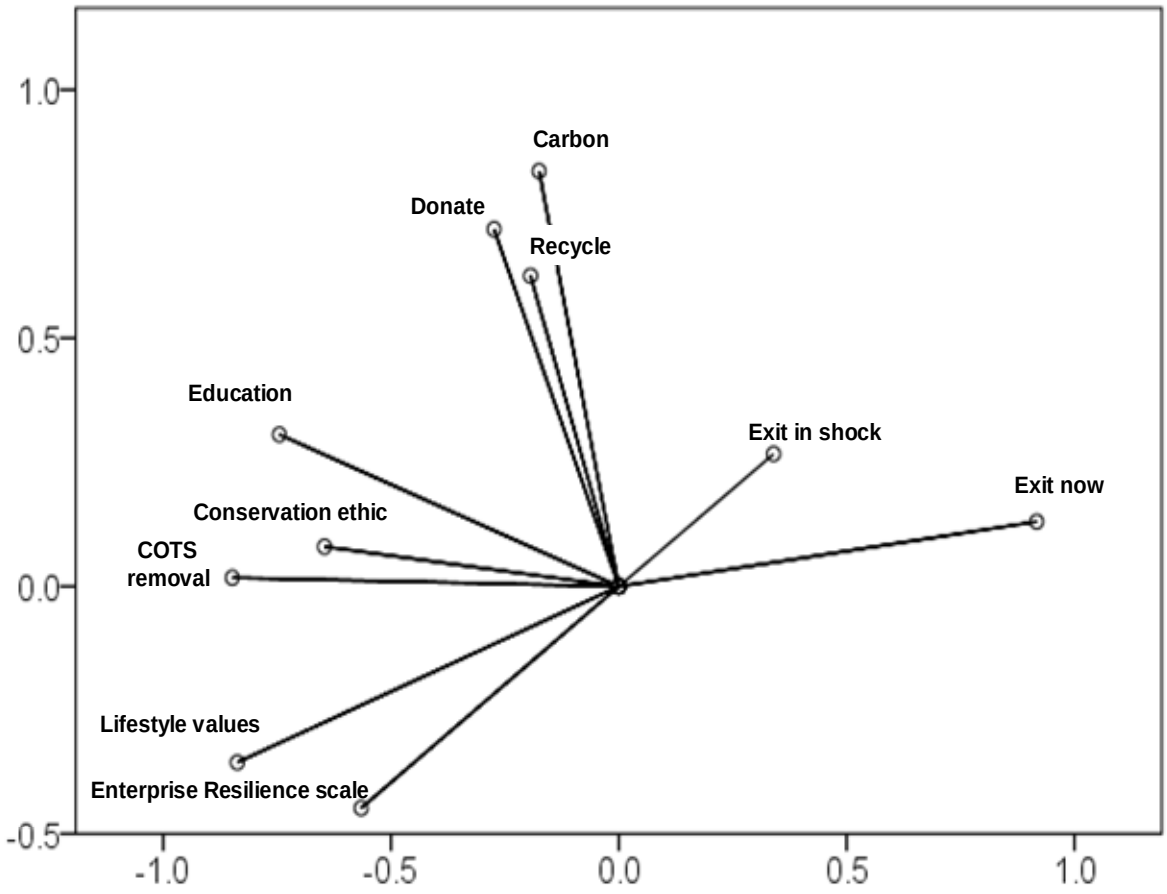

Figure 1. Categorical Principal Components Analysis of the structure of the relationships among conservation, lifestyle and resilience variables. COTS = crown-of-thorns starfish eradication. Exit shock = enterprises who indicated they would exit in the face of a 50% collapse in tourism for 12 months. Details of other variables are contained in table 1. Dimension 1 explains 38% of the variance and Dimension 2 explains 21%.

Barriers to and opportunities for enterprise contribution to conservation

Enterprises reported a range of barriers to their participation in conservation. Eight out of 38 enterprises (21%) mentioned regulatory and institutional barriers to taking pro-conservation steps, including the lack of recycling facilities in the marinas in Cairns and the Whitsundays. An additional example of institutional constraints were mentioned by one

enterprise in relation to using green diesel, "we are trying to move to green diesel, but marina infrastructure challenges are a constraint". Another participant said, "We want to use alternative fuel sources for our boats, but the Marine Safety Authorities won't allow us." Enterprises also reported that they lacked the knowledge to participate effectively in carbon offsetting. Furthermore, 16 out of 38 (43%) of enterprises were concerned about the bureaucracy and inefficiencies associated with how GBRMPA's Environmental Management Charge was spent to achieve conservation outcomes. Enterprises reported that they were happy contributing money to the management and conservation of the GBR but were concerned with how government agencies spend that money.

Certification for advanced ecotourism practises is an example of how the commercial and conservation interests of enterprises can be connected. Twenty out of 48 (42%) of interviewed enterprises had Advanced Ecotourism Australia certification. Enterprises indicated that the Advanced Ecotourism Australia accreditation was worthwhile because of the marketing value and the opportunity to gain access to a longer term permit, as reflected in the following quote, "We have advanced Ecotourism certification which gets us to keep a longer GBRMPA permit (i.e. 15 years instead of 7). We are also doing Ecotourism Australia Climate Action certification – this is the right thing to do and it is good for marketing." However, a few enterprises mentioned that the Ecotourism Australia certification was expensive, a lot of paperwork, and was more about branding than improved environmental practice. As a respondent said, "Ecotourism Australia is too much paperwork, and is not that useful as a reflection of environmental consciousness". Another had a similar sentiment, "Ecotourism Australia certification is a lot of paperwork and it is expensive".

DISCUSSION

This paper is the first exploration of the relationship between the resilience of nature-based tourism enterprises, enterprise contribution to conservation, and the role of lifestyle values in this relationship. We show that enterprises with higher lifestyle value scores and higher levels of resilience consider reef conservation to be more important. They participate to a greater degree in selected conservation actions (but not all actions) compared to enterprises with lower lifestyle values and a lower level of resilience to crises. Our results align with research on tourism enterprises in the accommodation sector that also highlights the importance of lifestyle considerations and an attractive environment in the establishment of rural enterprises (Dewhurst & Thomas 2001). Such lifestyle-motivated rural enterprises are typically also interested in contributing to the conservation of their chosen locale (Carlsen *et al*. 2001). Similarly, lifestyle values are important in decision-making among small scale fishers in southeast Asia (Pollnac *et al* 2001), farmers in Australia (Holmes & Day 1995; Pannel & Wilkinson 2009) and foresters in Virgina, USA (Kendra and Hull 2005). In addition, one study showed a relationship between the extent of lifestyle value orientation and a pro-environment and conservation attitude (Pannel & Wilkinson 2009).

Harnessing nature-based tourism's contribution to conservation

The lifestyle values of nature-based tourism enterprises staff is associated with higher levels of enterprise resilience to crises as well as higher levels of support for, and participation in conservation efforts. Thus, enterprises which are more resilient to crises, and are more likely to remain in nature-based tourism during difficult times, are also more likely to support and engage in conservation efforts. Enterprises, motivated by lifestyle values, are therefore key partners in achieving conservation outcomes. The nexus of lifestyle values, resilience, and

conservation in nature-based tourism therefore presents opportunities to strengthen conservation outcomes in three key ways.

First, enterprises characterised by strong lifestyle values can advance the conservation agenda within tourist associations and tourism representation bodies. Through these bodies and partnerships with relevant government agencies and NGOs, the extent to which conservation initiatives emerge in recognition of the economic value of nature-based tourism can be extended. For example, the Reef Water Quality Protection Plan on the GBR (Reef Water Quality Protection Plan 2007) emerged in part due to the recognition of the economic contribution of tourism to the GBR. Organized and vocal bodies that represent agglomerations of lifestyle-motivated nature-based tourism enterprises can increase the likelihood of such positive conservation outcomes emerging.

Second, lifestyle and conservation-motivated enterprises are more likely to take direct conservation action to improve their local environment. Reef tourism enterprise contribution to the local eradication of crown-of-thorns-starfish is an example from our study. In Zimbabwe's Hwange National Park, the nature-based tourism company Wilderness Safaris is playing an active role in reducing poaching and maintaining water supply in the park (Wilderness Safaris 2010). Conservation actions by tourism enterprises are likely to become increasingly important as the threats to biodiversity continue to escalate through the 21st century (Rands *et al*. 2010).

Third, enterprises characterised by higher lifestyle values are more likely to play an active role in generating awareness about the conservation value of the natural attraction/s their clients come to visit. In addition, lifestyle-motivated enterprises are likely to play a stronger

role in environmental education in their own communities. These lifestyle-motivated enterprises can play an important role in mobilising awareness and contributing to an international outcry when a particular natural asset comes under threat. Nature-based tourism enterprises have added their voice to the international outcry against the proposed tarmac road through the Serengeti National Park (Hamisi 2011). This contribution to public awareness, and if necessary public opposition, to the degradation of natural areas may become increasingly important as pressure on natural resources increases.

Barriers to and opportunities for enterprise participation in conservation

Four main barriers to enterprise participation in conservation action emerged from our study. These are cost, lack of knowledge, bureaucratic obstacles, and infrastructure constraints.

Cost

Conservation actions that are simple and have a direct and visible benefit to tourism enterprises, and can be done at limited extra cost, are likely to be supported to a greater degree (Russel *et al*. 2008; Carmody & Zeppel 2009). In our study, enterprise contribution to crowns-of-thorns starfish removal has clear and visible benefits to enterprises. The majority of reef tour enterprises operate at only one or a few sites due to GBRMPA permit restrictions and it is in their interests to keep these sites in as healthy condition as possible by contributing to on-site control of crowns-of-thorns starfish.

Enterprise participation in conservation actions with higher cost of participation, and that yield public rather than private benefits (e.g., mitigation and offsetting of carbon emissions), is likely to be lower (Carmody & Zeppel 2009; Van Haastert & Grootboois 2010).

Research from the hotel industry also suggests that the majority of tourists are willing to pay only between 1 and 5% extra to cover the increased costs of renewable energy sources (Dalton *et al* 2008). The cost of reducing carbon emissions is substantial for many tourism enterprises, particularly on the GBR due to the long travel distances to the reef. In addition, enterprises may feel that efforts to address a global scale environmental problem are pointless because of the global scale action it requires. Unless there is leadership at the tourism association, destination, or national scale, enterprise participation in reduction and offsetting of carbon emissions is likely to remain restricted to early adopters within the industry (Simpson *et al*. 2008). Enterprise participation in activities such as carbon offsetting is likely to increase if there is a strong culture and expectation of carbon offsetting among tourism enterprises in a region, supported by visitor demand for offsets.

Conservation and management authorities can play a role in promoting action on climate change and other environmental issues by enterprises, by rewarding actions with more favourable or longer term operating permits that are not accessible by other means. Our study shows that the incentive for improved environmental practice through Ecotourism Australia accreditation is a good example of how enterprise support of conservation can be linked to marketing that has commercial value to enterprises. A study from Costa Rica's hotel industry demonstrates how hotels that participate in voluntary environmental accreditation schemes are able to positively differentiate themselves from competing service providers, and charge additional premiums (Rivera 2002).

Lack of knowledge

A lack of knowledge and awareness about how to participate in conservation actions (e.g. mitigating carbon emissions) is an issue on the GBR and elsewhere (Dewhurst & Thomas 2003; Carmody & Zeppel 2009; van Haastert & Grosboois 2010). Regional and national tourism associations, as well as conservation agencies, can play a key role in disseminating such information and fostering innovation (Simpson *et al*. 2008). A coherent national policy on issues such as carbon emissions reductions and offsetting, supported by extensive communication to tourism and other sectors, can also play an important role in reducing lack of knowledge as a barrier to conservation action. Conservation agencies such as GBRMPA and the Association for Marine Park Tourism Operators can make a contribution to this knowledge distribution in partnership with representative tourism agencies such as Ecotourism Australia.

Bureaucratic obstacles and infrastructure constraints

The regulatory barriers to pro-conservation activities by tourism enterprises has been shown in other studies (Carmody & Zeppel 2009). Bureaucratic obstacles can directly limit pro-conservation activities where it is not possible to get an operating license for alternative greener technology on a boat or in a hotel for example. A regulatory burden can also impede conservation activities indirectly by contributing to financial pressure, particularly on small enterprises, and limit available finances and staff time for conservation (Russel *et al*. 2008; Biggs 2011).

Infrastructure constraints have also been identified in other studies as a barrier to tourism enterprises participating in some conservation actions (Carmody and Zeppel 2009). Development and provision of pro-conservation technologies and infrastructure (e.g., supporting alternative fuels) would be strengthened by a coherent national policy and

commitment to alternative energy sources (Simpson *et al*. 2008; Gossling *et al*. 2010). Conservation agencies can raise awareness and add pressure to the infrastructure developers and providers to support pro-environmental infrastructure.

CONCLUSION

Partnerships and synergies between conservation and other sectors are critical to stem the tide of biodiversity loss. Nature-based tourism enterprises whose owners and staff are motivated by lifestyle values are potentially valuable partners for conservation, because of their resilience to crises and their conservation ethic. Conservation agencies can strengthen the opportunities for nature-based tourism enterprises to contribute to conservation by 1) generating awareness among enterprises and create opportunities for enterprises to support and participate in conservation action; 2) actively supporting the development of infrastructure and policies that enable enterprise support of conservation; and 3) working in partnership with enterprises to reduce ill-conceived regulatory and other barriers that reduce the lifestyle values enterprise and staff experience. Conservation agencies should grasp the opportunity that the nexus of lifestyle values, enterprise resilience, and conservation presents to ensure that nature-based tourism's contribution to conservation is maximised.

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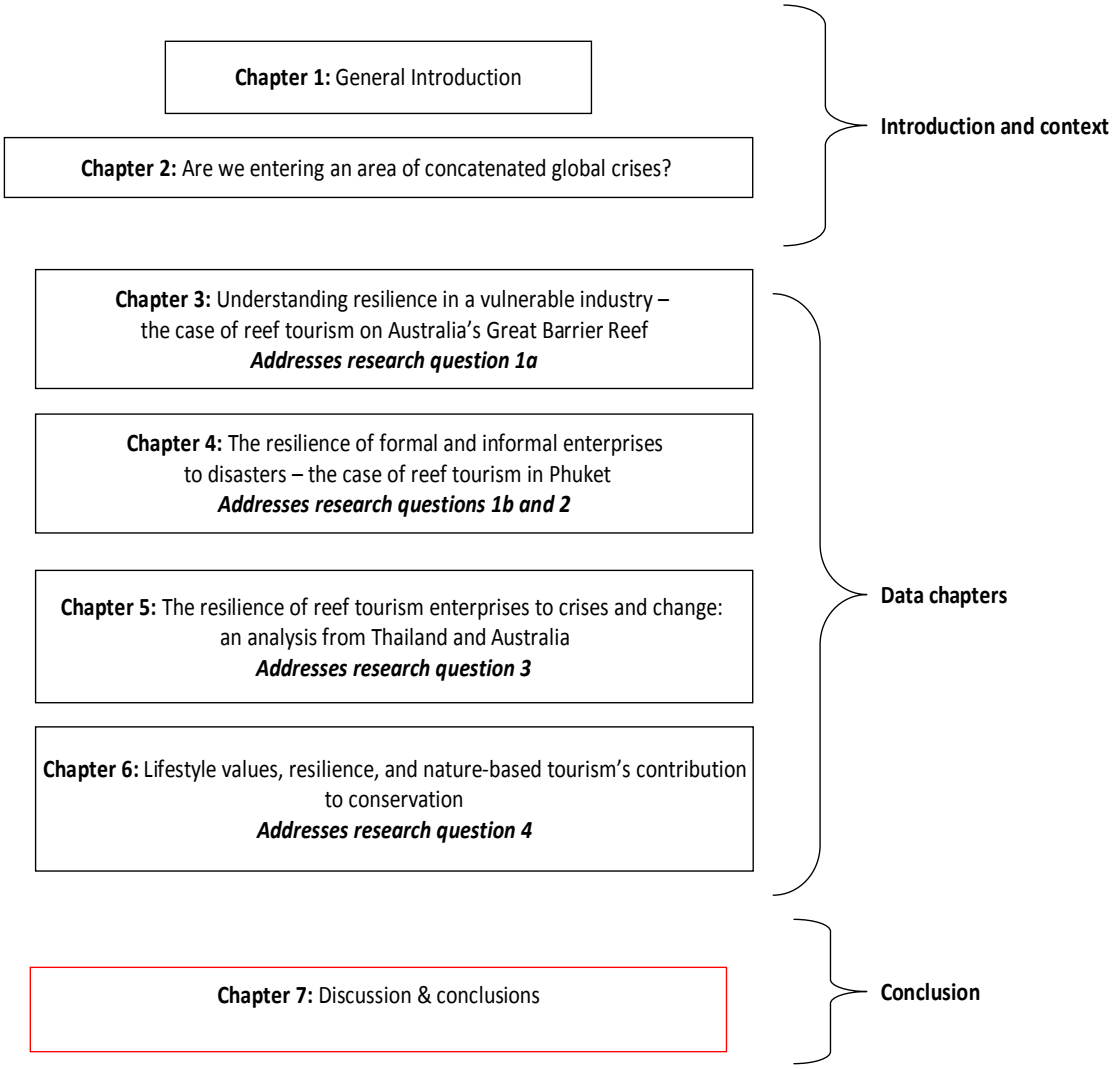
Chapter 7: Discussion and conclusions



The key findings relevant to each research question is summarised in the table below. Following that, this chapter contains a synthesis of the results presented in this thesis. The theoretical and practical implications of the findings from the individual chapters are discussed in more detail in chapters 3 - 6.

Research Question	Finding
1: Which factors predict the resilience of reef tourism enterprises	
1a: Which factors can predict the perceived resilience of reef tourism enterprises in a high income, good governance setting?	The results from Australia's Great Barrier Reef (GBR) indicate that lifestyle identity and human capital both predict enterprise resilience using binary logistic regression analyses. Reef tourism enterprises indicate that financial and marketing support are the most helpful actions that government can take to support enterprises in the face of a crisis.
1b: Which factors can predict the resilience of reef tourism enterprises in the formal and informal tourism sector in a middle-income country?	The results of a binary logistic regression analysis shows that access to finance and higher levels of social capital predict resilience among informal enterprises in Phuket, Thailand. The overall regression model for formal sector enterprises was not significant and therefore it was not possible to determine the predictive factors of the resilience of formal sector enterprises.
2: Are there differences between formal and informal enterprises in the theoretical components of resilience, and in their response actions and the factors that enabled their survival of crises in Thailand?	Informal enterprises in Phuket, Thailand report better financial condition in a crisis scenario, as well as higher levels of social capital in the form of government, family and community support than formal enterprises. Informal enterprises also report higher levels of resilience during a crisis. Both formal and informal enterprises in Phuket indicate the importance of lifestyle values in their participation in the reef tourism industry. During past crises informal enterprises have responded mainly by temporarily closing down and relying on subsistence or an alternative source of income. The main response by formal sector enterprises to past crises was cost-cutting.
3: What commonalities can be identified in the factors associated with the resilience of reef tourism enterprises in different socio-economic and governance settings?	A redundancy analysis showed that social capital in the form of support from government, NGOs, family and friends, perceived good reef condition, and lifestyle considerations such as identity are associated with the resilience of all enterprises. Financial capital is positively associated with the resilience of informal and formal enterprises in Phuket, but to a lesser extent with enterprises

	in Australia.
4: What is the relationship between the resilience of reef tourism enterprises and their contribution to coral reef conservation?	Lifestyle values are positively associated with enterprise resilience. Enterprises with high lifestyle values on Australia's GBR have higher conservation ethic scores, and participate more extensively in conservation actions. Hence, enterprises with higher lifestyle values are more resilient to crises and more likely to support conservation efforts. Lifestyle values link enterprise resilience to enterprise conservation ethic, and contribution to conservation.

This is the first quantitative study on the resilience of reef tourism enterprises. In addition, it is the first study of the resilience of nature-based tourism enterprises to crises and change, and the first to explore the link between enterprise resilience and enterprise contribution to conservation. As this is the first study of its type, it is broad in nature, and aimed to quantify the factors associated with the resilience of reef tourism enterprises in three different contexts – enterprises on Australia's Great Barrier Reef, and informal and formal sector enterprises in Phuket, Thailand. The informal sector is primarily of small-scale self-employed entrepreneurs and enterprises that are usually officially registered or taxed (Aguilar and Campuzano 2009). In contrast, enterprises in the formal sector tend to be licensed, registered for taxation and officially enumerated. Chapters 1, 3, 4, and 5 describe the different contexts of these three sectors in more detail.

Stronger lifestyle values and higher levels of human capital are predictors of increased resilience among enterprises on Australia's GBR (Table 1). Access to finance and social capital are predictors of enterprise resilience in Phuket's informal sector (Table 1). Human capital, social capital, lifestyle values, and perceived good reef condition are associated with the resilience of all enterprises. Below, I discuss my results with reference to the pertinent literature as well as

the limitations of this study, and the way in which future studies can build on the foundation established by my PhD research. I start with a discussion of the factors that predict, and are associated with, enterprise resilience across the three sectors I studied. I follow with discussions on the role of lifestyle values and the ecological condition of coral reefs in relation to enterprise resilience. This is followed by a section on the alternative analytical approaches I used to explore enterprise resilience, adaptive capacity and vulnerability and the possible trade-offs that exist between resilience and efficiency in enterprises. Finally, I discuss how my research relates to the literature on psychological resilience and how studies of resilience at the enterprise scale can be connected to sectoral and national scale econometric and modelling exercises.

Factors associated with enterprise resilience across crises and sectors

Resilience manifests differently in different cultural, socio-economic and governance contexts. Hence, enterprises from three different sectors of reef tourism were studied, each corresponding to different cultural, socio-economic and governance settings. In researching the three sectors, I evaluated enterprises 1) before a crisis when presented with a scenario of a crisis (enterprises on Australia's Great Barrier Reef), 2) that had survived a large crisis in the past (the Asian tsunami in December 2004), and 3) during a crisis (all enterprises surveyed in Thailand during a political crisis). The redundancy analysis of all enterprises (detailed in chapter 5) showed that human capital, social capital, perceived good reef condition, and lifestyle considerations such as identity are associated with the resilience of all enterprises. The inclusion of enterprises from three contrasting reef tourism sectors, and before, during, and after a crisis reinforces the validity of the results in my PhD.

This is the first study of the resilience of informal nature-based tourism enterprises to crises and change and found that access to finance, lifestyle values, and social capital are predictors of enterprise resilience. It is possible that the importance of access to finance and social capital is exaggerated in Phuket's informal sector as a result of the substantive aid delivered in the aftermath of the 2004 tsunami. Lifestyle values are discussed in the next subsection. Hence, an issue for future research is whether the factors associated with the resilience of informal reef tourism enterprises hold for other informal sectors such as the craft trade.

Different components of human capital seem to play varying roles in contributing to enterprise resilience. I measured human capital in this study by a single item response scale. A multi-faceted and in-depth measure of human capital was not possible given the time and resource constraints. Future studies should expand the measures of human capital. Human capital relates to an enterprise's ability to innovate (Hall and Williams 2008). Innovation, and management systems and processes that enable innovation have received wide coverage in the tourism and business literature (Hall and Williams 2008, Hall 2009, Hjalager 2010). Clearly, innovation plays an important role in enterprise resilience. Enterprises that are more innovative, and are able to use crises as opportunities for positive change are more resilient than enterprises that focus on maintaining the status quo. The discussion section of chapter 3, describes in more detail how the quantitative and empirical approach to resilience research can be integrated with the more qualitative and conceptual approach from the tourism literature. A question that can be addressed in future studies is how different management systems and processes in enterprises enhance or reduce enterprise resilience. A valuable contribution of future research will be to analyse how issues such as education, management experience, a flexible and adaptive mindset, and different attitudes towards dealing with disturbance and change, measured in different ways, affect enterprise resilience.

Lifestyle values

The importance of lifestyle values, and associated measures such as identity, to enterprise resilience, across all three sectors surveyed, is one of this PhD's key contributions to advancing knowledge. Entrepreneurs motivated by lifestyle decisions are more willing to tolerate poor financial performance and accept a greater degree of risk (Getz 2004, Hall and Rusher 2004, Ateljevic 2007). The majority of studies on the lifestyle motivations of tourism entrepreneurs to date are from high-income countries such as New Zealand and the UK (Williams et al. 1989, Ateljevic and Doorne 2000). There is only a sparse literature on informal tourism enterprises in middle and low-income countries (Morrison et al. 2008). Participation in the informal tourism economy is regularly viewed as a livelihood option of last resort (Losby et al. 2002, Aguilar and Campuzano 2009). The importance of lifestyle values to informal tourism enterprises is therefore a novel contribution of this thesis. The importance of lifestyle considerations has been demonstrated for subsistence fishers in low and middle-income countries (Pollnac et al. 2001). Considering the importance of the informal sector to the benefits from tourism in low and middle-income countries around the world (Nemastoni and Rogerson 2005, Liu and Wall 2006, Henderson and Smith 2007) research is required to establish whether lifestyle values are as important in other informal tourism sectors, such as township tourism and the craft trade. It may be that the importance of lifestyle values is unique to informal enterprises in the reef tourism sector because it is somewhat similar to boat-based fishing.

Condition of coral reefs

The perception of the condition of the coral reefs visited by enterprises with their clients, was not a predictor of enterprise resilience in a binary logistic regression analysis (see chapter 3 for details). However, chapter five's redundancy analysis shows that enterprise perception of reef

condition is associated with the measures of enterprise resilience. Due to time and resource constraints, it was not possible to analyse the relationship between reef condition and enterprise resilience in more depth. Chapter 3 includes a detailed discussion of the relationship between coral reef condition and tourist propensity to visit a reef site and how this may affect enterprise resilience. Overall, research on the role of reef condition in the decisions of tourists to visit a destination is ambiguous (Uyarra et al. 2005, Andersson 2007, Uyarra et al. 2009). The way in which reef condition affects tourist demand and experience is mediated by marketing, guided interpretation of reefs, and levels of tourist experience and expectations (Leujak and Ormond 2007). A more nuanced understanding of the role of coral reef condition in enterprise resilience should aim to: 1) include ecological metrics and measures of reef condition; 2) analyse the relationship between ecological metrics of reef condition, and the perceptions of reef condition by enterprise owners, staff and tourists; 3) research how tourist expectation and knowledge of ecologically-measured reef condition affects visitor satisfaction and experience; and 4) develop an understanding of how marketing and managed interpretation of reef condition affects tourist expectation, experience and satisfaction.

Enterprise resilience and enterprise contribution to conservation

Chapter 6 shows that enterprises with higher lifestyle values have higher conservation ethic scores and support reef conservation to a greater degree. Hence, lifestyle values link enterprise resilience to enterprise contribution to conservation. Although lifestyle motivations, and a desire to contribute to conservation are important in decision-making in farming, forestry and fisheries (Holmes and Day 1995, Pollnac et al. 2001, Pannel & Wilkinson 2009) this work is the first exploration of the relationship between enterprise resilience and enterprise contribution to conservation in nature-based tourism enterprises. Moreover, this research makes a novel

contribution by elucidating the link between enterprise resilience and enterprise contribution to conservation through lifestyle values.

My results agree with much of the prior research on tourism enterprises in the accommodation sector which points to the importance of lifestyle considerations and an attractive environment in the establishment of rural enterprises (Dewhurst and Thomas 2003). Furthermore, owners and senior managers of rural tourism enterprises want to contribute to the conservation of their chosen locale (Carlsen et al. 2001). Lifestyle motivations, and a desire to contribute to conservation are important in decision-making in fisheries, forestry and farming (Holmes et al 1995; Pollnac et al. 2001, Pannel and Wilkinson 2009). However, my research also highlighted bureaucratic barriers that limit the ability of enterprises to contribute to conservation efforts. One implication of my PhD is that reef tourism and reef conservation authorities should explore how opportunities for enterprise participation in conservation action be expanded, and barriers reduced or removed.

Alternative analytical approaches to understand resilience, adaptive capacity and vulnerability

I used three different analytical techniques to explore the resilience of reef tourism enterprises. In chapter 3, I used binary logistic regression analysis for enterprises on Australia's GBR. In chapter 4, binary logistic regression analysis was used for formal and informal sector enterprises in Phuket. In chapter 4, I also used Mann Whitney U tests to explore the differences in the measures of resilience and the variables theoretically associated with resilience between formal and informal sector enterprises. In chapters 5 and 6, I used Redundancy Analysis (RDA) to explore the variables associated with measures of enterprise resilience, and enterprise conservation ethic respectively. These alternative analytical techniques each represent a different analytical lens through which to understand resilience. A regression analysis is a

predictive one. Binary logistic regression aims to predict a response variable from a combination of explanatory variables (Field 2009). In contrast, an RDA analysis looks for associations between groups of variables by combining multiple regression analysis with ordination (Legendre and Legendre 1998, ter Braak and Smilauer 2002). The purpose of using alternative analytical techniques is not to find the best one, or a single 'correct result'. Resilience is a complex and multi-faceted concept and the different types of analyses represent different ways of understanding the complexity of the agents and system under question and to develop a more nuanced overall grasp (Biggs et al. 2009).

In addition, as discussed in chapter 1, the research approaches to resilience, vulnerability, adaptive capacity have come closer together in recent years. All three domains of research now recognise the uncertainty in predicting the ways in which individuals, organisations, and society may respond to disturbances and change in complex social-ecological systems. Thus, this thesis deals with vulnerability and adaptive capacity to almost the same extent as it does with resilience. I chose to use the term resilience because I combined Adger's definition of social resilience (Adger 2000) with the conceptualisation of resilience as the ability of a system to adapt in the face of crises and change without collapsing into a different state with a different identity (Cumming et al. 2005). Yet, the factors that were identified that strengthen the resilience of reef tourism enterprises are also determinants of enterprise adaptive capacity. Thus, an enterprise with high levels of human capital, strong lifestyle values and social capital will likely have higher adaptive capacity, and lower vulnerability to crises and change.

Therefore, this PhD has contributed to advancing our knowledge of resilience, vulnerability, and adaptive capacity of industries based on the non-extractive use of natural resources beyond the

ski industry (Elsasser and Burki 2002, Steiger and Mayer 2008, Hoffmann et al. 2009). A study by Marshall and others (2010) contrasted the perspectives of dive tourism operators on the impacts of climate change with those of tourists, in the Red Sea. Yet, this is the first study that has empirically quantified the determinants of resilience of reef tourism enterprises. Additional studies are required on other natural resource-based service industries. Quantitative studies on the determinants of enterprise resilience in other vulnerable sectors such as mountain tourism (Scott et al. 2007) and tourism-dependent societies in small, low-lying tropical islands are also required (Barnett and Adger 2003, Simpson et al. 2008). Such studies will shed light on whether the factors identified as important for resilience in this study, are valid in other sectors of nature-based tourism.

Trade-offs: resilience vs. optimisation and efficiency

There is a recognised trade-off between resilience and short term cost efficiency in systems such as agricultural production that may be of relevance to reef tourism enterprises as well (Anderies et al. 2002, 2006). For example, a crop-producer may choose to farm in a way which maximises crop yield and profitability, but reduces options and buffering capacity to a drought or crop disease if it occurs. The diverse livelihood strategies that characterise households and communities in many low-income countries are well-documented as a way to reduce risk above considerations of maximising production and profit (Ziervogel 2003, Tao & Wall 2009). My research shows that informal enterprises in Phuket are more resilient to crises than formal sector enterprises, and the dominant coping strategy among informal enterprises in a crisis is temporarily closing down and living off alternative sources of income. Phuket's informal enterprises thus have a strategy of low levels of capitalisation, associated with lower levels of turnover and total profit, but which increases their capacity to cope with crises. Formal sector

enterprises on the GBR have higher levels of capitalisation demonstrated by all the enterprises interviewed owning their own boats. Formal sector enterprises in Phuket mostly rent boats or space on other boats which reduces their capitalisation, reduces their exposure to risk, but may also reduce their ability to earn income and profit during busy times. Moreover, some of Phuket's formal sector enterprises operate only during the high season, which reduces their total annual costs of operation. This discussion has been conceptual and qualitative but in future studies it may be possible to quantify more accurately where the trade-offs lie between maximising enterprise profit, and maintaining a buffering capacity to crises and disasters, and how this varies at different temporal scales.

Furthermore, informal tourism enterprises are different from informal enterprises based on activities such as primary production and sale of agricultural produce. Informal tourism enterprises require a different suite of skills and are subject to different pressures and stressors. Whereas informal tourism enterprises may continue to prosper during a bad year for agricultural production due to a drought for example, they are more vulnerable to economic, political, and security concerns (Ritchie 2008, Gossling et al. 2010) in far-removed countries. A key area for future research in the light of a potential for escalating crises detailed in chapter two, is whether a combination of informal tourism, and agricultural production may be a resilient strategy for maintaining income at the household or community scale. Such studies would need to include a consideration of the skill requirements and the trade-offs involved in engaging in both activities and sectors rather than optimising production and efficiency in one. Additional studies of adaptation and coping strategies of informal tourism enterprises during crises, should also investigate resilience before, during, and in the aftermath of crises.

Psychological resilience, enterprise resilience, lifestyle values and conservation

Through investigating perceived enterprise resilience to past, present, and future crises, and the relationship between enterprise resilience and enterprise contribution to conservation, this thesis has made an exploratory attempt to link concepts associated with psychological resilience with the larger scale resilience of social-ecological systems. Linking psychological resilience at the individual and small enterprise scale to the resilience of the broader social-ecological system is an obvious area for the expansion of future research efforts. There is a vast body of literature on psychological resilience (e.g. Masten 1994, Almendon and Glanden 2007, Almendon 2008) and a growing literature on social resilience (e.g. Adger 2000, Cinner et al 2009, Marshall 2007, 2010). Future research should aim to link these two epistemologies and scales of analysis for an enhanced understanding of resilience.

The relationship between enterprise resilience and enterprise contribution to conservation, by means of lifestyle values, was explored in this PhD. There is a large body of research in environmental psychology that is pertinent to understanding this relationship. Frameworks such as the New Ecological Paradigm (NEP) have been widely used to understand the motivation, decision-making, and constraints around pro-environmental, and pro-conservation actions (e.g. Schultz et al. 2005, Fraj and Martinez 2006). In future research, more in-depth studies into the nexus of lifestyle values, enterprise resilience and enterprise contribution to conservation should include frameworks such as the NEP to advance understanding of the relationship between resilience, lifestyle values and conservation. Chapter six explores the constraints that reef tourism enterprises face in their contribution to reef conservation actions. The types of constraints to conservation activity experienced by enterprises, and how they affect decision-making and action, should also be explored in more depth.

Connecting enterprise resilience to sectoral and national scale modelling studies

The largest body of literature on how climate change and crises may affect tourism consists of modelling-based studies on the impacts on tourism flow and income at an international, national, sub-national, or sectoral scale (Gossling and Hall 2006). Typically, these studies take an econometric approach, and aim to predict how tourist numbers may be affected by changes in environmental variables and tourist perception (e.g. Maddision 2001, Hamilton et al. 2005). A key contribution of future research would be to link these sectoral scale econometric approaches to the empirical studies on the resilience of key agents in the sector such as reef tourism enterprises. One way in which this can be done is to conduct an integrated study at both scales simultaneously. The predicted results from the econometric models could be included in the surveys with agents such as reef tourism enterprises. The responses by enterprises to the scenarios, in addition to other factors could be fed back into the econometric models. In this way the econometric models can include supply-side dynamics which are important for sectoral resilience, and the scenarios presented to enterprises can iteratively be based on the latest models and predictions available.

IN CONCLUSION

This is the first study that has empirically explored the predictors of and factors associated with the resilience of reef tourism enterprises to climate change and crises. In addition, this PhD thesis has included both informal and formal sector enterprises and investigated the relationship between enterprise resilience and enterprise contribution to reef conservation. The relationship between enterprise resilience and enterprise contribution to conservation is an

important component of the resilience of the broader reef tourism-driven social-ecological system. This PhD research has therefore made an original contribution by investigating the resilience of reef tourism enterprises, researching the resilience of informal tourism enterprises, and by exploring the link between enterprise resilience and enterprise contribution to conservation. Furthermore, this PhD has contributed to the understanding of social resilience more broadly by investigating a nature-based service industry. What is more, this thesis has expanded the application of a system-identity conceptualisation of resilience (Cumming et al. 2005) by combining it with the social resilience concept (Adger 2000).

The factors identified in this thesis provide enterprise-owners, and reef tourism policy-makers and managers with an indication of the characteristics and the types of support and action that enhance the resilience of reef tourism enterprises. In managing for resilience, policy-makers and managers of reef tourism need to embrace the uncertainty associated with a fast-changing, highly connected and complex world. Reef tourism enterprises are important players in reef conservation and should be supported and this thesis provides an indication of how this participation can be supported. Finally, this PhD research provides a basis for researchers and policy-makers in Thailand, Australia, and elsewhere to actively enhance the resilience of the iconic reef tourism sector and enable the continued enjoyment of coral reefs into the future.

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List of Appendices

Appendix 1

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Appendix 2

Biggs, D.; Turpie J.; Fabricius, C.; Spenceley, A. 2011. The value of avitourism for community-based conservation – an analysis from South Africa. *Conservation and Society 9(1): 80-90*

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Article

The Value of Avitourism for Conservation and Job Creation—An Analysis from South Africa

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Abstract

Tourism directed at bird watching (avitourism) has become increasingly popular. In many lower and middle-income countries, including South Africa, avitourism is being applied in an effort to simultaneously achieve community development and biodiversity conservation. This paper presents the results of an exploratory investigation of 11 community-based avitourism projects in South Africa. Conservation benefits were measured with the Threat Reduction Assessment tool. We calculated the Gamma (G) correlation coefficient to explore the relationship between conservation and income benefits and project characteristics. The projects were successful at reducing threats to sites where conservation was an explicit objective (n=11, G=0.609, *P*=0.03). The level of income benefits did not correlate with success in reducing threats to conservation. Once involved in avitourism projects, the average monthly income earned by local bird guides increased from USD 114 to USD 362. The extent of income benefits was positively related to the extent of support to projects (n=10, G=0.714, *P*=0.01). Participants in the projects reported substantive capacity building and empowerment benefits. Success in delivering conservation, income and empowerment benefits was challenged by the local guide's limited previous exposure to tourism and business, the guide's lack of self assurance, cultural differences, and a requirement for sustained mentorship and support to overcome these barriers. We conclude that with adequate long-term support, avitourism projects can be a cost-effective way to create jobs and deliver conservation and human development benefits.

Keywords: nature-based tourism, ecotourism, avitourism, community-based conservation, poverty alleviation, job creation, skills development, bird watching, tour guides

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INTRODUCTION

Bird watching or birding tourism (hereafter called avitourism) is a specialised sector of nature-based tourism focused explicitly on looking at birds. Bird watching has become an increasingly popular hobby, and its importance and value as a niche market in tourism is recognised (Cordell & Herbet 2002; Sekercioglu 2002; US Fish and Wildlife Service 2001, 2007; Naidoo & Adamowicz 2005b). Over the past two decades, avitourism has been increasingly promoted as a tool for achieving conservation and development outcomes,

particularly in rural areas in lower and middle income countries (Hvengaard & Dearden 1998; Naidoo & Adamowicz 2005a, b). Avitourism enables income generation through selecting and training local birding guides from low-income communities close to sites of conservation interest. These local guides are trained and encouraged to play an active role in local conservation and lead awareness activities in their communities (BirdLife South Africa 2009).

In this paper, we call this process community-based avitourism (CBAT), which is a form of community-based tourism. The notion of community-based tourism as a tool to achieve both conservation and development objectives has been in existence for over two decades (Murphy 1985; Walpole 1997; Bookbinder *et al*. 1998; Kiss 2004). Community-based tourism can provide livelihood security, minimise leakage from the local economy and strengthen conservation (Murphy 1985; Wilkinson 1989; de Kadt 1990; Drake 1991; Wells & Brandon 1992; Steele 1995). Overall, community-based tourism has delivered mixed results for conservation and local economic development (Kiss 2004). Successes have been limited to specific contexts in which there were favourable local conditions such as a strong local leader or organisation supporting ecotourism development. The type of tourism operation, the nature and degree of community involvement, and whether earnings become private income or are channelled into community projects, or other benefit-spreading mechanisms, are also important determinants of success (Kiss 2004). Furthermore, a lack of necessary skills, e.g., tourism, communication, business and marketing skills, often hamper the success of community-based tourism ventures (Spenceley 2008a).

Despite its increasing application, the success of CBAT in delivering conservation and income benefits, and factors that enable these benefits, have not been investigated in the academic literature. The primary author was involved in the development and management of CBAT in South Africa. The need to address this knowledge gap on avitourism inspired this exploratory analysis of 11 CBAT project sites in South Africa. Specifically, this paper aims to: 1) explore the biodiversity conservation and income benefits of CBAT, 2) gain insight into the project characteristics associated with conservation and income benefits, 3) explore the relationship between conservation and income benefits, 4) evaluate the cost-effectiveness of CBAT as a biodiversity-based approach for job creation, and 5) assess factors that can enable or impede the sustainability of CBAT initiatives.

The Context: Growing Avitourism in South Africa

The democratisation of South Africa, which culminated in the first multi-racial elections in 1994, led to the establishment of strong political and financial incentives for rural economic development, cost-effective job creation, and capacity building. Furthermore, and aligned with the international trend, conservationists became more aware of the critical need to ensure benefits to and the inclusive participation of local communities in conservation (Brooks & Thompson 2001; Berkes 2004; Sanderson 2005). At the same time, the end of Apartheid-era sanctions led to a rapid increase in the number of foreign tourists visiting South Africa. Foreign tourist arrivals increased from 3.9 million in 1994 to 9.1 million in 2007 generating substantive economic benefits (South Africa.info 2009). Birding tourists were part of the increase as South Africa hosts a wide diversity of habitats, species and high levels of endemism. The only quantitative study to date on avitourism to South Africa conservatively estimated that by 1997 between 11,400 and 21,200 birdwatchers spent USD 12–26 million annually in the South African economy (Turpie & Ryan 1998). The rapid increase since 1997 in the number of birding-focused tourist establishments and the number of birding tours and products offered in South Africa suggests that these numbers have continued to increase over the past decade.

History and Evolution of Avitourism in South Africa: The BirdLife South Africa Model

The idea of training and developing local guides emerged around 1994, the year of South Africa's first democratic elections. Warwick Tarboton, an influential conservationist, bird watcher, and ornithological author started discussing his ideas for training local bird guides around his home base in Wakkerstroom. Wakkerstroom is situated in the Grassland Biosphere Reserve (Figure 1), which is considered one of the most important biodiversity areas in Africa and one of the top birding destinations in South Africa (Barnes 1998). In 1997, South Africa's first local bird guide course was held in Wakkerstroom funded by United Distillers, through a top manager in the company, Patrick Cardwell, also a well-known birder. The 1997 training course aimed at capacity building of individuals from the financially depressed black segment of the Wakkerstroom community as local bird guides. The training would provide individuals with an opportunity to earn an income and provide a stimulus for raising conservation awareness in Wakkerstroom's financially depressed black community. Following the 1997 course, the South African-based oil company SASOL expressed an interest in funding local bird guide training further. In 2000, with funding from Sappi WWF and SASOL the construction of the BirdLife South Africa training centre in Wakkerstroom was completed. The first training course at the new centre took place in September 2000.

The history and development of the Zululand Birding Route (ZBR) played an important role in advancing avitourism and CBAT initiatives in South Africa. A birding route is a type of tourism route that aims to cluster activities in less developed areas and stimulate cooperation and partnerships between communities in neighbouring regions to stimulate economic development through tourism (Briedenhann & Wickens 2004a). In South Africa, tourism routes are proposed as a strategy to synergise job creation, tourism and conservation. Starting in 1993, a group of birders around Eshowe, Kwazulu Natal, organised and ran birding weekends in the conservancies in the region. These weekends were popular and were a precursor to

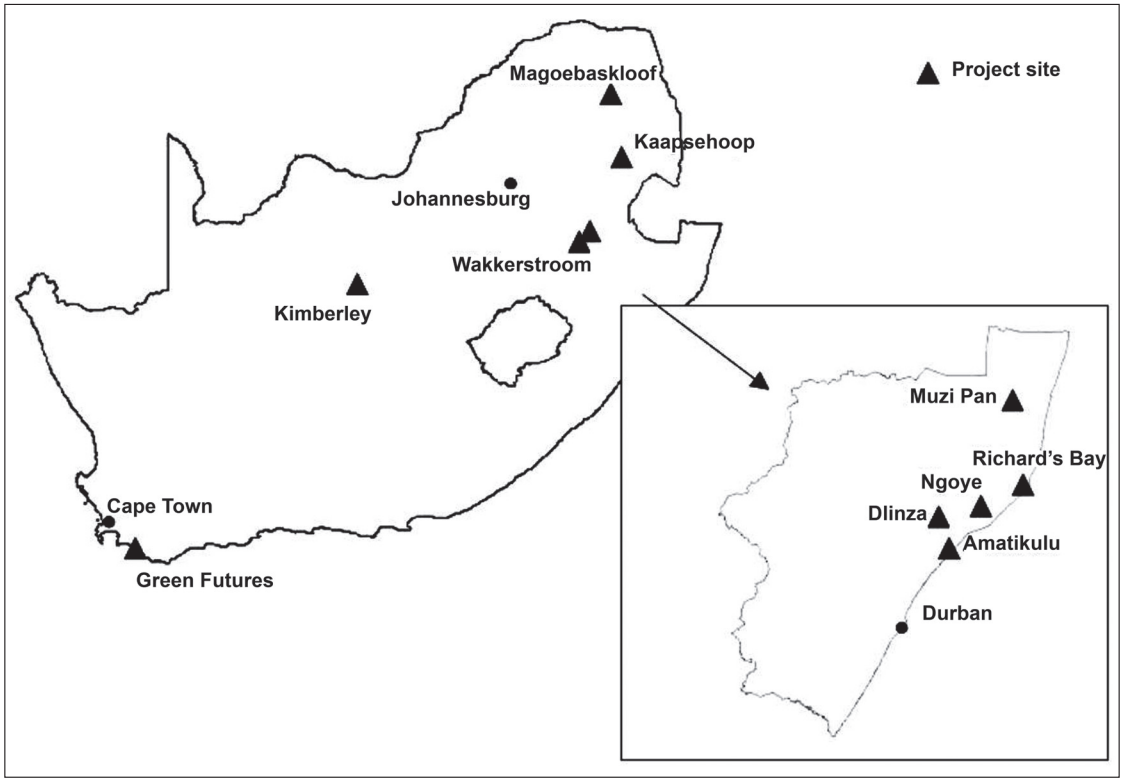

Figure 1

A map of South Africa showing the location of the study sites. The inset of Kwazulu Natal shows the location of sites on the Zululand Birding Route

the development of the Dlinza boardwalk in Eshowe and the ZBR. The ZBR's first brochures were published and distributed in 1997. By 1999, there was recognition that for the ZBR to continue to grow and develop, it needed to appoint a full time person. BirdLife South Africa's affiliation with BirdLife International enabled it to access funding opportunities through the Rio Tinto BirdLife International partnership to appoint a full time person for the ZBR in 2002. A stronger ZBR, which would provide marketing and coordination support to local guides would address the realised need for long-term mentorship beyond a two to four week training course.

The creation of the bird guide training centre in Wakkerstroom in 2000 expanded the awareness of the potential to train bird guides across a range of sites in South Africa. The Endangered Wildlife Trust's Blue Swallow Working Group initiated an economic feasibility study for the development of local birding guides at the Blue Swallow Natural Heritage Site at Kaapsehoop. The Blue Swallow Working Group, which by 2002 had a self-employed trained guide in place at Kaapsehoop, started training and developing a guide in the Magoebaskloof. The need for stronger marketing of the local guides and the destinations they were based at led to the development of BirdLife Travel in 2003. BirdLife Travel is a division of BirdLife South Africa which works closely with the ZBR to market and coordinate reservations for local guides. The Oppenheimer De Beers program, focussed on developing birding tourism and local guides at De Beers properties throughout South Africa, was initiated in 2003, as was a South African National Lottery-funded guide development project based in Kimberley, in the Northern Cape Province. In 2004, BirdLife South Africa's avitourism projects were showcased at the BirdLife International World Conference in Durban. By this time, BirdLife South Africa had established an avitourism program, as an umbrella for the different CBAT projects that aimed to achieve the following objectives (BirdLife South Africa 2009):

1. Develop a network of birding routes through South Africa to create opportunities for local communities to become involved in the tourism economy and conservation.
2. Train and develop local guides that operate along the routes with a focus on developing skills and business opportunities for communities.
3. Develop partnerships along these routes that act as a support structure for conservation action, local guides and accredited tourism products.
4. Marketing avitourism in South Africa and providing a professional travel service to provide a link between local birding guides and potential clients.

Since 2004, spearheaded by the success of the ZBR, nine additional birding routes including the De Beers-linked Diamond Birding Route have been developed throughout South Africa.

METHODS

The Study Sites

The eleven projects evaluated in this study included all

Table 1

Projects included in this study

Project	No. of guides at time of fieldwork	First guide/s started work	Project actors, structures and additional notes
Dlinza Boardwalk, Eshowe (ZBR)	5	2001	A boardwalk management authority raised funding for the boardwalk's construction.
Muzi Pan (ZBR)	2	2002	Local community characterised by high levels of unemployment. Distant location over 100km from the ZBR office in Richard's Bay led to the local guides' perception of isolation. There was pre-existing conflict between the local community and KZN Wildlife who manage the adjoining Mkuze Game Reserve.
Richard's Bay (ZBR)	7	2002	Richard's Bay is the site of the ZBR coordinating office. The local Umhlatuze Municipality have supported the project through financial and site access support.
Ngoye Forest Reserve (ZBR)	1	2002	The Uthungulu District Municipality supported the development of birding tourism. At the time of field research the local guide was undertaking university studies and was no longer guiding locally. The forest was served by guides from other sites on the ZBR.
Amatikulu Nature Reserve (ZBR)	3	1999	In 1998, a local community development project first started training bird guides and a local bird club was started in 1999. By 2001, 15 local guides had been trained from the local community. Due to a low level of support and low tourist demand only three of the original guides remained at the site at the time of field research, four others moved to the Dlinza boardwalk.
Green Futures	12	2004	A partnership between Green Futures (NGO) and the Grootbos Private Nature Reserve. Individuals were selected and trained in conservation-focussed horticulture and in tourism. Subsequent to training, individuals either became active as guides and tourism workers with Grootbos Private Nature Reserve, or gained employment in horticulture and received continued support from Green Futures and Grootbos Private Nature Reserve.
Kimberley	5	2003	A project managed by BirdLife South Africa with 24 months of funding from the National Lottery Distribution Trust Fund of South Africa. The provincial Northern Cape Department of Environmental Affairs, Tourism and Conservation played an important on-site coordination and support role to the project which continued at a lower level after the initial funding ceased in July 2004.
Blue Swallow Natural Heritage Site, Kaapsehoop	1	2001	Project was preceded by an extensive study on the economic feasibility (Biggs 2001) which showed adequate economic demand for local guides and strong support from the primarily white local business owners and residents. Funded support to the project from BirdLife South Africa and the Endangered Wildlife Trust – Blue Swallow Working Group ended in 2003.
Magoebaskloof	1	2002	The local guide, Mr. Letsoalo, was a bird-watcher and naturalist of his own accord for six years prior to the project and had extensive previous exposure to western business norms. BirdLife South Africa and the Endangered Wildlife Trust – Blue Swallow Working Group provided ongoing mentoring and support for 18 months. Mr. Letsoalo gained employment through a partnership with a local tourist lodge which augmented his income.
Wakkerstroom – BirdLife South Africa local guides	2	2000	BirdLife South Africa employs local guides full time, with reservation support and coordination. When not guiding, the guides engage in other conservation-related work. At the time of field research one of the local guides had just joined a South African based international bird tourism company.
Wakkerstroom – Bell's guides	1	1997	The first avitourism project in South Africa which was funded by United Distillers and coordinated through the Wakkerstroom Natural Heritage Association. In 1997, seven local guides were trained but by the time of field research only one remained active due to limited longer term support to the local guides. Conflict was reported between the remaining Bell's guide and the BirdLife South Africa guides in Wakkerstroom.

of BirdLife South Africa's CBAT initiatives that had been operating for over two years at the time of field research in 2005 (Figure 1, Table 1). The projects in Kwazulu Natal (Table 1) were all part of the ZBR (a central marketing and coordination and training support unit and linked to a longer term partnership between Rio Tinto and BirdLife International), but each had their own particular set of birding attractions, and stakeholder groups and each project was treated as an independent site. A number of the project sites on the ZBR were nature reserves, or were adjacent to nature reserves managed by the provincial conservation agency in Kwazulu Natal, Ezemvelo KZN Wildlife—hereafter referred to as KZN Wildlife. The non-ZBR projects were smaller and were managed by the Endangered Wildlife Trust's Blue Swallow Working Group and BirdLife South Africa (Table 1). The Green Futures project was a partnership between Green Futures (an NGO) and the Grootbos Private Nature Reserve, and trained individuals as guides and tourism workers as well as in horticulture.

Data Collection

The primary author conducted semi-structured interviews with local guides, project coordinators, and other tourism and

Table 2

The number of interviews per project site per data collection category

Project	Threat Reduction Assessment	Project characteristics	Income
Dlinza Boardwalk, Eshowe	5	4	3
Muzi Pan	3	4	3
Richard's Bay	1	6	5
Ngoye Forest Reserve	2	3	1
Amatikulu Nature Reserve	1	5	4
Green Futures	1	8	8
Kimberley	2	9	7
Blue Swallow Natural Heritage Site, Kaapsehoop	2	3	2
Magoebaskloof	3	4	2
Wakkerstroom – BirdLife South Africa local guides	2	3	3
Wakkerstroom – Bell's guides	2	3	2
Total	24	52	40

conservation stakeholders at each project site. The interviews collected data on the conservation benefits, the local guides' income, and the characteristics of each project (Table 2). Interviews consisted of a fixed list of open-ended and Likert scale questions, but respondents could elaborate on particular topics if they chose to (Bernard 2002; Czaja & Blair 2005). The qualitative results from the interview process enabled a deeper understanding of the contexts of CBAT projects and the nuances that may lead to success or failure. Interviews were conducted between April 26, 2005 and July 13, 2005.

Conservation Benefits

The conservation benefits of each project were assessed through the Threat Reduction Assessment (TRA) tool (Salafsky & Margoluis 1999) and through quantifying the extent of conservation awareness and action benefits at each project site. TRA measures the percentage reduction in identified threats to the conservation of a site as a result of project interventions. TRA is a practical and cost-effective way of measuring conservation benefit as it is directly related to project interventions and is based on data collected through simple techniques and can be done in retrospect (Salafsky & Margoluis 1999; Mugisha & Jacobson 2004). TRA has a theoretical disadvantage in being a proxy measure for conservation, as it measures the reduction in threats to biodiversity and not biodiversity itself. We followed the TRA procedure as outlined by Salafsky and Margolius (1999). We conducted our TRA analysis through interviewing key conservation informants (members of government conservation agencies, and the avitourism project coordinators) at each project site. The first step in conducting our TRA analysis was for the interviewees to define the exact spatial area of the project in question and to establish start and end dates for the assessment. Secondly, all the direct threats (i.e., threats that immediately affect the biodiversity of the site of interest such as poaching and habitat destruction), were identified. The direct threats were ranked according to spatial extent (the area affected by the threat), intensity (severity of the destruction caused by the threat) and urgency (i.e., is it a current threat or will it occur only in the future). The rankings for spatial extent, intensity and urgency were added to determine the total ranking of each direct threat. In the next step, the interviewees indicated the extent to which they perceived each threat had been reduced, judged against a benchmark of a definition of a 100% reduction of each threat. The total ranking for each threat was multiplied by the percentage reduction of that threat to calculate the total raw score (see Salafsky & Margoluis 1999 for full methodological details). The final step was to divide the total raw score by the total ranking to calculate the TRA score or index. TRA scores were calculated with inputs from key conservation stakeholders including the avitourism project coordinator and other conservation stakeholders. In cases where a key informant for TRA scores clearly gave biased responses, scores were excluded from the final analysis.

Furthermore, interviewees were questioned on the extent of conservation action and awareness activities in communities that stemmed from the CBAT projects. The extent of conservation action was quantified as the total person-labour-days directed at conservation action. A person-labour-day is defined as the equivalent of eight hours of conservation-directed activity undertaken by one adult. Conservation action activities included the monitoring of bird species and numbers, patrolling conservation sites, clearing invasive alien species and clearing litter. Conservation awareness was measured by the number of people that participated in an awareness-raising event that stemmed from the CBAT projects. Conservation awareness events included presentations at community meetings, schools, churches, and school and community outings.

Income Benefits and Project Costs

The income benefits to local guides were measured as the increase in income generated due to avitourism projects. The primary author questioned local guides and project coordinators at each project site about the levels of income earned by the local guides and the number of local guides that gained part-time or full-time employment. Project reports and budgets were used to obtain information on project costs. Data on income were collected in South African Rands and converted to United States Dollars at the prevailing rate of exchange (ZAR 6.2 = USD 1).

Project Characteristics

Seven-point Likert scales (1=very weak to 7=very strong) were used to collect data on project characteristics (Table 3) (Likert

Table 3

The project characteristics measured on 7-point Likert scales (1=very weak; 7=very strong)

Project characteristic	Description
Extent of threat reduction targeted	The extent to which a project has explicitly targeted the reduction of threats to the conservation of a site or group of sites of interest
Extent of total project support	The extent to which a project budgeted resources/made provision for marketing, training, coordination and network-building in support of the local guides.
Extent of focus on the candidate selection process	The extent to which projects have committed time and other resources in the selection process of candidates for training in CBAT projects
Accessibility to potential market	The perception of project coordinators and avitourism stakeholders of the extent to which a site with local guides is accessible to potential clients
Extent of birding and tourism attraction	The perception of project coordinators and avitourism stakeholders of the level of attractiveness of each project site as a bird-watching location

1967; Tourangeau *et al.* 2000). Some of the CBAT projects were initiated with an explicit objective of reducing threats to the conservation of a site. Other CBAT projects were initiated to create jobs through avitourism and raise awareness about birds and the environment more generally. For this reason, the extent to which conservation and the reduction of threats were targeted in a project, was measured as a project characteristic (Table 3). The other measured project characteristics were the extent of total project support, the extent of focus on the candidate selection process, the accessibility to the potential market, and the level of birding and tourism attraction of the sites. The Likert scale scores and supporting qualitative evidence for scores were obtained from project coordinators, local guides and stakeholders at each site, and averaged across respondents.

Analysis

The relationship between conservation benefit, as indicated by a project's TRA score (Salafsky *et al*. 2001), total income, and different project characteristics were evaluated through the Gamma correlation coefficient (G), recommended for many tied observations (Siegel & Castellan 1988). The relationship between income and conservation benefits was evaluated through Pearson's Correlation Coefficient, as there were few tied scores. The relationship between income and conservation benefit was adjusted for size through calculating the income per hectare of the site of conservation interest. We adjusted the p-values using the Bonferroni correction for multiple testing (Quinn & Keough 2002). The cost of job creation in the CBAT projects was calculated by dividing the project expenditure at each project site with the number of project beneficiaries (local guides). Project beneficiaries included those guiding, working in a job related to their training and development, and working in a job they obtained because of their training development. At the time of field research, all projects in this study had been in operation for over two years and only one local guide had been employed for less than one year. The creation of a new job is defined as a job that is sustainable for one year or longer depending on government's continued policy to invest (Urban-Econ 2000).

RESULTS

Conservation Benefits

Alien invasive plants and the unsustainable utilisation of natural resources were the two most common threats to the CBAT projects surveyed (Table 4). The extent of threat reduction as measured by the TRA score varied from 3% at Amitikulu and Ngoye Nature Reserves to 53% in Richard's Bay. The extent of threat reduction, was positively correlated with the extent to which the reduction of threats to the conservation of a site was a targeted project objective (n=11, G=0.609, adjusted P=0.03). The CBAT projects at Amatikulu and Ngoye were centred on existing protected areas managed by KZN Wildlife, a government conservation agency, and focussed and job creation and fostering an increased awareness of birds. The project in Richard's Bay was initiated to strengthen the conservation of key bird conservation sites in high value development areas of an expanding industrial city. An example of the conservation benefits in Richard's Bay is the declaration of Thulasihleka Pan, which was earmarked for development, as a no development zone, to be managed by BirdLife Zululand, the local BirdLife South Africa branch. Additional conservation benefits from CBAT projects included 36,557 people primarily from financially impoverished rural communities that attended at least one outing, talk or event arranged and conducted by one of the 73 local guides on the CBAT projects. Additionally, a total of 2,393 person-labour-days were contributed to conservation activities. The level of income benefits did not correlate with success in reducing threats to conservation.

Income Benefits and Cost-effectiveness

At the time of field research, local guides were earning an average of USD 362 (± USD 268) per month compared to USD 114 (±USD 155) per month before they were trained and started working as local guides (paired t-test; t=-5.019, $P < 0.001$, n=26). This amounts to an additional USD 248 per month or USD 2,976 per annum. The extent of project support (including marketing, network building, coordination/management, capacity building/training) was positively associated with total income of the guides (n=10, G=0.714 adjusted P=0.01). The average cost per job created in the avitourism projects was USD 6,974. The cost varied from USD 2,437 in the Magoebaskloof to USD 13,905 per job created for the projects of the ZBR. Thus, it would take an average of 2.34 years for the increased income of local guides to equate to the cost of the CBAT projects, although this would vary from 0.82 years for small

cost-effective projects like Magoebaskloof to 4.67 years for larger projects like the ZBR.

Empowerment Benefits

Empowerment is defined as giving someone a greater ability to take charge of their own future according to their own goals and criteria (de Beer & Swannepoel 1998). Many of the local guides indicated a noteworthy increase in their sense of self-worth and their capacity for self-determination. The following quotes from local guides are an indication of these empowerment benefits: "Now I can go out and do something valuable with my life that can make a difference." "I have become a much more responsible person and it [the CBAT project] has made me famous. I am now famous and I must use this fame in a positive way." "This project has changed my life tremendously in a positive way."

Furthermore, there was an increase in guides' sense of pride in their local environment, and a desire to share their newfound knowledge with their community and visitors. An empowered sense of wanting to share newly-gained knowledge with their communities would have strengthened the success of the conservation and awareness activities described above as indicated by the following quotes: "Learning about bird identification, bird behaviour and bird ringing and measuring has opened a whole new world to me. By taking out schoolchildren this awareness can be widened." "Learning about the birds and the environment around me and how to guide has been a positive and life-changing experience that I want to share with my community."

Empowerment benefits were not restricted to the local guides only. The end of Apartheid presented a challenge and opportunity for white South Africans to engage constructively in a multi-racial society and to start addressing the imbalances of a racially segregated past. A majority of individuals that supported CBAT projects were birdwatchers and the CBAT projects gave them an opportunity to contribute to building a post-Apartheid society through initiatives that related to bird watching. The following quote from a supporting individual reflects these benefits: "Learning about a different culture and being part of the growth and personal development of the local guides has been phenomenal and a very gratifying experience".

Challenges and Failures

The successful and sustainable implementation of CBAT projects face four types of challenges. First, the differences in cultures and worldviews between project participants, tourists and local guides were a source of misunderstanding and conflict. This manifested in one case in local guides

Table 4

Summary of the Threat Reduction Assessment (TRA) scores for each site.
X denotes a threat is present at a site. TRA score % represents the extent to which threats to a site have been reduced as a result of a project.

Project / Direct threats	Dlinza	Muzi Pan	Richards Bay	Ngoye Forest Reserve	Amatikuu Nature Reserve	Green Futures	Kimberley	BSNHS	Magoebaskloof	Wakkerstroom
Alien invasives	X	X		X	X	X		X	X	
Unsustainable harvesting of natural resources	X	X		X	X	X	X		X	
Fragmentation by urban development	X									
Domestic pets	X						X			
Overutilisation by tourists	X									
Habitat transformation***		X	X			X			X	X
Pollution and industrial spills			X				X			
Siltation			X							
Cattle / Livestock grazing				X			X	X		X
Trampling by vehicles				X						
Unfavourable burning practices				X	X	X	X			X
Prospecting and mining							X	X	X	
Illegal access							X	X		X
TRA score %	19	24	53	3*	3	33	0	24	7	6**

*The projected score for Ngoye once the birding lodge is up and running was calculated at 33.70%.
**The TRA score for Wakkerstroom is attributed 50% to the Bell's guides project and 50% to the BLSA project as the combined extent of influence on conservation in the Wakkerstroom area was reported as similar.
***The causes of habitat transformation were subsistence agriculture at Muzi Pan, industrial development at Richards Bay, housing and agricultural development at Green Futures and commercial forestry expansion in the Magoebaskloof and Wakkerstroom.

viewing a project as a tremendous success, whilst the project coordinator of the same project viewed it as a failure. Second, the post-Apartheid South African socio-economic environment rooted in a legacy of oppression resulted in local guide's lack of self-assurance and confidence as reflected in this statement by a local guide: "If we are making an arrangement with a white person, it is very difficult to say, 'no, I can't make it on Sunday morning to go birding'. It is easier and more acceptable for us to say 'yes, we can make it', knowing that we can't and then we just don't show up". Understandably, the sentiments and actions reflected in the above quote resulted in the generation of negative sentiments from the primarily white supporting individuals and organisations. Third, high levels of community and family problems, and lack of resources (e.g., lack of money for taxi fare to attend a project meeting) negatively affected the reliability of local guides, who frequently missed appointments. Fourth, most local guides have had little exposure to western business norms. Developing the capacity of birding guides to compete successfully in a western-dominated business environment is a challenging and costly process. This frequently led to project stakeholders becoming frustrated as reflected in this quote from a supporting individual: "The local guides do not seem to be able to see or have the capacity to utilise the opportunities that are being created for them or understand the consequences of their actions".

Long-term Sustainability

Anecdotal evidence gained in 2009 from informal conversations, newsletters and websites of the CBAT projects provided insight into their long-term sustainability. A majority of the projects associated with the ZBR still had active local guides, and the ZBR continued to provide marketing and training support, and was planning to continue to do so. In addition, the successful model of the ZBR was used as a basis for the development of nine additional birding routes in South Africa (BirdLife South Africa 2010). A majority of the trainees from the Green Futures project and the associated Grootbos Private Nature Reserve were still active in their field of training. Green Futures also provided ongoing and long-term support to its past trainees. The local guide based in the Magoebaskloof was also still active. Although the budget for the Magoebaskloof project was limited, the local guide, Mr. Letsoalo entered into a partnership as an employee of the local Khurisa Moya Lodge, which provided him with an additional source of income. Importantly, during the interviews, many of the local guides also indicated a strong preference for being employed, or having clients sent to them, rather than having to start up their own businesses or micro-enterprises and generate demand for their services on their own.

DISCUSSION

Our study represents one of the first assessments of factors that can enable the success of CBAT projects. Our evaluation of CBAT projects in South Africa provides insight into factors associated with higher levels of conservation and income benefits, and their cost-effectiveness and long-term sustainability. The successes and failures of CBAT projects, and the conditions under which they are more likely to work, are similar to those in community-based tourism and community-based conservation more broadly. These issues are discussed in turn.

Conservation Benefits

Our finding of a non-significant relationship between total income and conservation benefit measured by the TRA score is commensurate with other studies on community-based conservation (Salafsky *et al*. 2001; Stem *et al*. 2003; Berkes 2004; Linkie *et al*. 2008). Non-cash benefits, including the extent of local ownership and strength of local property rights, education, equity and empowerment are often more important than monetary incentives for conservation (Salafsky *et al*. 2001; Stem *et al*. 2003; Berkes 2004; Fabricius 2004). On the other hand, Morgan-Brown *et al*. (2010) showed that income from butterfly farming in Tanzania mediated higher levels of participation in conservation-behaviour and a greater belief in the effectiveness of conservation action. Overall, it seems as though increased income can strengthen favourable conservation attitudes and actions, but it may be insufficient on its own. Increased income is more likely to lead to favourable conservation outcomes if combined with additional benefits such as education, an increased sense of pride and ownership of a resource or area, and stronger local property rights that empower communities to manage their own resources.

Our finding that total project support was positively correlated with income benefits to local guides is commensurate with previous studies (Salafsky *et al*. 2001; Kiss 2004; Sanderson 2005). A majority of the support to CBAT projects usually comes directly from the project implementing and coordinating agency. However, there are examples where direct support from an NGO is relatively limited, and a high level of external support from, for example, interested private individuals or companies was important in ensuring project success.

Cost-effectiveness and Sustainability of Job Creation

The cost per job created in the CBAT projects varied from USD 2,437 for the Magoebaskloof project to USD 13,905 for the ZBR related projects with an average of USD 6,974 per job created. The CBAT projects with a shorter funding commitment created jobs more cost-effectively than the ZBR projects which had a larger budget and a longer funding commitment. However, the long-term sustainability of the jobs in the smaller, shorter term projects is dependent on the competitiveness of the local guide(s) and the existence of a strong and sustainable local support network for the guide(s). Whilst the investments by the ZBR increased the overall cost per job created, they have played an important role in the sustainability and long-term success of the project. This is evident by the ZBR's continually updated website (www.zbr.

co.za) and ZBR's regular presence at international birding travel fairs such as the British Birdwatching Fair.

Partnerships with lodges in the private sector (e.g., Magoebaskloof and Green Futures) enable smaller commitments of upfront funding to CBAT projects which lead to sustainable job creation in the longer term. In such partnerships, many of the costs associated with job creation, such as marketing and the creation of a client base are absorbed as part of the existing costs incurred by an agency such as a lodge. An advantage of this approach is that the established tourism lodges are often better equipped than an NGO to market the services of local guides. However, anecdotal evidence from our research suggests that often the relationships between the local guides and a partnered tourist establishment need to be facilitated and supported by an NGO. This support is necessary because the challenges and failures described above also regularly manifest in the relationships between local guides and western tourist lodges, and frequently require mediation. While this may increase the cost of a partnership-based model, it is likely to be cheaper than a project that requires a large commitment of funding over a long period of time.

When Can CBAT Work?

The challenges experienced in CBAT projects are not unique. Capacity constraints and inadequate consideration of the market and business aspects are challenges central to community-based tourism more broadly. In a review of 218 community-based tourism ventures operating in 12 southern African countries, Spenceley (2008a) identified severe business capacity constraints. These constraints included accessibility (among 91% of enterprises), market access (72%), advertising (70%) and communications (57%)—despite more than half of the enterprises receiving some form of external support from a third party. Similarly, Dixey (2008) found that only nine of 25 community-based tourism enterprises in Zambia evaluated had sufficient information on their income to compare their level of donor investment, visitor numbers, gross revenue and net income. Key determinants of success were linkages to tourism companies, proximity to main tourism routes, competitive advantage, financial management, visitor handling and community motivation. There is little value in establishing a community-based tourism venture which tourists do not know about (because of poor promotion); cannot reach (because of poor infrastructure); where the establishment is product-rather than demand-led (because no market research was done), and where service levels are inadequate (because of poor training) (Spenceley 2008b).

The birding route approach taken by BirdLife South Africa in its CBAT projects addresses a number of the challenges identified in the community-based tourism literature. CBAT projects have paid attention to the tourist market (through feasibility studies and a strong marketing focus), and concentrated on enabling small business development underpinned by long-term organisational support through birding routes and BirdLife Travel. The BirdLife South Africa model requires external funding to provide long-term support to CBAT initiatives. The need to provide external long-term funding to enable societal transformations toward conservation and human development is well recognised in South Africa and elsewhere (Cattarinich 2001; Salafsky *et al*. 2001; Ashley 2006). This long-term support can be directed through the organisational structure of a birding route, partnerships with tourism companies or lodges, or the presence of strong and committed stakeholder support groups. In addition, the large private sector companies, such as Rio Tinto, SASOL, and De Beers, that have supported CBAT projects in South Africa to date may be able to make an important contribution to this long-term support. Ultimately, however, CBAT initiatives need to consider the tourism market and its requirements, as increased commercial viability will increase the prospects of CBAT initiatives surviving in the long-term.

However, it is widely acknowledged that one of the major challenges of engaging in the tourism market is its volatility (Ashley *et al*. 2001; Christie & Crompton 2001; Briedenhann & Wickens 2004b). Although the South African tourism market is exposed to this volatility, the strength of the domestic tourism market plays an important buffering role. Biggs (2001) showed that of the potential demand for the services of a local guide at the Blue Swallow Natural Heritage 96% is from South African tourists. A high proportion of domestic demand reduces the exposure of local guides to the volatility of the international tourist market. Nevertheless, CBAT should not be seen as a stand-alone community development strategy. CBAT should be considered as one component of a broader livelihoods strategy for individuals and households in a community and should complement rather than displace existing activities (Fabricius 2004; Tao & Wall 2009).

Finally, this paper demonstrates the success of CBAT in reducing threats to sites of conservation interest, where this is a targeted objective, and in raising conservation awareness and fostering conservation action. CBAT provides tangible income benefits to local guides and we have shown that CBAT is a cost-effective way to create jobs in South Africa. Realising the potential that CBAT holds for conservation and communities, however, requires a commitment to long-term support, a nuanced understanding of the market and business principles that underpin CBAT, the ability to engage in cost-effective marketing of local guides, and a tolerance and understanding of diverse cultures and worldviews.

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Appendix 3

Copy of main questionnaire survey used in Australia and Thailand

BUSINESS NAME: **INTERVIEWEE:**

Interviewee Position: **Length of time with company:**

DATE: **Time Start:**

CONSENT:

Are you willing to participate in this survey? Y / N

Is it okay if we take notes during the interview? Y / N

If there are any questions you do not want to answer that is okay?

This survey is dived into two main sections:

a) Your current situation
b) Your effect of shocks in the past on your business
c) I will sketch a scenario and I am interested in your perception of how your business will respond to it.

Code	Question	Response
G1:	How long has your business been in operation for?	
G2:	What are the main types of packages and tours that your business offers	
G4:	What is the structure of your company?	
G3:	How many employees does your business currently have	

G5: How many boats does your company have and what is their capacity

G16: What is the vision and plan that you have for your company in the future?

Physical capital

(Part of the redundancy measure – use external measures as a backup)

PC20 What are the most important transport infrastructure sources that enable tourists to get to the destination at which your company is based?

Please provide estimates of the percentages:

Mechanism	Percentage
Road	
Air	
Other	

This part of the survey is as follows, we would like you to provide your views on the extent to which infrastructure presents a constraint to your business. This could be through, a) making it difficult for tourists to get to your destination, b) difficult or costly to get the equipment, goods and services that you need to run your business or c) communications constraints, limited or excessively expensive communication:

	Physical Capital
1	Very inadequate – it represents a serious limitation, tourists, products and services really struggle to get here, it is expensive and it is a major impediment to our business
2	Somewhat inadequate – it represents some limitations, conditions and maintenance of infrastructure is not as good as it could be and should be improved.
3	Medium quality – It serves its purpose adequately
4	Good - It serves its purpose well and efficiently
5	Excellent - It enables smooth and efficient functioning of our business with very few limitations

PC1 To what extent do you feel that the road system is adequate to meet your business's needs?

	Group						NO RESPONSE

PC1	Road system		**1**	**2**	**3**	**4**	**5**	
PC2	Air Transport System		**1**	**2**	**3**	**4**	**5**	
PC3	Rail system	**N/A**	**1**	**2**	**3**	**4**		
PC4	Marina/boat transport and port infrastructure	**N/A**	**1**	**2**	**3**	**4**	**5**	
PC5	Telecommunications		**1**	**2**	**3**	**4**	**5**	
PC6	All infrastructure overall		**1**	**2**	**3**	**4**	**5**	

Details:

Perceived ability to cope and other questions:

In this section I would like you to respond based on your feeling of your business's ability perceived ability to keep operating successfully in the future.

I provide statements and you have to indicate the extent to which you agree or disagree.

1 = strongly disagree, 2 = disagree, 3 average indifferent, 4 agree; 5 strongly agree

Code	**Question**	**Response**				
HC3	My business is in a better position to adapt to changes and stay in the reef-based tourism sector than others I know.	**1**	**2**	**3**	**4**	**5**
HC5	I am confident that things will turn out well for my business in the future.	**1**	**2**	**3**	**4**	**5**
HC7	There are many options for my business to adapt to changes and stay working in the reef-based tourism sector.	**1**	**2**	**3**	**4**	**5**
HC8	Life has become increasingly difficult in the reef-based tourism sector	**1**	**2**	**3**	**4**	**5**
HC23	I do not think that my company will survive for much longer	**1**	**2**	**3**	**4**	**5**
HC21	There is no reason to believe that foreseeable changes will make my business go under	**1**	**2**	**3**	**4**	**5**
HC22	My business has it what it takes to be able to deal with future changes in the reef-based tourism sectors	**1**	**2**	**3**	**4**	**5**
NC3	Our business considers the conservation of the reef and the maintenance of its health, of utmost importance, no matter how difficult and dire the situation for our business may be	**1**	**2**	**3**	**4**	**5**
HC4.1	I love working in reef-based tourism	**1**	**2**	**3**	**4**	**5**

HC4.2	I do not think that there is a better job or work environment than in the reef-based tourism sector	**1**	**2**	**3**	**4**	**5**
HC4.3	I enjoy working in an industry where I share my knowledge and experiences of the reef and marine environment with others.	**1**	**2**	**3**	**4**	**5**
HC4.4	I am looking for opportunities to move out of the reef-based tourism sector	**1**	**2**	**3**	**4**	**5**
HC4.5	I enjoy the lifestyle associated with working in the reef-based tourism sector	**1**	**2**	**3**	**4**	**5**
HC4.6	Working in the reef-based tourism sector is an important part of who I am and how I see myself	**1**	**2**	**3**	**4**	**5**
HC31	The management and key staff in my business have the necessary skills to deal with future changes in reef-based tourism	**1**	**2**	**3**	**4**	**5**
HC32	The management and key staff of this business have the self-belief and determination to adapt to and survive future changes in the reef-based tourism sector	**1**	**2**	**3**	**4**	**5**

NC3det: What are you doing for reef and marine life conservation?

HC9	**What are the best things about being involved in the reef-based tourism sector?**

1.

Natural Capital

NC1	What is the current condition of the coral reefs that are the focus of your tourist activities?
1	Very poor
2	Poor

3	Medium
4	Good
5	Excellent / pristine or close to it
	No response

Details:

NC2	To what extent has your business changed the way in which it operates, in terms of shifting the reefs that it visits or change other aspects of its operations (like shifting the position of the pontoon) due to degradations of the reefs that you visit in the past 5 years?
1	Very little or none
2	To a small extent
3	Average/ Medium – we have made a moderate level of changes to our business operations
4	High
5	Very substantial: We have made very substantial changes to the way in which we operate as a result of degradations of the natural resource base.

Details:

Redundancies

RC1: Are most of your tourists from one origin or market, or do they come from a range of places?

Origin markets e.g.: 1. Sweden, 2. Germany, 3. Europe generally, 4. Other countries

Country **Percentage contribution per annum**

RC2: What are the main functional groups or market segments of tourists that you get? E.g. Backpackers, Upmarket,

Market segment	Definition/ Description	Percentage contribution

Other issues:

O1: How important do you think climate change is for the future well-being of your business?

O1	
1	Insignificant
2	Low importance – it may have a small impact but much less than a range of other factors
3	Average/ Medium – It may have an impact but is not more important than a range of other factors
4	High importance – It is likely to be one of the more important factors in the future of my business
5	Critical – I believe that it will be the single most important factor in the future well-being of my business

O2:

Are there other factors that you believe will be more important than climate change in the future well-being of your business?

Please rank these in order of importance:

O2

1

SECTION 2: PAST SHOCKS AND SCENARIOS

Has there been a substantial shock to the tourism industry in your area over the past 10 years. A substantial shock is one where there was a 25% or more change (increase or decrease) in the average flow of tourist numbers or a 25% or more change in tourist income or operating costs for a period of at least 3 months?

S1: SHOCK 1 Description:

S1A1: What actions did your business take to deal with this shock

SHOCK # 1 (S1)		% change	Duration in nr of months	% reduction in change year of biggest impact	Financial year of biggest impact
FC2	Tourist numbers				
FC1	Number of people employed				
FC6	Annual revenue				
FC7	Operating profit or surplus				

Social Capital:

S1	Group						
SC1	A formal government institution (municipality, local government, provincial/state or national government)		**1**	**2**	**3**	**4**	**5**
SC2	Your family and friends in your country		**1**	**2**	**3**	**4**	**5**
SC3	Family and friends outside of your country	**N/A**	**1**	**2**	**3**	**4**	**5**
SC4	A community group	**N/A**	**1**	**2**	**3**	**4**	**5**
SC5	Increased collaboration with other companies due to the shock		**1**	**2**	**3**	**4**	**5**
SC6	Social capital overall		**1**	**2**	**3**	**4**	**5**

1	*virtually none*
2	*To a small extent*
3	*A mid-level of support, not critical in our ability to survive but it will help*
4	*A high amount of support, it is will be important in enabling our survival*
5	*critical, without this support our business will not survive the shock*

Access to finance

S1FC3	**How easy do you feel it was for you to access additional funds to keep your business float in times of big trouble, like a cyclone or tourism collapse?**
1	Very difficult or virtually impossible
2	Difficult
3	Average/Medium
4	Easy to access small amounts, large amounts could be accessed with effort
5	Large amounts of emergency capital were easy to access

S1G10: What do you believe enabled you to survive this shock?

S1G11: Did anything change in the way that you operate, or the clients you get during or after this shock?

SHOCK 2 Description:

What actions did your business take to deal with this shock

SHOCK # 2 (S2)		**% change**	**Duration in nr of months**	**% reduction in change year of biggest impact**	**Financial year of biggest impact**
FC2	Tourist numbers				
FC1	Number of people employed				
FC6	Annual revenue				
FC7	Operating profit				

Social Capital:

S2	**Group**						
SC1	A formal government institution (municipality, local government, provincial/state or national government)		**1**	**2**	**3**	**4**	**5**
SC2	Your family and friends in your country		**1**	**2**	**3**	**4**	**5**
SC3	Family and friends outside of your country	**N/A**	**1**	**2**	**3**	**4**	**5**
SC4	A community group	**N/A**	**1**	**2**	**3**	**4**	**5**
SC5	Increased collaboration with other companies due to the shock		**1**	**2**	**3**	**4**	**5**
SC6	Social capital overall		**1**	**2**	**3**	**4**	**5**

Details:

Access to finance

S2FC3	How easy do you feel it was for you to access additional funds to keep your business float in times of big trouble, like a cyclone or tourism collapse?
1	Very difficult or virtually impossible
2	Difficult
3	Average/Medium
4	Easy to access small amounts, large amounts could be accessed with effort
5	Large amounts of emergency capital were easy to access

Who provided this support and other details:

S1G10: What do you believe enabled you to survive this shock?

S1G11: Did anything change in the way that you operate, or the clients you get during or after this shock?

GPS: general questions on past shocks:

GPS1	What were the key reasons that you believe your business survived past shocks as opposed to other companies?

GPS2	Which type of government support, if any, enabled you to survive the past shocks

SQ: Scenario responses

SHOCK SCENARIO

Suppose a large disturbance hits your tourist market and company. There is a substantial reduction in tourist numbers, revenue and profits to your business. Assume that there is not an increase in operating costs above average inflation you expected. The slump could be due to tourist perception of reef and environmental degradation, oil price and air-travel increases, or global economic decline. I am posing you with a 10%, a 30% and a 50% shock

10%

SQ10a:	How would you respond if you experienced a 10% decline in annual revenue over a period of a financial year or 12 months?

SQ10b:	If you decided that your business would stay in reef-based tourism, what actions would you take?

REMOVE SOCIAL and FINANCIAL CAPITAL AT 10 and 30%

30%

SQ30a:	How would you respond if you experienced a 30% decline in annual revenue over a period of a financial year or 12 months?

SQ30b:	If you decided that your business would stay in reef-based tourism, what actions would you take?

50%

SQ50a:	How would you respond if you experienced a 50% decline in annual revenue over a period of a financial year or 12 months?

SQ50b:	If you decided that your business would stay in reef-based tourism, what actions would you take?

Social and Financial Capital in response to shocks: To what extent do you think the support from the following groups will be important in you surviving these shocks?

Social Capital:

SQ50	**Group**						
SC1	A formal government institution (municipality, local government, provincial/state or national government)		**1**	**2**	**3**	**4**	**5**
SC2	Your family and friends in your country		**1**	**2**	**3**	**4**	**5**
SC3	Family and friends outside of your country	**N/A**	**1**	**2**	**3**	**4**	**5**
SC4	A community group	**N/A**	**1**	**2**	**3**	**4**	**5**
SC5	Increased collaboration with other companies due to the shock		**1**	**2**	**3**	**4**	**5**
SC6	Social Capital Overall		**1**	**2**	**3**	**4**	**5**

Details:

Access to finance

SQ50FC3	How easy do you feel it was for you to access additional funds to keep your business float in times of big trouble, like a cyclone or tourism collapse?
1	Very difficult or virtually impossible
2	Difficult
3	Average/Medium
4	Easy to access small amounts, large amounts could be accessed with effort
5	Large amounts of emergency capital were easy to access

Who do you think the most likely provider of this support is going to be:

SQSV:	What do you think will be the most important reason/s you will survive such shocks in the future?

SQSV: How important do you think the following aspects are for the survival of your company/boat in reef tourism in the future?

Item		**Rank**				
SQSV1	Support from government	**1**	**2**	**3**	**4**	**5**
SQV1b	Support from an external NGO	**1**	**2**	**3**	**4**	**5**
SQSV2	Support from your family and friends and community	**1**	**2**	**3**	**4**	**5**
SQSV3	Access to savings or additional funds	**1**	**2**	**3**	**4**	**5**
SQSV4	The skills and determination of the key company staff	**1**	**2**	**3**	**4**	**5**
SQSV5	Increased collaboration with other companies due to the shock	**1**	**2**	**3**	**4**	**5**
SQSV6	Good infrastructure and telecommunications	**1**	**2**	**3**	**4**	**5**
SQSV7	Our reefs (natural assets) are excellent and tourists will always want to come and see them	**1**	**2**	**3**	**4**	**5**
SQSV8	I and my staff love working on the sea and in reef tourism and we will not stopping working in this industry unless we really cannot survive at all anymore	**1**	**2**	**3**	**4**	**5**

SQGenc:	If you decided that you and your business would exit the reef-based tourism sector what actions would you take and how would you go about it?

SQGPS:	What actions of support by government or an external agency do you believe will best put you in a position to survive these disturbances.

If you think these differ at all between a 10%, 30% and 50% slump, please indicate this.

SQFU:	In addition to what we have mentioned above - what other factors are important determinants of your company's success in the future.

SQWE: Are there certain weather or water quality or other environmental conditions that you feel are critical to the future success of your company?

1 = no very little impact; 2 = some impact; 3 = moderate impact; 4 = high impact; 5 = very high or critical impact

Item		**Rank (of importance)**				
SQWE1	Rain	**1**	**2**	**3**	**4**	**5**
SQWE2	Wind	**1**	**2**	**3**	**4**	**5**
SQWE3	Poor water visibility	**1**	**2**	**3**	**4**	**5**
SQWE4	Heat	**1**	**2**	**3**	**4**	**5**
SQWE5	Cold	**1**	**2**	**3**	**4**	**5**
SQWE6	Changes in ocean currents	**1**	**2**	**3**	**4**	**5**
SQWE7	Changes in tides	**1**	**2**	**3**	**4**	**5**

Others write in and rank					
SQWE8	**1**	**2**	**3**	**4**	**5**
SQWE9	**1**	**2**	**3**	**4**	**5**

Most recent financial data:

Please provide the details below for your most recent financial data

Most recent information		**Number**	**Percentage change on average of the last 3 years**
FC2	Tourist numbers		
FC1	Number of people employed		
FC6	Annual revenue		
FC7	Operating profit		
FC11	Annual operating expenses		

FC2.1	What percentage of your businesses annual income is from activities directly related to the reef, such as diving and snorkelling; vs activities such as selling gear.	
	Snorkelling and diving	Other services
Details:		

FC4: To what extent is your businesses goods, equipment are covered? Is it 100% or less? :

FC5D:

FC5D	Do you have insurance against a loss of income or tourist numbers?	Yes	No

FC8: How would you describe your business's assets to liabilities ratio?

FC8	
1	Very poor – heavily indebted
2	Poor
3	Average
4	Good
5	Excellent: We are in a strong position to take further loans or increase our liabilities.

Assets	$
Liabilities	$

Ranking Scale:

1 = very poor; 2 = poor 3 = average 4 = good 5 = excellent

How would you rank the following (most recent financial data) and in response to shock 1 and response to shock 2 in their financial year of worst impacts as well as the 10%, 30% and 50% shock scenarios.

Code	Issue	Current or most recent	Shock 1	Shock 2	10% slump	30% slump	50% slump
FC6	Annual revenue						
FC7	Profit						
FC8	Assets to Liabilities ratio						

Appendix 4

Copy of conservation questionnaire survey used in Australia

BUSINESS NAME: INTERVIEWEE:

Interviewee Position: **DATE:** **Time:**

CONSERVATION

Do you consider your business to be environmentally responsible, and if so, why?

Code	Question	Response				
NC3	Our business considers the conservation of the reef and the maintenance of its health, of utmost importance, no matter how difficult and dire the situation for our business may be EXTRA INFO	**1**	**2**	**3**	**4**	**5**
NC6	We will only support reef conservation (beyond GBRMPA requirements), if it has no or negligible extra cost to our company	**1**	**2**	**3**	**4**	**5**
NC8	We are willing out of our way, absorb additional costs and take whatever steps necessary, to support and take part in reef conservation measures EXTRA INFO on what have done in past	**1**	**2**	**3**	**4**	**5**
NC10	We would be willing to absorb an increase in the cost of fuel for our boats towards becoming that would go towards protecting the reef from climate change? (NEGATIVELY PHRASED) EXTRA INFO	**1**	**2**	**3**	**4**	**5**

NC3:

NC6:

NC8:

NC10, If yes How much do you think you would be prepared to absorb? Bid: 30%, and then up or down by %

Does your company:

NC20	Educate your guests on reef conservation issues?	**no**	**little bit**	**yes**
NC21	Have a Recycling program for the materials it uses on its boat?	**no**	**little bit**	**yes**
NC30	Have a Recycling Program for the materials used in the office?	**no**	**little bit**	**yes**
NC22	Offset its carbon emissions?	**no**	**little bit**	**yes**
NC23	Have specific targets for energy conservation and minimal fuel use for the boats?	**no**	**little bit**	**yes**
NC24	Contribute to COTS eradication? How?	**no**	**little bit**	**yes**
NC25	Have energy reduction targets for the offices?	**no**	**little bit**	**yes**
NC26	Provide information to guests on how to offset carbon from their trip to Australia and with your company	**no**	**little bit**	**yes**
NC27	Provide information to your guests on increasing energy efficiency and reducing or offsetting emissions when back home?	**no**	**little bit**	**yes**
NC28	Is your company a member of any voluntary reef or general conservation organisations . Which ones?	**no**	**little bit**	**yes**
NC29	Does your company donate money to any reef or general conservation agencies?	**no**	**little bit**	**yes**
NC31	Does your company make your boat or spaces on your boat available for environmental education	**no**	**little bit**	**yes**

NC28: Details

NC29: Details

NC30: Does your company undertake any other actions not mentioned yet in support of reef conservation?