



Research

Value of traditional oral narratives in building climate-change resilience: insights from rural communities in Fiji

Shaiza Z. Janif¹, Patrick D. Nunn², Paul Geraghty^{3,4}, William Aalbersberg⁵, Frank R. Thomas⁶ and Mereoni Camailakeba⁷

ABSTRACT. In the interests of improving engagement with Pacific Island communities to enable development of effective and sustainable adaptation strategies to climate change, we looked at how traditional oral narratives in rural/peripheral Fiji communities might be used to inform such strategies. Interviews were undertaken and observations made in 27 communities; because the custodians of traditional knowledge were targeted, most interviewees were 70-79 years old.

The view that oral traditions, particularly those referring to environmental history and the observations/precursors of environmental change, were endangered was widespread and regretted. Interviewees' personal experiences of extreme events (natural disasters) were commonplace but no narratives of historical (unwitnessed by interviewees) events were found. In contrast, experiences of previous village relocations attributable (mainly) to environmental change were recorded in five communities while awareness of environmentally driven migration was more common. Questions about climate change elicited views dominated by religious/fatalist beliefs but included some more pragmatic ones; the confusion of climate change with climate variability, which is part of traditional knowledge, was widespread.

The erosion of traditional environmental knowledge in the survey communities over recent decades has been severe and is likely to continue apace, which will reduce community self-sufficiency and resilience. Ways of conserving such knowledge and incorporating it into adaptation planning for Pacific Island communities in rural/peripheral locations should be explored.

Key Words: *adaptation; climate change; community; Fiji; oral traditions; Pacific Islands; resilience; rural*

INTRODUCTION

Pacific Island coastal communities are particularly vulnerable to future climate change, both because in many cases their livelihoods depend almost entirely on coastal food production and because alternatives to coastal locations for living and subsistence are effectively nonexistent on many islands (Barnett and Campbell 2010). Over the past 30 years, much effort has been expended to assist Pacific Island countries in adapting to future climate change yet hardly any effective and sustainable adaptation is in place. Particularly in archipelagic countries, rural/peripheral locations, which are invariably sparsely populated and often not national priorities for adaptation, are especially exposed because of a generally low awareness of future climate change (Nunn et al. 2014). This situation does not bode well for livelihood sustainability in such places over the next few decades when the pace of global change, particularly sea-level rise, is expected to accelerate (Church et al. 2013).

Key to this challenge is the empowerment of leaders of rural/peripheral communities, already accustomed to developing and sustaining their own environmental plans, to understand the specific future threats posed to their livelihoods by climate change and to act accordingly (Nunn 2009a). A key to this is using an approach that ties future climate change to previous/existing threats and not something entirely new. Pathways to community empowerment are many but those that have involved the imposition of Western scientific concepts and planning horizons on people who invariably lack much formal education and are

used to setting short-term environmental goals has, not surprisingly, failed (Berkes and Jolly 2002, Fazey et al. 2011, McNamara 2013). Failure may not only involve rejection of messages, typically as foreign preoccupations, but also a lack of commitment to sustain adaptation initiatives. Most governments in Pacific Island countries lack sufficient resources to develop and sustain adaptation initiatives in their constituent rural/peripheral communities, so depend on those communities, which also have limited (human and financial) capacity, to do so. This is why many donor-funded projects for community adaptation in the Pacific Islands are not sustained after external funding stops (Nunn 2009a, 2010).

This situation has led to calls for greater community involvement in the development of adaptation strategies as well as the incorporation of traditional knowledge from communities in these strategies to increase the likelihood of their uptake (Mercer et al. 2007, McNaught et al. 2014). This approach works best in those communities that retain a comprehensive body of traditional knowledge and less so in those where traditions have been eroded by the forces of globalization, particularly by the spread of nonindigenous languages that may create communication barriers between children and their elders, the usual custodians of traditional knowledge. However, such knowledge defines communities and may pervade many aspects of their cultural practice, ranging from simple oral narrative to song and dance, and can provide suitable inputs to the participatory development of environmental conservation and

¹Research Office, University of the South Pacific, Suva, Fiji Islands, ²Australian Centre for Pacific Islands Research, University of the Sunshine Coast, Queensland, Australia, ³School of Language, Arts and Media, University of the South Pacific, Suva, Fiji Islands, ⁴Department of Linguistics, University of New England, New South Wales, Australia, ⁵Institute of Applied Sciences, University of the South Pacific, Suva, Fiji Islands, ⁶Oceania Centre for Arts, Culture and Pacific Studies, University of the South Pacific, Suva, Fiji Islands, ⁷Fiji Museum, Suva, Fiji Islands

resilience-building (Johannes 1978, 2002, Veitayaki et al. 2003, McMillen et al. 2014).

ORAL TRADITIONS IN PACIFIC ISLAND CULTURES

Like many of the world's long-established cultures in which literacy began comparatively recently, information about past events and rules for the organization and conduct of Pacific Island society was for a long time communicated intergenerationally by oral means. Oral traditions in Pacific Island cultures have provided valuable insights into the ways they evolved as well as information about geological phenomena observed in preliterate times in the region (Blong 1982, Taylor 1995, Nunn and Pastorizo 2007, Nunn 2009b). Most authorities would regard Pacific Islander oral traditions as able to describe events that occurred as much as 400-700 years ago, less than one-third of the time that most western Pacific island groups have been occupied.

With the introduction of western systems of literacy to Pacific Island countries and their current near-ubiquity, the imperatives for retaining oral traditions have disappeared in many Pacific societies. So rapid has been the marginalization and loss of oral traditions that they were never written down in many societies and now survive only in fragments, occasionally popularized or reinvented; many of the most complete accounts of some groups' oral traditions were recorded by 19th-century European writers in the decades following contact. Today in Pacific Island countries, globalization and the associated rapid spread of literacy-dependent technologies like the internet and mobile-phone communication have further subordinated interest in oral traditions, particularly among younger people.

However, as shown by studies in parts of the world (including Pacific Islands) where oral traditions remain central to expressions of cultural integrity and the understanding of environmental risk (Petterson et al. 2003, Cronin and Cashman 2008, Mercer et al. 2012), communities are proud of these traditions and consider them to be their property, in often stark contrast to outside messages about environmental history and sustainability. Recognizing this, it has become apparent that such traditions might be incorporated into local adaptation strategies to make these more acceptable to local communities (Hviding 1998, 2006, Nunn 2014).

The bodies of oral tradition that once existed in Fiji have been significantly eroded within the 150 years since European settlement and are today most completely remembered by older people in more marginal locations, often in fragmented form. We sought to record Fijian (*iTaukei*) oral traditions about past environmental changes in a range of rural/peripheral (traditionally organized) Fiji communities with a view to determining whether these traditions might be useful in explaining future climate change and developing adaptive strategies that will enhance resilience.

STUDY SITES AND METHODS

A range of rural/peripheral settlements or villages was sampled within the Fiji archipelago (Fig. 1, Table 1). Given that most of Fiji's population lives on Viti Levu, the largest island in the group, where the major urban centers are located, a few rural (rather than peri-urban) villages on this island were sampled; these included five in the southwest of the island, three along its east coast, and three in the Rewa Delta. Villages on islands off the

coast of Viti Levu, on Vatulele and Viwa, are more marginal, especially Vatulele, which is reached by means of a three-hour boat journey from the south coast of Viti Levu.

Fig. 1. Map of the Fiji Islands showing the locations of study sites (see Table 1 for more detailed information).



Five settlements within two hours' drive of Savusavu Town on the island of Vanua Levu, the second largest in the group, were also sampled as well as three on Taveuni Island and one each on the nearby islands of Kioa, Qamea, and Rabi. All these villages are considered to be in peripheral locations.

Interviews in each village were conducted by SZJ and MC in one or more of the preferred vernacular languages of Fiji; part of this survey was reported in an unpublished higher degree thesis (Janif 2014). Snowball sampling was used as well as both opportunistic and targeted sampling of male and female elders in the select communities, facilitated in each village by its headman (*turagani-koro*). The research targeted people who had resided continuously in the particular village for at least 25 years, the assumption being that those who had lived elsewhere, or who had married into the village, would be less familiar with the community's traditions, possibly even misrepresenting them (Lata and Nunn 2012). The other selection criterion was that informants needed to be at least 50 years old, the assumption being that younger people would not necessarily be privy to the range of oral traditions that their elders knew. The largest cohort (42%) was the 70-79 age range and most (58%) were male.

Following preliminaries, interviews involved questions, not asked directly but through topic prompting, concerning oral traditions (including poetry, songs, and performance) referring to past climate and environmental changes, prompted through memories of natural disasters and village relocations (migrations). All interviews were translated into English and transcribed and analyzed using NVivo. Interviews were supplemented by larger gatherings, invariably involving *yaqona* (a traditional drink) consumption, at which discussions ranged wider, generally from oral traditions through village history, responses to (environmental) threats, and resilience in the face of future threats. Systematic and participant observations were also employed to provide context.

Table 1. Study sites for village data gathering in Fiji (see Figure 1 for locations).

Island	Village	Traditional knowledge of environmental events
Kioa	Salia	none reported - residents moved in 1947 from Vaitupu Island, Tuvalu
Qamea	Dreketi	none reported
Rabi	Tabwewa (Nuku)	none reported - residents moved in 1945 from Banaba Island, Kiribati
Taveuni	Bouma	none reported
	Lavena	none reported
	Vuna	none reported
Vanua Levu	Ketei	none reported
	Nagigi	village moved here during the 19th century because large waves swept over previous site
	Savudrodro	none reported - village relocated in AD 1917
	Vanuavou	none reported
	Yaroi	none reported
Vatulele	Bouwaqa	memories of past tsunamis and tropical cyclones
	Ekubu	memories of past tsunamis and tropical cyclones
	Lomanikaya	memories of past tsunamis and tropical cyclones
	Taunovo	memories of past tsunamis and tropical cyclones
Viti Levu (east coast)	Matacaucau	village moved here in AD 1868 after increasing tidal flooding of former site
	Matacula	village moved here in AD 1940 after increasing tidal flooding of former site
	Ucunivanua	none reported
Viti Levu (Rewa Delta)	Lokia-Naililili	progressive disappearance of Bucona Island attributed to wave impact
	Nukui	increasing distance from Taituraga Island attributed to shoreline erosion
	Vutia	progressive size reduction of Nukubuco Island attributed to wave impact
Viti Levu (southwest)	Korotogo	memories of past tsunamis and tropical cyclones
	Malevu	memories of past tsunamis and tropical cyclones
	Sanasana	memories of past tsunamis and tropical cyclones
	Semo	none reported - residents relocated in 1970s from Viwa Island [†] because of isolation
	Vatukarasa	memories of past tsunamis and tropical cyclones
Viwa	Viwa	none reported

[†]Note that this is the Viwa Island in the Yasawa group, not that off the east coast of Viti Levu Island, which was one of the study sites.

RESULTS AND ANALYSIS

Quotations from informants were translated from a particular Fijian vernacular and are deidentified to ensure informant anonymity.

Valuation and endangerment of environmental traditions

The introduction of Christianity (*lotu*) to Fiji in the second half of the 19th century led to massive changes in indigenous culture, something aided by the huge loss of life from introduced disease and land “purchases” by settlers (McNeill 1994, Campbell 2011). The uptake of Christianity among indigenous Fijians (*iTaukei*) was almost total by the 1880s and their pre-Christian history was comprehensively rewritten (France 1966, Geraghty 1977). Nineteenth century European settlers found that Fijians had no knowledge about where they had lived before reaching Fiji so, as a result of courses taught at the Methodist training institution and a newspaper competition in 1892, the improbable story that they came from East Africa in a canoe named Kaunitoni led by a warrior named Lutunasobasoba was born, and is still widely believed in modern Fiji.

All respondents in this project rated their oral traditions, especially those containing practical advice for coping with environmental risk, as “extremely important” and key to their community’s cultural identity. Most recognized their oral traditions to be endangered and several believed the government should be more proactive in their recording and conservation.

Recalling his youth, one informant stated the following:

I used to be like a shadow, following my grandfather everywhere. He used to tell me the names of the [different types of] fish and the best time to catch them. He would dive and I would sit in the boat and wait for him to come up. That was a long time ago [but] I did the same with my grandsons (Male, 68 years, Viti Levu Island).

Of all respondents, 33% stated that they spoke often about their experience of natural disasters, most commonly with children and grandchildren, but also in community gatherings where younger people could absorb this traditional knowledge. Parents’ preference for this kind of knowledge over school-taught Western knowledge within rural Fiji communities has been documented elsewhere (Kline et al. 2013).

Several discussions in the sample villages recalled persons lately deceased who had had an enviable knowledge of oral traditions, far greater than anyone still alive, an observation that underlines their endangerment. Some informants recalled that the traditional contexts in which storytelling once routinely took place had changed as communities became less self-sufficient, more focused on cash-generating activities, and connected through radio, television, and internet to a world with more possibilities than that in which older villagers lived when young. Several informants recalled times in their youth when elders would

systematically recount village history to younger people and explain what constituted proper behavior, something that is less common today. This seems to contrast with the situation in Yasawa villages, on the Fiji periphery (see Fig. 1), where 95% of respondents stated that culturally appropriate behavior was currently taught by parents to children, including “knowledge of ritual traditions and respectful behaviour expected from those living in a Fijian village” (Kline et al. 2013:362).

Only 11% of informants knew narratives about past extreme events that were not wholly based on personal experience of these. These narratives were generally conflated accounts of different events (extreme waves, winds, drought), all of which had occurred within the lifetime of the informant. Similarly, although 29% of respondents stated that their cultural unit (*mataqali* or *yavusa*) had either songs (*sere*) or dances (*meke*) composed in memory of such events, none of the respondents could remember the words; only a few were able to outline the circumstances in which the song/dance had been created.

We have forgotten the meke[s], that is why you don't find meke for this village. It is because the elders have passed away. This is what I am talking about, that times are changing (Male, 50 years, Viti Levu Island).

A *meke* recalling the story about why and how Matacaucau Village moved to its present site once existed but the lyrics and actions were considered the property of the composer (*daunivucu*) and were intentionally forgotten after he died. One explanation for this is the belief that *meke* are divinely inspired, the composer a mere mouthpiece and not permitted to bequeath his/her knowledge (Goldsworthy 1995).

In the villages surveyed, the creation of commemorative *sere* and *meke* was formerly more common than it is now. Their displacement by both visual media (DVDs/video tapes and television) and professional (commercial) recordings was commented on in several discussions. *Meke* specific to a particular group are now performed only during certain cultural functions, often at intervals of many years, so with no regular practice or the death of *daunivucu*, precise knowledge of them disappears.

Tradition and experience in preparation for natural disasters

All informants could tell of their personal experiences of extreme events, mostly the tropical cyclones (hurricanes) that regularly affect Fiji, but a few (14%) told of tsunamis that occasionally reach island shorelines in Fiji, particularly where gaps exist in offshore reefs. All respondents knew how the community should respond when a tropical cyclone was approaching and stated that this knowledge, which ranged from strengthening buildings to harvesting crops and burying to ferment “cyclone foods” like breadfruit (*Artocarpus altilis*) and plantain (*Musa balbisiana*; (Aalbersberg et al. 1988), was well known among community residents. Some informants lamented the fact that younger people were apparently less interested in learning about this because external assistance invariably arrived after the cyclone had passed, a comparable situation to that identified in other Pacific Island countries (Campbell 1984, 2015).

Several narratives containing information about how to recognize the approach of a tropical cyclone (in advance of the weather changing) or tsunami wave were collected in the villages surveyed.

These narratives include observations of unusual animal and plant behavior, similar to those found in Samoa (Lefale 2010). One mentioned the danger of inadvertently catching a particular type of fish.

My grandmother always said that if someone goes out fishing and catches a fish called Na Ki [Upeneus vittatus, the bandedtail goatfish] and brings it to the village without noticing, there will be a large wave (tsunami) coming soon afterwards (Female, 69 years, Viti Levu Island).

Several respondents also mentioned that when hornets start building their nests closer to the ground than usual, it is a sign that a tropical cyclone is imminent. Likewise it appeared common knowledge in the villages surveyed that the excessive fruiting of breadfruit and mandarin (*Citrus* spp.) signalled the approach of extreme weather. These narratives were commonly linked to practical advice.

My elders have told me that when I see these signs I have to be prepared. Get things ready ... like the houses to be properly secured and the storage of food for hurricane time as well as after the hurricane. In the past we used to bury the vudi [plantain] in the ground and that would be used after the hurricane. It would taste as good as the fresh ones and it was something we could always rely on after the hurricane passed (Male, 80 years, Vatulele Island).

Similar advice is used in villages on Taveuni Island (see Fig. 1) and includes smoking of fish and cooking of dense root vegetables in an earth oven (*lovo*) as food for the period of postcyclone shortage (McNamara and Prasad 2014).

Several informants on Vatulele Island recalled that their ancestors also knew when bad weather, perhaps a tropical cyclone, was approaching even weeks in advance because the central unfurled leaf (*uvu-na*) of the *vudi* plant would be bent down rather than pointing straight up. Seven people interviewed on Vatulele insisted this was correct, stating that within the past five years they had noticed *vudi* leaves not growing straight just before a tropical cyclone reached the island (Fig. 2). On each occasion, these observations had been accepted by the community as a warning sign and it had made appropriate preparations.

Such instances are most common today in more traditional settings, especially those that are peripheral within archipelagic countries like Fiji, farther from developmental cores where awareness of disaster is effectively tracked on television and radio days in advance of impact and officials are proactive in encouraging appropriate preparations. Similar traditional knowledge involving observing ocean color, waves, and wind is used as prognosticators of extreme weather elsewhere in the Pacific Islands (Nakashima et al. 2012) while longer term, more pragmatic preparations for tropical-cyclone impacts are also found in Fiji; for example, the chief of Naselesele Village on Taveuni Island counselled younger villagers to always plant a patch of sweet potatoes (*kumala*, *Ipomoea batatas*) before December so it would be available for easy harvest should the village be affected by a cyclone (McNamara and Prasad 2014).

Fig. 2. Photograph of a vudi (*Musa balbisiana*) plant showing the leaves that indicate the likelihood of bad weather if not growing straight.



Relocation and migrations

Narratives collected from five villages told of the time when the village and its inhabitants moved to the present site (Table 1). Nagigi Village was relocated during the 19th century after large waves, probably storm surge rather than tsunami (given its sheltered location), washed over the former village site rendering it uninhabitable. This is distinct from the stories collected from Matacaucau and Matacula villages that moved to their present sites after progressive flooding of their former sites rendered these uninhabitable. Other examples in Fiji of both these situations are known to the authors. For example, the coastal village of Maloku on Moala Island was relocated upslope in the 1980s when its lowland site became uninhabitable as the combined result of sea-level rise and subsidence. Villages surveyed for this project in the largest river delta in Fiji, that of the Rewa River in southeast Viti Levu Island, all had stories about changing shorelines and disappearing land that are typical of such dynamic deltaic environments and not necessarily indicative of climate-change impact.

In two groups of Rewa villages (Lokia-Nailili and Vutia), progressive size reductions of islands were reported. Bucona Island was once inhabited by several families, crops were planted there, but in the 1960s as the size of the island was reduced during floods it became a recreation area and performance space; by the 1980s it had disappeared. Nukubuco was 3600 m² in area in the 1950s and was used by fisherfolk and for picnics; today it is devastated and almost vanished.

In another Rewa village (Nukui), recent sea-level rise is stated to be the cause of the progressive increase in the distance between the village shoreline and that of offshore Taituraga Island. Although sea-level rise is known to be affecting Nukui (Mimura and Nunn 1998), it does not necessarily need to be even the principal cause of this observation because the village is located along a dynamic delta front.

There is a growing acknowledgement of the value of knowledge about past relocations for easing the problems in discussing future relocation with vulnerable coastal communities in the Pacific Islands (Campbell 2010, McAdam 2014). In addition, the study of past relocations has also led to an understanding of the associated problems and how they might be alleviated in the future (Connell 2012). However, a challenge remains in countries like Fiji where past settlement relocation commonly occurred for reasons that differed from those likely to necessitate future relocation. For example, respondents in all villages sampled for this project, when asked about past relocation, explained that many villages in Fiji had shifted in the late 19th century because of the 1875 measles epidemic that swept through these islands causing the death of “one fifth (perhaps even one quarter) of the islands’ population” (Cliff and Haggett 1985:29). Only three villages in our survey had stories of how their settlement had once relocated for environmental reasons (see Table 1) but other examples are known, including the flood-exposed inland village of Biausevu in southern Viti Levu (Campbell 2010).

Views about climate change

After all other topics had been discussed in the sample villages, questions were asked about future climate change and the ways in which it might affect livelihoods of the villagers; this question is premised on the exposure of Fiji people to information about climate change for at least a decade. All respondents in the sample villages stated that they had heard about climate change, a contrast to other Fiji surveys; for example, 50% of residents questioned in the Vutia villages in the Rewa Delta (Viti Levu Island) claimed not to have heard about climate change (Lata and Nunn 2012). Differences should not be exaggerated because respondent age range differed and because there are challenges involved in translating “climate change” into different Fijian languages and dialects, something encountered in other Pacific Island groups (Rudiak-Gould 2012).

A few respondents expressed pragmatic views about how the community should respond to the challenges associated with climate change.

It means to me that I should be prepared and prepare my family as well for the future. I have been preaching here in the village, about the changes in the climate. We need to preserve the environment because we are connected to the environment. We should preserve the resources in the sea and on land (Male, 71 years, Vatulele Island).

Such views gel with most secular messaging about climate change in the contemporary Pacific, as well as that from the ecumenical Pacific Conference of Churches (PCC), yet most respondents drew more deeply upon their spiritual beliefs to explain climate change.

I think that it is God's will that these changes are happening. All we need to do is to pray more and be good people with good hearts and God will help us (Female, 78 years, Viti Levu Island).

It means that God is punishing us (Female, 73 years, Viti Levu Island).

We are coming to the end of the world. In the past there were seasons that came every year and were predictable. But now we are facing all kinds of weather any time of the year. I believe that this is the end of times and so we need to be prepared (Female, 69 years, Viti Levu Island).

This kind of religion-contextualized response to climate change has been found elsewhere in Fiji and in other Pacific Island groups (Mortreux and Barnett 2009, Lata and Nunn 2012) and is unsurprising given the comparatively high numbers of churchgoers; for example, in both the 2007 census in Fiji and the 2011 census in Tonga less than 1% of the population stated they had no religion. The belief that unwelcome environmental changes are punishments from an offended deity are likewise common in the Pacific and in traditional belief systems in most other parts of the world (Kelsen 1988, Nunn 2009b). What is more surprising is the millennialist/fatalist tone of these expressions, which may reflect the helplessness that people such as those interviewed feel when thinking about climate change; similar feelings were reported among people of islands in neighboring Tuvalu (Mortreux and Barnett 2009).

When asked about the effects of climate change that they had witnessed, respondents were generally more circumspect, 71% unable to name any specific effect in their local area. Six percent cited unspecified changes in the pattern of the weather while 20% named beach/shoreline erosion as the principal consequence.

These results are similar to other comparable surveys in tropical Pacific Island countries. For example, in a 2009-2010 study of communities in the Rewa Delta (Fiji), riverbank erosion, flooding and rainfall seasonality changes were all identified as changes attributable to climate change although discussions made it clear that the communities actually believed these effects to be caused by shorter term climate variability (Lata and Nunn 2012).

Many Pacific Island coastal communities have attributed evidence of local-area shoreline erosion, groundwater salinization, and increased incidences of coastal/lowland flooding to climate change although in all cases this is unlikely to be an independent judgement but rather a convenient one that assumes climate change to be the explanation for everything out of the ordinary (Rudiak-Gould 2012). However, coastal communities in the Pacific Islands region are demonstrably capable of identifying and attributing long-term temperature and sea-level rise. Examples come from Kiribati (Kuruppu 2009) and from Solomon Islands, where increases in nearshore seagrass extent and increased difficulty of crossing nearshore reefs on foot were both cited by local communities as evidence for recent sea-level rise

(Lauer and Aswani 2010). Similar observations have been documented for indigenous communities elsewhere (Krupnick and Jolly 2002).

DISCUSSION

There is no doubt that traditional ecological and environmental knowledge is valued highly by the older generation of rural-dwelling Fijians who also consider that storytelling and oral instruction are the most culturally valid methods for communicating this knowledge. This conclusion is consistent with that from a study of rural villages in the Yasawa group (northwest Fiji) that found that traditional knowledge was regarded as more practical with villagers rating more formally educated individuals as “having less knowledge of important domains of work within the village” (Kline et al. 2013:358).

However, our survey registered a loss of traditional ecological and environmental knowledge about which respondents expressed concern, often contextualized within broader changes to society associated with globalization and the spread of new technologies, analogous with the effects of modernization on indigenous responses to disaster in the Pacific Islands (Pelling and Uitto 2001). Similar situations documented on other Pacific Islands have led to a progressive “erosion of resilience” in many communities (Campbell 2009). An example comes from Mota Lava Island in Vanuatu where following a tropical cyclone in 1910 the islanders processed sago and did not go hungry, a contrast to the situation in 1980 when only a handful of people knew how to do this (Campbell 1990).

Although no suggestion was made during our survey that any traditionally acquired information about environmental hazards, typically communicated orally, was not free for any member of the community to share with any other (typically parent to child), this is the case elsewhere in the Pacific and has been identified as a risk in future disaster response (Walshe and Nunn 2012). However, the same liberty does not apply in our sample villages to other forms of communication, such as songs and dances, some of which die with their composers. Although this may hinder aspects of cultural continuity, it appears that songs and dances are today regarded largely as entertainment, expressions of cultural pride, rather than the practical lessons in culture history and definition they may have been before the watershed introduction of Christianity and the beginning of written history in Fiji (Pigliasco 2010).

In the villages surveyed, there is a wealth of knowledge about the precursors of environmental threats (natural hazards) and about how to prepare for these. The former are mostly long-held beliefs that have not been scientifically validated—stories like catching particular fish, observing hornets’ nests—while the latter generally represent knowledge of undisputed validity acquired within a person’s lifetime and reinforced in many nontraditional ways, such as through mass media and government-sponsored community workshops. In the Pacific Islands, there is also considerable scientifically validated traditional knowledge ranging from weather to natural medicinal products (Lefale 2010, Kumar-Roine et al. 2011).

Although there appears to be some validity in nonscientific precursors of earthquakes (Whitehead et al. 2004), typically aberrant animal behavior, there has been less attention paid to

traditional methods of weather forecasting, particularly of extreme events, although knowledge of these methods is widely claimed by indigenous communities in many parts of the world. These include rice farmers in Sarawak (Malaysia) who bring an array of sensory methods to the prediction of monsoon onset and can detect El Niño Southern Oscillation-linked variations to normal conditions (Garay-Barayazarra and Puri 2011) and those of Ilocos Norte (Philippines) who employ a broader range of indicators, similar to many reported in this project, to predict the onset of various natural disasters and changes (Galacgac and Balisacan 2009).

There is a tension in the sample villages around the privileging of traditional or Western scientific knowledge that increasingly encourages people to choose one or the other. Older people, such as the majority of those interviewed, clearly have faith in customary beliefs, which they hold to be time-tested and valid for having helped sustain the community up until the present. Younger people, being more globally aware and engaged, generally hold such beliefs in less esteem and in some communities are known to be questioning their practical utility as well as the traditional decision-making hierarchy that sustains them; such a situation was described from Butaritari Island in Kiribati (Nunn et al. 2014).

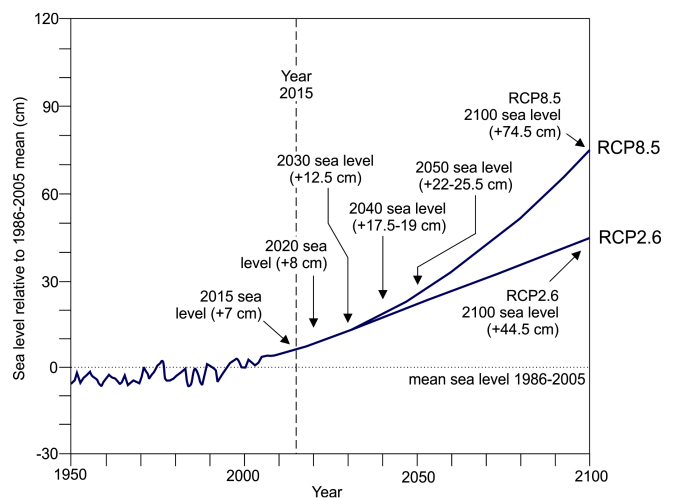
The role of actors outside the village, such as government, nongovernment organizations, donors, in moderating such tensions is critical. For example, governments that appear dismissive of traditional knowledge and uncritically favor solutions suggested/funded by their donor partners are likely to find little sustained enthusiasm for these solutions at present in villages such as those studied. In contrast, outside agencies that seek participatory solutions to environmental risk incorporating traditional knowledge are likely to find more receptive audiences in such villages (Mercer et al. 2012).

Traditional and nontraditional (“modern”) environmental knowledge coexist in our sample communities. A study of tsunami awareness among communities in southern Pentecost Island in Vanuatu concluded that, despite government attempts to raise awareness, traditional knowledge about tsunami precursors and response was far more widespread, and accounted for the low number of fatalities during the 1999 tsunami (Walshe and Nunn 2012). A parallel situation was documented for tsunami response within indigenous coastal communities in Indonesia and Solomon Islands (McAadoo et al. 2006, Fritz and Kalligeris 2008). However, it seems likely that traditional environmental knowledge is declining in such communities and has even been lost completely in some. This may be bemoaned but is certainly not unexpected. A key question is whether there is practical use in conserving such knowledge.

Conserving traditional knowledge of any kind is important simply because it represents a unique experiential record of cultural diversity. The conservation of traditional knowledge can also help its owners understand their history in ways that might help them cope with their future. This is especially true for coastal communities confronted by an increasing awareness of the fragility of their village locations, typically as a result of rising sea level. Learning that a similar village moved to its present location as a consequence, even in part, of environmental impacts is helpful in planning future village relocation.

The suggestion that coastal settlements on Pacific islands may have to relocate to less-vulnerable locations in the next few decades as sea level rises has met with considerable resistance at both government and community level (Nunn 2009a). As with coastal communities elsewhere in the world, this resistance is premised on both the belief that such locations must be secure because they have been settled for generations and a concomitant scepticism about whether the threat of sea-level rise is indeed real or illusory/exaggerated. However, as the best-available science demonstrates, sea level is likely to rise in Fiji over the next few decades (Fig. 3) in ways that will inevitably affect island coastlines and lead to a deterioration of coastal liveability; in order to remain viable, hundreds of rural/peripheral coastal settlements in Fiji will have to relocate to less-vulnerable (upslope/inland) locations before the end of this century.

Fig. 3. Past and projected sea-level change in Fiji (1950-2100; after BOM 2014). Projections are based on high and low representative concentration pathways (RCPs); uncertainty ranges are not shown.



For many reasons, especially those associated with land ownership and access to subsistence resources, the process of relocation in Fiji and other Pacific Island nations is likely to involve numerous challenges (Campbell 2010). Although Pacific Island governments may eventually develop national plans for the relocation of their most vulnerable settlements, it is likely that most rural/peripheral settlements in archipelagic countries like Fiji will be left to develop and implement their own relocation strategies (Nunn et al. 2014). In this regard, knowledge of past relocations may be valuable not just as precedents but also as practical demonstrations of how community and cultural integrity can survive such disruption.

There are many facets of Fiji villages exposed in this project and others that speak to the resilience of traditional communities to environmental shocks, something that has commonly been underplayed in discussions about the exposure of Pacific Islands to climate change (Campbell 2009, Farbotko 2010, Farbotko and McGregor 2010, Schwarz et al. 2011, McMillen et al. 2014, Allen 2015). Among the components of resilience are traditional environmental knowledge, community unity, respected decision-

making processes, abundant communication and discussion opportunities, and community self-belief in their ability to manage their own futures. Of course, many of these have been diminished within the past 50 years or so but their continued existence in all 27 villages studied for this project shows that the apparatus of resilience remains in place.

Strengthening this apparatus will help communities respond optimally to future climate change. Our research suggests this might be accomplished for Fiji by the systematic recording and sharing of traditional environmental knowledge, by gathering and disseminating knowledge about past settlement relocations, and by empowering “persons of influence” in communities to understand the nature of challenges posed by climate change and to respond appropriately (Nunn et al. 2014).

CONCLUSION

The clues for combating climate change lie in our past ancestral wisdom ... If we honour our Pacific traditions and carry our ancestors forward with us, then we will honour their systems of sustainability in order to provide an abundant future for our young (Dunsford 2010:4-5).

Words like these by Pacific Islanders speak to the determination that exists within the region to overcome the challenges that future climate change will bring. Such words also glorify Pacific pasts and the wisdom that has come from them, the culmination of more than 3000 years of living in “fragile” environments, weathering a range of environmental challenges. Knowledge of how Pacific people accomplished this is not merely a source of great pride but also, as is argued in this paper, a practical means of increasing/building resilience to cope with such challenges.

Of course, the landscape of the Pacific Islands has changed considerably in the past 150 years and the knowledge gulfs that exist in modern Fiji villages between both older and younger residents and between core and peripheral locations are well illustrated by this study. The situation today may be historically unprecedented but it does not necessarily render irrelevant the use of traditional environmental knowledge for developing future climate-change strategies.

Responses to this article can be read online at:
<http://www.ecologyandsociety.org/issues/responses.php/8100>

Acknowledgments:

Fieldwork for the data collection on which this paper is based was funded by the University of the South Pacific. We are grateful to the people of all communities named in Table 1 for their generosity in sharing their traditions and for their hospitality toward the researchers.

LITERATURE CITED

Aalbersberg, W. G. L., C. E. A. Lovelace, K. Madhoji, and S. V. Parkinson. 1988. Davuke, the traditional Fijian method of pit preservation of staple carbohydrate foods. *Ecology of Food and Nutrition* 21(3):173-180. <http://dx.doi.org/10.1080/03670244.1988.9991030>

Allen, M. G. 2015. Framing food security in the Pacific Islands: empirical evidence from an island in the Western Pacific. *Regional Environmental Change* 15(7):1341-1353. <http://dx.doi.org/10.1007/s10113-014-0734-5>

Barnett, J., and J. Campbell. 2010. *Climate change and small island states: power, knowledge and the South Pacific*. Earthscan, London, UK.

Berkes, F., and D. Jolly. 2002. Adapting to climate change: social-ecological resilience in a Canadian western Arctic community. *Conservation Ecology* 5(2):18. [online] URL: <http://www.ecologyandsociety.org/vol5/iss2/art18/>

Blong, R. 1982. *The time of darkness: local legends and volcanic reality in Papua New Guinea*. Australian National University Press, Canberra, Australia.

Bureau of Meteorology (BOM). 2014. *Climate variability, extremes and change in the western tropical Pacific: new science and updated country reports*. Pacific-Australia Climate Change Science and Adaptation Planning Program, Technical Report. Australian Bureau of Meteorology (BOM) and Commonwealth Scientific and Industrial Research Organisation (CSIRO), Melbourne, Australia.

Campbell, I. C. 2011. *Worlds apart: a history of the Pacific Islands*. Canterbury University Press, Christchurch, New Zealand.

Campbell, J. R. 1984. *Dealing with disaster: hurricane response in Fiji*. Pacific Islands Development Program, East-West Center, Honolulu, Hawai'i, USA.

Campbell, J. R. 1990. Disasters and development in historical context: tropical cyclone response in the Banks Islands, northern Vanuatu. *International Journal of Mass Emergencies and Disasters* 8(3):401-424.

Campbell, J. R. 2009. Islandness: vulnerability and resilience in Oceania. *Shima: The International Journal of Research into Island Cultures* 3(1):85-97.

Campbell, J. R. 2010. Climate-induced community relocation in the Pacific: the meaning and importance of land. Pages 57-79 in J. McAdam, editor. *Climate change and displacement: multidisciplinary perspectives*. Hart, Oxford, UK.

Campbell, J. R. 2015. Development, global change and traditional food security in Pacific Island countries. *Regional Environmental Change* 15(7):1313-1324. <http://dx.doi.org/10.1007/s10113-014-0697-6>

Church, J. A., P. U. Clark, A. Cazenave, J. M. Gregory, S. Jevrejeva, A. Levermann, M. A. Merrifield, G. A. Milne, R. S. Nerem, P. D. Nunn, A. J. Payne, W. T. Pfeffer, D. Stammer and A. S. Unnikrishnan. 2013. Sea level change. Pages 1137-1308 in T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P. M. Midgley, editors. *Climate change 2013: the physical science basis. Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge, UK.

Cliff, A. D., and P. Haggert. 1985. *The spread of measles in Fiji and the Pacific: spatial components in the transmission of epidemic waves through island communities*. Australian National University, Canberra, Australia.

- Connell, J. 2012. Population resettlement in the Pacific: lessons from a hazardous history? *Australian Geographer* 43(2):127-142. <http://dx.doi.org/10.1080/00049182.2012.682292>
- Cronin, S. J., and K. V. Cashman. 2008. Volcanic oral traditions in hazard assessment and mitigation. Pages 175-202 in J. Gratton and R. Torrence, editors. *Living under the shadow: cultural impacts of volcanic eruption*. Left Coast Press, Oakland, California, USA.
- Dunsford, C. K. 2010. Kaitiakitanga: protecting our oceans, islands and skies by inspiring a climate change of consciousness. *Dreadlocks* 6:1-22.
- Farbotko, C. 2010. Wishful sinking: disappearing islands, climate refugees and cosmopolitan experimentation. *Asia Pacific Viewpoint* 51(1):47-60. <http://dx.doi.org/10.1111/j.1467-8373.2010.001413.x>
- Farbotko, C., and H. V. McGregor. 2010. Copenhagen, climate science and the emotional geographies of climate change. *Australian Geographer* 41(2):159-166. <http://dx.doi.org/10.1080/00049181003742286>
- Fazey, I., N. Pettorelli, J. Kenter, D. Wagatora, and D. Schuett. 2011. Maladaptive trajectories of change in Makira, Solomon Islands. *Global Environmental Change* 21(4):1275-1289. <http://dx.doi.org/10.1016/j.gloenvcha.2011.07.006>
- France, P. 1966. The Kaunitoni migration: notes on the genesis of a Fijian tradition. *Journal of Pacific History* 1(1):107-113. <http://dx.doi.org/10.1080/00223346608572082>
- Fritz, H. M., and N. Kalligeris. 2008. Ancestral heritage saves tribes during 1 April 2007 Solomon Islands tsunami. *Geophysical Research Letters* 35(1):L01607. <http://dx.doi.org/10.1029/2007GL031654>
- Galacgac, E. S., and C. M. Balisacan. 2009. Traditional weather forecasting for sustainable agroforestry practices in Ilocos Norte Province, Philippines. *Forest Ecology and Management* 257(10):2044-2053. <http://dx.doi.org/10.1016/j.foreco.2009.01.002>
- Garay-Barayazarra, G., and R. K. Puri. 2011. Smelling the monsoon: senses and traditional weather forecasting knowledge among the Kenyah Badeng farmers of Sarawak, Malaysia. *Indian Journal of Traditional Knowledge* 10(1):21-30.
- Geraghty, P. 1977. How a myth is born: the story of the Kaunitoni story. *Mana* 2(1):25-29.
- Goldsworthy, D. 1995. Continuities in Fijian music: meke and same. *Yearbook for Traditional Music* 27:23-33. <http://dx.doi.org/10.2307/768101>
- Hviding, E. 1998. Contextual flexibility: present status and future of customary marine tenure in Solomon Islands. *Ocean & Coastal Management* 40(2-3):253-269. [http://dx.doi.org/10.1016/s0964-5691\(98\)00042-8](http://dx.doi.org/10.1016/s0964-5691(98)00042-8)
- Hviding, E. 2006. Knowing and managing biodiversity in the Pacific Islands: challenges of environmentalism in Marovo Lagoon. *International Social Science Journal* 58(187):69-85. <http://dx.doi.org/10.1111/j.1468-2451.2006.00602.x>
- Janif, S. Z. 2014. *Assessing the value of oral narratives to build resilience to climate change - case study of southwestern coast of Viti Levu and the island of Vatulele, Fiji*. Thesis. University of the South Pacific, Suva, Fiji.
- Johannes, R. E. 1978. Traditional marine conservation in Oceania and their demise. *Annual Review of Ecology and Systematics* 9:349-364. <http://dx.doi.org/10.1146/annurev.es.09.110178.002025>
- Johannes, R. E. 2002. The renaissance of community-based marine resource management in Oceania. *Annual Review of Ecology and Systematics* 33:317-340. <http://dx.doi.org/10.1146/annurev.ecolsys.33.010802.150524>
- Kelsen, H. 1988. The principle of retribution in the flood and catastrophe myths. Pages 125-149 in A. Dundas, editor. *The flood myth*. University of California Press, Berkeley, California, USA.
- Kline, M. A., R. Boyd, and J. Henrich. 2013. Teaching and the life history of cultural transmission in Fijian Villages. *Human Nature* 24(4):351-374. <http://dx.doi.org/10.1007/s12110-013-9180-1>
- Krupnick, I., and D. Jolly. 2002. *The Earth is faster now: indigenous observations of Arctic environmental change*. Arctic Research Consortium of the United States, Fairbanks, Alaska, USA.
- Kumar-Roiné, S., H. T. Darius, M. Matsui, N. Fabre, M. Haddad, M. Chinain, S. Pauillac, and D. Laurent. 2011. A review of traditional remedies of ciguatera fish poisoning in the Pacific. *Phytotherapy Research* 25(7):947-958. <http://dx.doi.org/10.1002/ptr.3396>
- Kuruppu, N. 2009. Adapting water resources to climate change in Kiribati: the importance of cultural values and meanings. *Environmental Science & Policy* 12(7):799-809. <http://dx.doi.org/10.1016/j.envsci.2009.07.005>
- Lata, S., and P. D. Nunn. 2012. Misperceptions of climate-change risk as barriers to climate-change adaptation: a case study from the Rewa Delta, Fiji. *Climatic Change* 110(1):169-186. <http://dx.doi.org/10.1007/s10584-011-0062-4>
- Lauer, M., and S. Aswani. 2010. Indigenous knowledge and long-term ecological change: detection, interpretation, and responses to changing ecological conditions in Pacific Island communities. *Environmental Management* 45(5):985-997. <http://dx.doi.org/10.1007/s00267-010-9471-9>
- Lefale, P. F. 2010. *Ua'afa le Aso* Stormy weather today: traditional ecological knowledge of weather and climate. The Samoa experience. *Climatic Change* 100(2):317-335. <http://dx.doi.org/10.1007/s10584-009-9722-z>
- McAdam, J. 2014. Historical cross-border relocations in the Pacific: lessons for planned relocations in the context of climate change. *Journal of Pacific History* 49(3):301-327. <http://dx.doi.org/10.1080/00223344.2014.953317>
- McAdoo, B. G., L. Dengler, G. Prasetya, and V. Titov. 2006. Smong: how an oral history saved thousands on Indonesia's Simeulue Island during the December 2004 and March 2005 tsunamis. *Earthquake Spectra* 22(S3):S661-S669. <http://dx.doi.org/10.1193/1.2204966>
- McMillen, H. L., T. Ticktin, A. Friedlander, S. D. Jupiter, R. Thaman, J. Campbell, J. Veitayaki, T. Giambelluca, S. Nihmei, E. Rupeni, L. Apis-Overhoff, W. Aalbersberg, and D. F. Orcheron. 2014. Small islands, valuable insights: systems of customary resource use and resilience to climate change in the Pacific. *Ecology and Society* 19(4):44. <http://dx.doi.org/10.5751/es-06937-190444>

- McNamara, K. E. 2013. Taking stock of community-based climate-change adaptation projects in the Pacific. *Asia Pacific Viewpoint* 54(3):398-405. <http://dx.doi.org/10.1111/apv.12033>
- McNamara, K. E., and S. S. Prasad. 2014. Coping with extreme weather: communities in Fiji and Vanuatu share their experiences and knowledge. *Climatic Change* 123(2):121-132. <http://dx.doi.org/10.1007/s10584-013-1047-2>
- McNaught, R., O. Warrick, and A. Cooper. 2014. Communicating climate change for adaptation in rural communities: a Pacific study. *Regional Environmental Change* 14(4):1491-1503. <http://dx.doi.org/10.1007/s10113-014-0592-1>
- McNeill, J. R. 1994. Of rats and men: a synoptic environmental history of the island Pacific. *Journal of World History* 5:299-349.
- Mercer, J., D. Dominey-Howes, I. Kelman, and K. Lloyd. 2007. The potential for combining indigenous and western knowledge in reducing vulnerability to environmental hazards in small island developing states. *Environmental Hazards* 7(4):245-256. <http://dx.doi.org/10.1016/j.envhaz.2006.11.001>
- Mercer, J., J. C. Gaillard, K. Crowley, R. Shannon, B. Alexander, S. Day, and J. Becker. 2012. Culture and disaster risk reduction: lessons and opportunities. *Environmental Hazards* 11(2):74-95. <http://dx.doi.org/10.1080/17477891.2011.609876>
- Mimura, N., and P. Nunn. 1998. Trends of beach erosion and shoreline protection in rural Fiji. *Journal of Coastal Research* 14(1):37-46.
- Mortreux, C., and J. Barnett. 2009. Climate change, migration and adaptation in Funafuti, Tuvalu. *Global Environmental Change* 19(1):105-112. <http://dx.doi.org/10.1016/j.gloenvcha.2008.09.006>
- Nakashima, D. J., M. Galloway, H. D. Thulstrup, A. Ramos Castillo, and J. T. Rubis. 2012. Weathering uncertainty: traditional knowledge for climate change assessment and adaptation. UNESCO and United Nations University, Paris, France.
- Nunn, P. D. 2009a. Responding to the challenges of climate change in the Pacific Islands: management and technological imperatives. *Climate Research* 40(2-3):211-231. <http://dx.doi.org/10.3354/cr00806>
- Nunn, P. D. 2009b. *Vanished Islands and hidden continents of the Pacific*. University of Hawai'i Press, Honolulu, USA.
- Nunn, P. D. 2010. Bridging the gulf between science and society: imperatives for minimizing societal disruption from climate change in the Pacific. Pages 233-248 in A. Sumi, K. Fukushi, and A. Hiramatsu, editors. *Adaptation and mitigation strategies for climate change*. Springer, Berlin, Germany. http://dx.doi.org/10.1007/978-4-431-99798-6_15
- Nunn, P. D. 2014. Geohazards and myths: ancient memories of rapid coastal change in the Asia-Pacific region and their value to future adaptation. *Geoscience Letters* 1(3). <http://dx.doi.org/10.1186/2196-4092-1-3>
- Nunn, P. D., W. Aalbersberg, S. Lata, and M. Gwilliam. 2014. Beyond the core: community governance for climate-change adaptation in peripheral parts of Pacific Island Countries. *Regional Environmental Change* 14(1):221-235. <http://dx.doi.org/10.1007/s10113-013-0486-7>
- Nunn, P. D., and R. Pastorizo. 2007. Geological histories and geohazard potential of Pacific Islands illuminated by myths. Pages 143-163 in L. Piccardi and W. B. Masse, editors. *Myth and geology*. Geological Society of London, London, UK. <http://dx.doi.org/10.1144/gsl.sp.2007.273.01.13>
- Pelling, M., and J. I. Uitto. 2001. Small island developing states: natural disaster vulnerability and global change. *Global Environmental Change Part B: Environmental Hazards* 3(2):49-62. [http://dx.doi.org/10.1016/S1464-2867\(01\)00018-3](http://dx.doi.org/10.1016/S1464-2867(01)00018-3)
- Petterson, M., S. Cronin, P. Taylor, D. Tolia, A. Papabatu, T. Toba, and C. Qopoto. 2003. The eruptive history and volcanic hazards of Savo, Solomon Islands. *Bulletin of Volcanology* 65(2-3):165-181.
- Pigliasco, G. C. 2010. We branded ourselves long ago: intangible cultural property and commodification of Fijian firewalking. *Oceania* 80(2):161-181. <http://dx.doi.org/10.1002/j.1834-4461.2010.tb00078.x>
- Rudiak-Gould, P. 2012. Promiscuous corroboration and climate change translation: a case study from the Marshall Islands. *Global Environmental Change* 22(1):46-54. <http://dx.doi.org/10.1016/j.gloenvcha.2011.09.011>
- Schwarz, A.-M., C. Béné, G. Bennett, D. Boso, Z. Hilly, C. Paul, R. Posala, S. Sibiti, and N. Andrew. 2011. Vulnerability and resilience of remote rural communities to shocks and global changes: empirical analysis from Solomon Islands. *Global Environmental Change* 21(3):1128-1140. <http://dx.doi.org/10.1016/j.gloenvcha.2011.04.011>
- Taylor, P. W. 1995. Myths, legends and volcanic activity - an example from northern Tonga. *Journal of the Polynesian Society* 104(3):323-346.
- Veitayaki, J., A. Tawake, W. Aalbersberg, E. Rupeni, and K. Tabunakawai. 2003. Mainstreaming resource conservation: the Fiji locally-managed marine area network and national policy development. Pages 105-124 in H. Jaireth and D. Smyth, editors. *Innovative governance, indigenous people, local communities and protected areas*. Ane Books, New Delhi, India.
- Walshe, R. A., and P. D. Nunn. 2012. Integration of indigenous knowledge and disaster risk reduction: a case study from Baie Martelli, Pentecost Island, Vanuatu. *International Journal of Disaster Risk Science* 3(4):185-194. <http://dx.doi.org/10.1007/s13753-012-0019-x>
- Whitehead, N. E., U. Ulusoy, H. Asahara, and M. Ikeya. 2004. Are any public-reported earthquake precursors valid? *Natural Hazards and Earth System Sciences* 4(3):463-468. <http://dx.doi.org/10.5194/nhess-4-463-2004>