Conservation Decision-Making in Palau: An Example of the Parallel Working of Scientific and Traditional Ecological Knowledge

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Abstract

Despite unprecedented knowledge of conservation science, loss of biodiversity continues on a global scale. In this study, we investigate how choices are exercised where science, local and traditional knowledge come together for conservation decision-making. Our case study is the Palau Protected Areas Network, a program established to support conservation in the Pacific island nation of Palau. We apply a framework based on the concept of knowledge governance to explore the rules and norms that shape the relationships between knowledge and decision-making across both customary and Western-styled institutional lines. The major practical implications from this study are that: (1) there are internal and external audiences for Palauan conservation, (2) these audiences are associated with different expectations around what makes knowledge a legitimate basis for action, (3) the current conservation system operates in parallel, with science informing largely external audience and local and traditional knowledge speaking more directly to internal audiences and (4) this parallel system is likely to come under increasing pressure as the audiences for conservation change.

Introduction

> When we use the term environment (*lukel a klengar*), it literally means the nest of life. That is the most important thing: to always keep in mind that we are taking care of the nest of life. (High Chief Reklai Raphael Bao Ngirmang, interview data)

Knowledge-based processes are at the heart of conservation practice. From the scientific monitoring of global biodiversity indicators, to small scale community management of protected areas based on traditional ecological knowledge, conservation decision-makers are continuously negotiating different knowledge systems to form judgements on how to best conserve the natural environment. This article focuses on how these processes occur, specifically, on how 'scientific' and related technical approaches operate alongside local and indigenous knowledge in conservation decision-making. Using the lens of knowledge governance, the formal and informal rules, which influence what kinds of knowledge are created, shared, accessed, legitimised and enacted, by whom and why (van Kerkhoff 2013) we examine how decision-making contexts shape knowledge-based processes for conservation in the Western Pacific Island state of Palau.

One of the features of current conservation efforts is that despite having unprecedented access to scientific information about species, ecosystems and landscapes, we are in the midst of ongoing, wide-scale, possibly irreversible loss of biodiversity (Cook et al. 2013). This is indicative of the "knowledge-action gap", the idea that many environmental problems do not stem from a lack of knowledge but rather a failure to translate that knowledge into action (Meffe and Viederman 1995; Kollmuss and Agyeman 2002; van Kerkhoff and Lebel 2006; Cook et al. 2013). In response, most efforts have typically concentrated on somewhat linear

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Fig. 1 Protected Areas Network. Sites surveyed are marked in order North to South: (1) Ngeruangel Marine Reserve (Kayangel), (2) Ebiil Channel (Ngarchelong), (3) Ngardok Lake (Melekeok), (4) Ngerderar Watershed (Aimeliik), (5) Medal Ngediull (Arai), (6) Rock Islands Southern Lagoon (Koror) and (7) Helen Reef (Hatohobei). [Map adapted from Palau PAN Fund (2015)]
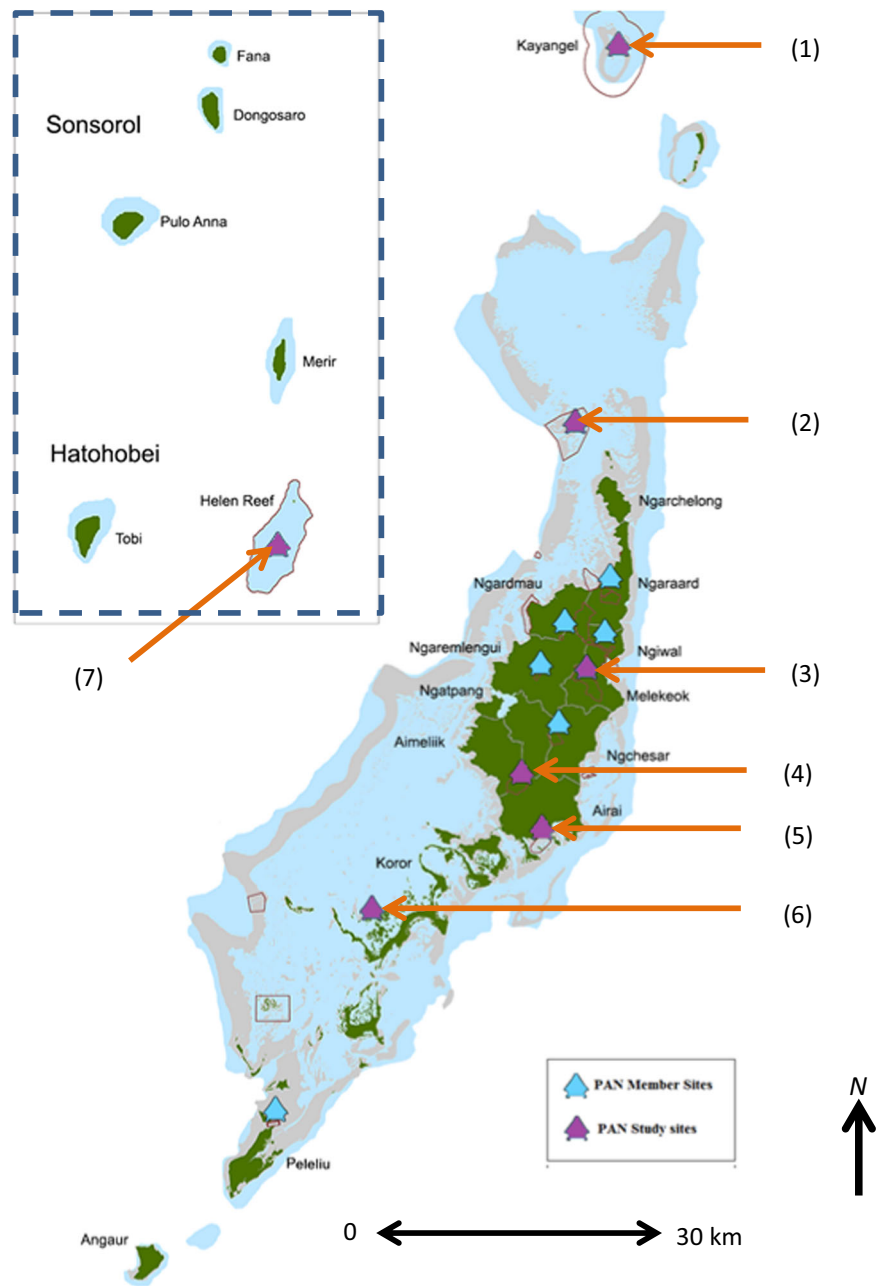
attempts to bridge this gap (see: Roling and Jiggins 1998; Cash et al. 2003) or project based strategies and methodologies to improve the connection between research and decision-making (Watson 2005; Cvitanovic et al. 2015; Roux et al. 2015). Far less effort has been directed at understanding the social, political and cultural contexts, in which decision-makers must operate, and how these shape the relationships between knowledge and action (Manuel-Navarrete and Gallopín 2012). Even less attention has been directed at exploring these issues outside Western settings (van Kerkhoff and Lebel 2015; Djenontin and Meadows 2018). This article draws on the concept of *knowledge governance* to explore these.

The knowledge governance approach focuses on the role of cultural norms and formal and informal institutions. This offers an inclusive analytical framework for understanding how knowledge-based processes work in a given social or cultural setting, enabling systematic exploration of diverse and possibly conflicting knowledge systems, which manifest in decision-making (van Kerkhoff and Pilbeam 2017). Understanding these knowledge-based processes can be particularly important in cross-cultural settings where different rules, norms and institutions are at play. However, when culture is understood as "the individual and collective ways of thinking, believing, and knowing" of a group (Tillman 2002:4), it becomes clear that socio-cultural

systems play a highly significant role in shaping how knowledge is produced and validated in both scientific and non-scientific settings. Understanding the social, cultural and political dimensions of knowledge-based processes is crucial in (post-)colonial contexts, where science has historically been used to dismiss and marginalise indigenous people and their knowledge systems (Odora Hoppers 2002; Tuhiwai Smith 2012).

Conservationists in Pacific Island states have been at the forefront of approaches that reconcile and synthesise different cultural ways of knowing and understanding conservation. Approaches in the region range from the co-production of knowledge about climate change adaptation between researchers and local communities (Ferguson et al. 2016), or the co-management of coastal fisheries (Govan et al. 2009) to the formalisation of customary conservation practices in protected area management in Palau (Gruby and Basurto 2014).

Palau

Palau is a small-island, large-ocean state (Hau'ofa et al. 1993) situated in the Western Pacific ~800 km north of Papua New Guinea. It comprises a string of islands (see Fig. 1) with relatively small land mass, but a marine Exclusive Economic Zone of 500,000 km^2, an area roughly the size of France (Friedman and Golbuu 2011). It has a population of around 21,000 people, with strong customary structures despite colonisation by the Spanish, Germans, Japanese and the United States in succession (Peacock 2002). Its economy is largely built around marine based tourism, with international tourism making up over 80% of GDP in 2014 (Remengesau 2015). Palau is a Republic comprised of 16 states.

Palau provides a particularly relevant case study for exploring the interactions between science and other forms of knowledge in conservation for two reasons. Firstly, Palau is an area of high conservation value (Gruby and Basurto 2014) with a variety of different conservation mechanisms and organisations involved. Palau accommodates an astounding array of biodiversity (Friedman and Golbuu 2011). *Palau's conservation system is a matrix of international NGOs, local NGOs, government involvement and traditional leadership authorities.* Secondly, Palau has demonstrated international and local conservation leadership while emphasising traditional models of conservation. On the international stage, like many other Pacific Island states (Barnett and Campbell 2010), Palau has been at the forefront of a number of significant global environmental initiatives including the elimination of deep sea bottom trawling (Beck and Burleson 2014) and the inclusion of a specific Sustainable Development Goal on the protection of

the world's oceans (Beck 2013). Palau has been an active partner in the Micronesia Challenge, a regional agreement to increase protected areas in the region to 20% of terrestrial resources and 30% of coastal marine areas (Kleiber and Koshiba 2014).

Palau created the Protected Areas Network (PAN), a national network of marine and land based protected areas in 2003, as a way of bolstering local conservation efforts (Kleiber and Koshiba 2014). In 2012, Palau's conservation work netted it the prestigious Future Policy Award from the World Future Council (Beck and Burleson 2014). The scope of PAN is limited to the protected areas in and around various local landmarks, as indicated in Fig. 1, in which the largest land area shown is <20 km wide. Going well beyond this, in 2015, the government of Palau designated 80% of its entire 200-mile Exclusive Economic Zone as a marine sanctuary—one of the largest in the world (Ewart 2015; Pew 2017). This action strongly confirms the commitment of the Palau legislature and people to treating its marine biodiversity as a continuing economic and cultural asset rather than as a resource to be "mined" (fished out), but further analysis of this is beyond the scope of this paper.

The sites in the PAN are examples of locally managed marine areas (LMMAs), which also exist in some form in most other Pacific Island countries. LMMAs are also becoming increasingly common outside the tropical Pacific, e.g. in Mexico (Ayer et al. 2018), West Africa and parts of Europe (Rice et al. 2012), though often with different names such as 'community-based marine protected areas'.

Govan et al. (2009) and Jupiter et al. (2014) both review the range of LMMAs in the Pacific Islands, and their objectives. Both these papers note that the objectives of the local community focus mainly on their own food security and on its sustainability for future generations of that community; means to this end include [attempting to] exclude fishers from outside the community from the defined local area, and various restrictions on local fishers (e.g. to allow breeding in season). To achieve this, LMMAs are often supported and guided by co-management partners (e.g. NGOs, government agencies or research institutes) who promote a diverse range of objectives, including biodiversity conservation, fisheries management, livelihood diversification and climate change adaptation. Government can be a particularly important partner as it can give legal effect to (e.g.) a locally declared no-take zone, which might otherwise not be recognised by 'outsiders' such as commercial fishers. However partnerships can produce conflicting objectives, e.g. LMMA objectives for enhanced fisheries-supported livelihoods may clash with conservation of biodiversity (Jupiter et al. 2014). Govan et al. (2009) and Thomas (2007) examine the financing of marine protected areas (including LMMAs) at that time. Although in each LMMA, the local community contributes in kind, additional

resources are needed to cover networking and mutual learning between LMMAs in similar situations, and (where necessary) limiting 'outside' access to an area. 'Active monitoring' (which includes responding to things not going according to plan) is another cost. Among the contributions that research institutions or other partner organisations can make is advice on how to systematically measure species abundance in the LMMA, thereby enabling a more reliable measure of 'success' than 'I remember there were more XX species here when I was a boy' (Govan et al. 2009). In Fiji the overhead cost of such service can be spread over hundreds of relatively small LMMAs ($<1\,km^2$). Several of the sites in the PAN are much bigger than this (e.g. Rock Islands Conservation Area covers $340\,km^2$), so even to demarcate and establish the site is well beyond the capacity of any local community. Such sites therefore run under the auspices of the relevant State government, which require significant human and financial resources to do so.

Bul, roughly translated by Johannes as "conservation laws" (1981:64), Palau's primary traditional institution for conservation (Gruby and Basurto 2014) remains ever present through all of these measures both institutionally and rhetorically, despite Palau's complex colonial past (Johannes 2002). President Tommy Remengesau Jr. in advocating for the creation of the National Marine Sanctuary, during his 2015 state of the Republic address, argued explicitly that "The sanctuary is Palau's tradition and *Bul* is Palau's proven success story [...] Now is the time to implement *Bul* across the entire Republic" (Remengesau 2015:16). Moreover, the success story of Palauan conservation is one in which Palauan traditional environmental governance operates alongside various scientific approaches.

Notwithstanding the strong commitments to *bul*, conservation in Palau is also shaped by 'western' scientific understandings and practices. In part this can be attributed to international influences, with UNESCO and The Nature Conservancy both active supporters of conservation in Palau, and Palau is a core partner of the Micronesia Challenge, a regional initiative to expand marine conservation. One of the sites (Rock Islands, 'the jewel in Palau's ecotourism crown') is recognised by UNESCO as a World Heritage site, as it is one of the most biodiverse sites in the world. To maintain this economically valuable status requires continual 'scientific' monitoring and reporting. However, Palauans themselves are also embracing the management tools associated with more 'western' conservation approaches. For the larger PAN sites, which are managed by State governments, the officials responsible nearly all hold degrees from international universities (predominantly from the United States of America), with many specifically trained in conservation biology and resource management. Palau also supports the Palau International Coral Reef Center, described as "...Palau's leading research and aquarium institution ... supporting coral reef stewardship through research and its applications for the people of Palau, Micronesia, and the world. Our vision is people empowered with science and knowledge for effective marine conservation and management." (http://picrc.org/picrcpage/Accessed 15.08.2019). These examples indicate that there is no simple separation of 'imposed' 'western' ideas of science that is seeking to undermine traditional custom. Rather, it suggests that there is a dynamic and rich hybridisation of both, that this study sought to understand and explore.

Applying the concept of knowledge governance in this rich Palauan context provides the opportunity to build a deeper understanding of the interface between scientific knowledge and local customary knowledges (including, but not limited to so-called Traditional Ecological Knowledge, TEK), and how they work together to support conservation decision-making. The aim of our study is to explore the relationships between these two bodies of knowledge, the rules surrounding their use, and their associated roles in decision-making and action. Our research questions were:

- How can knowledge governance be used to explain decision-making processes drawing on different bodies of knowledge?
- What lessons can we learn from Palauan experiences to strengthen knowledge governance as a practical way of understanding complex decision-making processes?
- What are the practical implications that these answers suggest for the continuing management of PAN?

Methodology

Case Study

A case study approach was implemented for the purposes of this study. Knowledge governance patterns are culturally embedded and thus, context specific (van Kerkhoff 2013). To conceptualise knowledge governance requires an appreciation of knowledge norms and practices in a specific time and place towards specific ends.

The central focus of this study was the Palau PAN, associated with which is the PAN Fund, established in its current form in 2012, which operates on a national level to finance, inform, coordinate and provide technical insight for the conservation of local protected areas (Palau PAN Fund 2015). The PAN is funded independently through a tourist visitor departure tax, and administered by the central government, with an independent agency (the PAN Fund) responsible for distributing funding. The protected areas are managed by the different state administrations but they must

submit reports and management plans to first gain access to PAN membership and continue doing so to receive funding.

This study includes insights from seven different protected areas from the PAN (see Fig. 1). Sites surveyed were (listed North to South): Ngeruangel Marine Reserve (Kayangel), Ebiil Channel (Ngarchelong), Ngardok Lake (Melekeok), Ngerderar Watershed (Aimeliik), Medal Ngediull (Arai), Rock Islands Southern Lagoon (Koror) and Helen Reef (Hatohobei). This sample was chosen based on an evaluation of management documents and in consultation with the PAN Fund staff in order to illustrate the diverse management contexts within the PAN. More specifically, the diversity of this sample was based on three criteria: the type of conservation undertaken at the site, the management goals for the site and the range of different interests embodied in the management regime of the site. This sample includes sites of acknowledged international importance such as the UNESCO world heritage site (Rock Islands Southern Lagoon) and a RAMSAR listed wetland (Ngardok Lake) alongside sites of primarily local importance like Ngerderar Watershed. In a similar vein, the primary resource uses for different protected areas vary considerably with fisheries (Medal Ngeduill and Ebiil Channel), tourism (Rock Islands Southern Lagoon), cultural preservation (Ngeruangel Marine Reserve) and scientific research (Ngardok Lake) all listed as important management interests.

Methods

This study relied on a range of qualitative research methods. Qualitative methods are well suited to an in-depth assessment of the motivations and the reasoning of stakeholders, which is key to cultivating an understanding of knowledge governance. The data used for this research was sourced through key informant interviews, document review and observational research.

A series of 20 1–2 h long semi-structured interviews were conducted with a total of around 80 key informants. All the interviews were conducted in Palau in May–June 2015. Interviews were mostly conducted in English and at times with translation from Palauan done by accompanying staff from the PAN Fund. Interviews were conducted primarily in small groups with some done individually. The amount of data generated through this process was considerable and as such, from the 20 original interviews, a sample of 13 was chosen for in depth analysis. The interviews analysed in depth represented a diverse range of stakeholders and directly referenced the management of the sites discussed in this paper. This sample of interviews includes environmental managers of the sites in question, traditional leaders, legislators, local environmental NGOs, research institutes, as well as PAN officials from a range of

different agencies (see Table A-1 in the Online Resource). The qualitative analysis software NVivo™ was used to code the responses, as described further in Appendix C of the Online Resource. These interviews were supplemented with [passive] participant observation on site visits.[1] Over 2 weeks, with the accompaniment of a ranger or PAN coordinator, the researchers visited 5/7 of the sites listed in this study. Documents studied were mainly site management plans and annual reports.

The themes listed in Table 1, based on Jasanoff's (2005) framework, formed the basis of our analysis and were used to structure the results of this research, as well as reference points for discussion with participants (see sample questions in Appendix B of the Online Resource).

In a complementary paper to the present case study, van Kerkhoff and Pilbeam (2017) establish that a [slightly modified] version of Jasanoff's framework offers a suitable tool to examine the knowledge governance of various situations. As a framework, it offers a set of *questions* to guide research. As van Kerkhoff and Pilbeam (2017) emphasise, one aim of the present case study is to see how useful this framework is in the context of parallel knowledge systems, such as those operating in Palau.

An active approach towards ethical concerns was undertaken in this research process, as outlined in the Ethics Statement at the end of this paper and elaborated in Appendix E of the Online Resource. Methodologically, this research was designed through consultation with the Palau PAN Fund in order to both follow cultural protocols and to maximise the benefits of the study for Palauans; short written reports in 2015 were part of the feedback to participants.

Results

For this analysis, site specific data and narratives are combined with information gathered through more general interviews with different key informant groups to address Jasanoff's original themes and an emergent theme of ownership (see Table 1). The ways in which these themes manifest in this case study shed light on the rules of knowledge governance within the system.

Dominant Style of Knowledge-Making and Decision-Making

Many participants raised the idea of consensus in *decision-making* around environmental issues. One Palauan elder asserted that this was because "*our culture is all about*

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[1] i.e. The researchers did **not** actively participate in the management of the sites visited.

Table 1 Key themes of data analysis based on Jasanoff's civic epistemologies

Themes used in this paper	Jasanoff's typology	Description and related questions
Dominant style of knowledge making	The dominant styles of public knowledge making (decision-making)	Who has public endorsement to generate sound knowledge on certain issues and what the dominant methods are for information to become knowledge and generate decisions and action?
Credibility	Public accountability (basis for trust)	How is knowledge tested and in so doing, deemed trustworthy?
Effectiveness	Demonstration (practices)	How are the benefits or outcomes of knowledge demonstrated to the wider public?
Objectivity	Objectivity (practices for securing)	The extent to which knowledge makes claims above subjectivity. Jasanoff construes this as a fairness issue in that it seeks to avoid subjective bias.
Expertise	Expertise (foundations)	There is a distinction to be made here between experts and knowledge holders. Experts help navigate society through conditions of uncertainty by providing knowledge and reassurance. Expertise is largely ascribed through unwritten cultural rules.
Transparency	Visibility and procedural environments	This focuses on the institutional mechanisms for permitting public observation and in turn, participation in decision-making processes.
Ownership	Absent from Jasanoff's typology	This refers to control of a particular group over both the processes through which knowledge is generated and the products which this produces.

Source: columns 1 and 2 Jasanoff (2005); column 3 van Kerkhoff and Pilbeam (2017)

relationships" and she went on to note that it was important to avoid alienating people given the small size of Palauan society. As such consensus and the inclusion of different perspectives were crucial to decision-making, how this was achieved was considered to be less important. One participant working for a local environmental NGO highlighted this by saying:

> We value the process of getting a consensus on a decision. We cannot just have a bottom-up decision-making process and frankly in Palau distance between bottom and top is like this (indicates with fingers very small distance). So we actually utilise all sorts […] because at the end of the day, it's not whether it was a top-down, bottom-up, lateral decision-making, it was whether there were enough people that believe in the decision, in the process, to get traction on something and to get by. (Local environmental NGO worker)

The fact that consensus is so valued in decision-making allows Palauans to have a relatively high level of trust in their leaders. By contrast, for example, open conflict through court contestation was not seen as an appropriate way of evaluating knowledge. This could be a particular barrier to those working in the sciences, where there is a tradition of building theory through contestation. Another participant involved in a number of Marine Protected Areas (MPA) studies at the Ebiil Channel, was frustrated by this misfit. She lamented:

> You cannot come into the same community one day and say 'MPA is the way to go' and then comes in another time and say 'they don't work, we need to go in this direction'. That's fine, that science continues to do that because everyone needs to push their own theory, right? But […] It is critical that they maintain that level of trust with us for the next study. When we do come in, [we need to ensure] that this new science is actually building from where we are today and not competing with it because then we are actually pulling the rug out from under our own feet, so to speak. (Local NGO worker)

Emphasising continuity with Palauan culture was a key way that knowledge was created and reaffirmed. One incarnation of this desire for continuity was the notion, which recurred across several interviews that "*science validates*" what Palauans already know rather than breaking new ground. Science was often conceptualised as being necessary mainly to satisfy the desires of non-Palauans.

Credibility

Participants indicated that the credibility of knowledge was closely linked to that of its individual source. Even during the course of our research, it was important that we be accompanied by a trusted Palauan member of the PAN Fund to confer credibility upon the research process. One participant summarised the importance of who is involved in a conservation process, by saying:

> People won't normally ask 'what is the meeting about', they will ask who will be there. It is about credibility, based on relationships and trust. When I come with someone from the community who is trusted, people will believe you, otherwise they will not, even if you have good science. (International NGO worker)

Knowledge was not conceived of independently from its champions and any distinction made between the two was seen as relatively artificial.

Within the context of PAN, this translated into an emphasis on who the particular manager of a site was and this was often touted as a crucial factor in the success of any given protected area. The case of the Ngardok Lake PAN site manager was raised several times as an example of how important the individual leadership of a site manager and the choice that state governments make in this appointment can be and how this in turn, strengthens the work of the whole network. At Ngardok Lake, those involved with management were equally emphatic that individual managers were crucial. One member of the Ngardok board noted, "*for all the PAN sites in Palau, what I would like to see in future, is for all the PAN sites to have a manager like [ours]*".

In this case, institutions were seen as largely secondary. Within this context, the components of credibility identified above meant that individuals reinforced the legitimacy of institutions, rather than institutions conferring legitimacy on individuals. Indeed, participants would more often refer to the people synonymous with organisations rather than actually naming the organisations they were talking about.

Expertise

Participants expressed a degree of distaste with the idea of "experts". Although we met with many Palauans with an incredible depth of knowledge, none self-identified as an expert. This is perhaps an illustration that an "expert" as coded in the Western sense did not resonate in this context. One participant echoed these sentiments by asserting:

> Palauans will be very quick to say that "we're not the experts". Part of it is the humility part. We don't

showcase ourselves, it's *mekull* [taboo]. The other thing is that when we think about "experts" it's a very western concept. You're educated, it's your profession, and you have this experience behind you. (Local business woman)

Within this context, the notion of "expertise" being a Western concept poses a conundrum for science—on the one hand, scientific knowledge is respected as educated and professional; on the other, this is foreign, and difficult to relate to local knowledge. As another participant involved in a local environmental NGO noted:

> We really had to work hard with communities to help them believe in their knowledge and to share it. Because a lot of times, they didn't share knowledge not because they were hiding anything, they just didn't think it was valuable. (Local NGO worker)

Quotes such as these illustrate that research-based approaches that value contributions made by local knowledge are needed to confront the division between the narrow technical conception of "expertise" and the considerable body of knowledge which is coded differently. Overcoming the exclusionary tendencies of science as a relatively technical and formal institution is not as straightforward as simply creating spaces for local participation, an idea further explored in the discussion section.

Beyond this general tendency towards modesty, within Palauan society this conundrum also appeared in determining who was considered 'knowledgeable'. Traditionally, in Palauan society, there were strong norms about who could and could not know certain things and who could share information (McKnight 1968:19). This tradition seems to continue today in who is qualified to speak about certain issues. From the data, we have identified two major criteria for how expertise is determined in Palau:

- *Practical experience and knowledge of custom*—this was closely linked to age and one participant noted that despite the changing nature of Palauan society, one participant noted "*there is still that respect that wisdom comes with age*". This also linked to experience in certain areas. For example, managers involved in terrestrial conservation were often reluctant to speak to the issues faced by MPAs and vice versa. Another manifestation of this respect was the way that those with a deep knowledge of custom were the subject of a great admiration and their advice was often trusted over that of scientists.
- *Foreign exposure*—Often this came in the form of a foreign education among the younger generation. Almost all the young environmental professionals that we met with held foreign university degrees. Among the

elder generations, many of the high ranking chiefs, even if they had not been educated overseas, had served with the US military or had worked in other parts of Micronesia. There was a certain notion that Palauans must prove themselves elsewhere, if they wanted recognition at home.

Despite the apparent contradictions suggesting a certain degree of tension between these two criteria, we saw very few manifestations of this. For the most part, they were seen as largely complementary. Those with foreign qualifications expressed a great deal of reverence towards elders with a depth of customary knowledge and elders expressed a desire for Palauan youth to cultivate both a knowledge of local environments and to receive Western University qualifications. That being said, it is interesting to note that the majority of Palauans working as environmental professionals that we interviewed were foreign educated, which indicates that formal conservation institutions had more of an emphasis on foreign exposure.

However, when scientific and customary knowledge conflicted on a particular issue, most opted to follow the advice of elders. One particularly striking example came from the Medal Ngediull PAN site, where there is an ongoing concern about mangroves encroaching on the reef protected by the site and the closing off of navigation channels. There is a strong custom of communities keeping channels clear by cutting back the mangrove. In recent years, due in part to run-off from the airport, the sediment load reaching the site has increased greatly leading to a significant increase in mangroves around the reef. Site managers wanted to cut back the mangroves. However, scientists expressed concerns at this practice because of the role that mangroves play in maintaining the integrity of the coastline. Despite the disagreement voiced by scientists, PAN managers and rangers decided to remove mangroves from the site and the community was even brought on board as volunteers to help clear the channels.

Effectiveness

Following on from Jasanoff's original typology, 'effectiveness' relates to how knowledge demonstrates its value to the wider public. During most interviews, we asked participants which PAN site they thought was the most successfully managed. One consistent response to this question was Koror state's Rock Islands Southern Lagoon. A number of reasons were given for this:

- *Financing*, firstly, in terms of the site's ability to fund itself outside the support of PAN and secondly, the site's ability to provide financial benefits to the local community. For example, the Jellyfish Lagoon in

Koror's PAN site is Palau's most visited tourist destination. Building on this idea, the Palau International Coral Reef Centre has begun commissioning socio-economic studies on the value of MPAs to demonstrate some of the benefits of protected areas to local communities (Kleiber and Koshiba 2014). Finance was also an important enabling factor for the other demonstrations of effective management.

- *Public outreach* was an important part of demonstrating the value of conservation areas by involving local communities. Many sites, including Koror, brought in local school students to visit and learn about conservation initiatives. One particular strategy that Koror used to promote their work was giving one of their protected areas, Ngederrak a mascot Captain Malii the Napoleon Wrasse (see Fig. 2).
- *Enforcement* of environmental regulation emerged in discussion with all the PAN managers, especially those working in MPAs, as a major challenge. Due to its considerable resources, Koror state was able to hire more rangers and implement a more rigorous regime to deter illegal fishers and irresponsible tourist behaviour.

One message that emerges from these different measures of effectiveness, is that for management to be deemed effective it has to have tangible outcomes for the local community. Amassing scientific data was not seen as a social good on its own terms. However, one notable absence which was listed as the primary goal across all management plans was effectiveness of actual conservation, that is to say whether protected areas increased populations of target species or added to overall ecological function. This indicates that the conservation outcomes of management were seen as more for external consumption.

Objectivity

Contrary to the way that Jasanoff allies objectivity with fairness, few if any participants perceived such a link. This indicates that the initial framework conflated objectivity and

Fig. 2 Captain Malii Banner [Photo: RARE (2015)]

impartiality in a way which did not resonate with participants. Objectivity it seems, was not seen as an important part of what makes decisions fair. Instead, many participants linked fairness to more flexible, context specific knowledge. Indeed, some participants noted that one of the great strengths of management based on *Bul* was that it be used in a more discretionary way to create more equitable results. One PAN manager saw *Bul* as an alternative to an increasingly codified form of management, where *Bul* would allow for both conservation and economic growth in the area. He posited that:

> Instead of adding more sites, it would be great if it [protected areas management] was like the traditional system of *bul*. [Where] you can move the boundaries of one protected area to another area. […] I think that would be really good, to be flexible and start following the old system more closely. (PAN manager)

However, many noted the use of more objective knowledge in regulating the behaviour of outsiders unaware of Palauan context:

> Traditional closures, that's only known to locals in Palau and [so] the international people that come in and fish the waters, they won't know it. So if we apply the science, on top of the traditional, then science can be applied to international people coming in and we can enforce it more clearly with them. So I think that's where the traditional isn't working as well now. (Local researcher)

In that sense, the objectivity of the closures under the formal management framework was regarded as commanding more respect from outsiders. Moreover, given the increasing numbers of tourists and the fact that many Palauans are venturing further afield to fish, this dimension may become more prominent in years to come. In a similar vein, the concept of transparency in knowledge-making found little traction in this dataset but there was some indication that it may do so in the future.

Transparency

Transparency did not seem to interview participants to be a particularly highly valued function of knowledge governance (i.e. of decision-making) in Palau. One participant working in an environmental NGO, when asked how political decision-making happened in Palau, likened the process to that of discussions, which took place traditionally in the *bai* (the traditional men's meeting house) (see Box 1 and Fig. 3).

Box 1: whispered decision-making in the *Bai*

In the traditional men's house, the *bai*, chiefs would come together to discuss different local issues and to make decisions about the future of their clans (See Fig. 3). It was considered disrespectful to talk above a whisper or for the chiefs to address each other directly, so they would have a messenger who they would whisper their statements to, who would then take their message to the other chief. Along the way, the messenger would often massage the message to ensure that it was well received by the other chief. The chief can never be wrong, it is always the messenger who is at fault. In contrast, when things go well it is a reflection of the chief's wisdom. Everyone would leave the meeting and only the messenger would know what exactly had happened in the decision-making process.
[source: an NGO participant]

Fig. 3 A *Bai*. Pictured, the oldest *Bai* still standing in Palau, Airai state [Author photo]

The PAN network provides an indication of this push and pull between a democratic emphasis on formalised transparency and a more traditional framework based on implicit trust. A participant engaged in the management of Ngardok Lake detailed the proceedings of a public hearing on the last management plan, which we interpret as an illustration of some of the ways that disinterest in formal transparency processes might play out at the site level.

> Participant: When the first management plan was put out, the state was going to conduct a public hearing, where the community could make any questions or

comments to the state officials and then the legislature passed it into law. […]

Author: With the hearing, did many people come?

Participant: Unfortunately, I was not able to attend the hearing but I think there were a lot of people who got involved with the public hearing. The people of Melekeok were satisfied with whatever the board put into the plan. So it was able to go out quickly and smoothly because if there was someone in the community who had a negative impression of the management plan, that would have slowed the process. But because nothing came out, it went fine.

Perhaps this is because Palau appears as a high trust environment for policy making and when people trust these institutions, they do not feel the need to know their exact workings. Another possibility is that official processes for transparency are not highly valued because there are plenty of informal channels for people to come to know the inner workings of decision-making. Many participants alluded to this. These channels are particularly robust across all different levels due to the compact nature of Palauan society.

However, some representatives from government stressed the importance of reporting in ensuring that the wider public knows how funding is used, reflecting more Westernised concepts of accountability. When asked what the major capacity development need across the network is, one public servant responded:

I think that reporting might be one of the biggest capacity needs. It's been something that we've emphasised from the very beginning, we want to see more use of management reports that we are receiving from the states. (PAN public servant)

The participant elaborated on the importance of sites reporting on their progress in order to maintain their funding base:

Basically, it's the report to our key stakeholders in leadership to say 'what are the green fees contributing to'. This is our way of showing them progress. This is the work that is taking place. […] Especially, to leadership because when it comes to the green fee there is always that interest in 'can we do something else, in addition to what we're doing now, with the existing green fee collection'. […] It's called the green fee and it's important that it continues to be the GREEN fee. (PAN public servant)

These statements indicate that while formal transparency may be unimportant to local audiences around decision-making, this was not the case when it came to showing national and international funders where the money was going. In this way, the relative importance of transparency depended on the intended audience. This in turn, provides an indication of friction between traditionally opaque processes and the push for a more open approach to decision-making. If transparency is not a highly held value of local knowledge governance in Palau, this might not be the case indefinitely.

Ownership

One theme which is not adequately addressed by Jasanoff's framework but which emerged through this study was the notion of ownership over knowledge and decision-making processes. When we asked one local NGO about what made its work different to international environmental NGOs involved in Palau one of the participants (after having remained silent for the length of the entire group interview) answered simply that "[Our NGO] is Palauan and [they] are not Palauan". This relatively self-evident statement demonstrates a wider undercurrent to Palauan conservation, that it must be defined on Palauan terms to work. With Palau's history, in which political control has been wrested by a series of colonial powers, this need for ownership seems a logical response. In this case study, ownership also manifests in the desire for continuity, the reliance on those knowledgeable in tradition and the desire to see conservation knowledge yielding tangible benefits for local communities.

An Example of Pragmatic Conservation

Throughout this case study, Palauan conservationists demonstrated the ability to gain pragmatic legitimacy (Suchman 1995) for their conservation efforts by successfully navigating the priorities of both internal and external audiences. One notable illustration from this case study is the incorporation of the Ebiil Channel site into the PAN. Figures 4 and 5 are conceptual models that map the decision-making process taken that led to the Ebiil community applying to join the PAN, as it was related by our participants and interpreted using the knowledge governance categories.

In the initial phase, those wanting to join PAN needed to convince the local community. This meant complying with a certain set of knowledge governance norms, including discussing with knowledgeable Palauan elders (expertise) and demonstrating the benefits of incorporation to local communities (effectiveness) (Fig. 4). Their credibility came
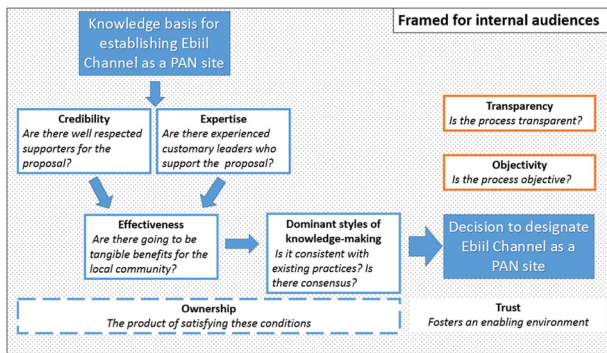
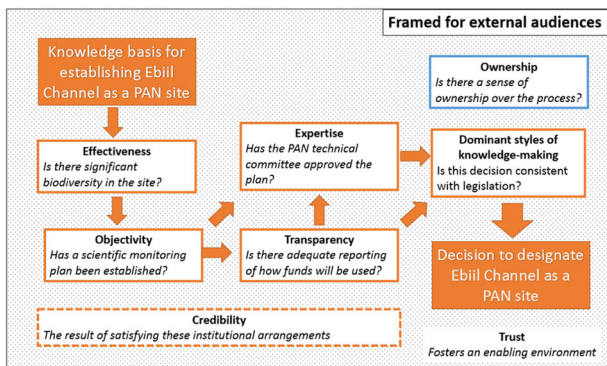Fig. 4 Framing the incorporation of the Ebiil Channel into PAN for *internal* audiences

Fig. 5 Framing the incorporation of the Ebiil Channel into PAN for *external* audiences

from their embeddedness in their communities, while the need for a locally-based consensus reflects the dominant styles of knowledge making. The layering of these conditions produces an overall sense of ownership which further reinforces the knowledge basis for this decision. Whereas, because of the emphasis on consensus and the high level of trust which this entails, rules around objectivity and transparency were largely irrelevant to internal decision-making.

However, once a consensus was established within the community, the original knowledge base had to be reframed for external audiences, in order to gain access to PAN funding and support. For this process of acceptance, the conditions were quite different (see Fig. 5). For example, rules around objectivity and transparency which were initially sidelined (see Fig. 4) become central to the approval of Ngarchelong state's nomination (see Fig. 5). In fact, mastery of knowledge which makes claims to objectivity was a core component of who was considered an 'expert' worthy of inclusion in decision making. At this stage in the process, transparency becomes key to showing to funders and others that this decision complies with legislation, policy and guidelines. The decision is now underpinned by more liberal democratic ideas. While, on

the other hand, ownership was no longer directly relevant to the process and effectiveness was demonstrated through biodiversity conservation rather than as tangible benefits to the local community. The knowledge governance norms manifested differently because of this change in audience. Despite these changes, trust remained consistent as an enabling factor in both phases of decision-making.

This example demonstrates some of the ways, in which those within the PAN negotiate between these different knowledge governance regimes and their respective audiences in order to steer decision-making processes. In this case, both knowledge regimes were satisfied, and the decision to incorporate the Ebiil Channel site into the PAN proceeded. It was when both sets of conditions were not fulfilled that conflicts arose. For example, the scientific advice to keep mangroves intact undoubtedly complied with various knowledge governance rules associated with coastal science but because it broke with continuity of existing environmental practices and contradicted the advice of experts in local custom (i.e. it failed to comply with the knowledge governance regime associated with internal audiences), that advice was ignored.

Discussion

Knowledge Governance as an Analytical Tool

An approach based on knowledge governance has provided useful insights into the way in which conservation areas in Palau are managed. In particular, the results demonstrate that the various dimensions of Jasanoff's (2005) analytical framework, with some modifications, can be a useful and useable tool for analysing situations where 'traditional' and 'modern' knowledge are both in active use.

A Tale of Two Audiences

> *A cherar a lokelli.*—(The distant eras reveal. The distant past reveals the distant future) (McKnight 1968:18)

There appeared to be a dual nature to Palauan conservation, which reflected the different audiences being addressed. The major division between these audiences was largely between those considered internal (Palauan communities) and external (tourists, donors, international scientists etc.). There was one narrative around the primacy of protecting biodiversity largely for external consumption and another which focused more on supporting local livelihoods. However, these two narratives were not mutually exclusive and often they complemented each other. For example, the emphasis on external audiences was often

presumed to feed into tourism income which in turn, supports local livelihoods. This indicates that conservation was not defined just by the PAN but by the arbitration of its audiences. Thus, the PAN's meaning as an institution and subsequently, its knowledge governance regime reflects what Christopher Ansell describes as "grounded conceptual ecologies with audiences" (Ansell 2011:39). Put differently, the audience is not merely a passive recipient of knowledge but a key determinant of the rules through which knowledge is legitimised. In this instance, there was one set of requirements grounded in the interests of internal, local audiences for making knowledge useful and another quite different set for external, foreign audiences.

More broadly, in Palauan conservation, customary knowledge appeared to have more traction than the techno-rational because it was more closely associated with internal audiences who exerted greater control over conservation. In PAN, ultimately the bulk of decisions are made by the states, small communities of resource-owners (Gruby and Basurto 2014). Consequently, the internal Palauan knowledge governance regime took precedence, with outside audiences second, in order to declare new protected areas. Within this context, while customary ways of understanding may find it harder to address external audiences (Huntington 2000), they still had greater traction locally not only because they explicitly addressed Palauan concerns but also because of their provenance. Efforts by researchers to involve local communities through participatory and engaged methods are often framed in terms of the former (addressing local concerns, demonstrating public accountability) but may find it harder to develop the 'provenance' that emerges through sensitive connections with existing customary institutions (see van der Hel 2016).

A Parallel System of Knowledge Governance: Science and Custom in the *Bai*

In Palau, techno-rational and customary bodies of knowledge appeared not to conflict openly but instead to operate in parallel. For the most part, there was a notable lack of open conflicts around "science vs. custom" and many participants saw no dichotomy. However, this absence of conflict does not necessarily denote cooperation but rather that there is a perception of a parallel relationship. This is echoed in statements made by participants along the lines of "we need science for outsiders but for locals tradition will suffice".

In this arrangement there are echoes of how decisions were made traditionally in the *bai*, in that although these two forms of knowledge exist in the same decision-making space, they do not directly address each other. This significantly limits the potential for conflict but also limits a

deeper form of cooperation. Within this context, like the traditional go-betweens, Palauans are continuously engaged in reframing and moderating conservation knowledge so that it conforms to relevant knowledge governance norms and in turn, is accepted by the necessary audience. To an extent, this mirrors the conceptualisation of boundary work made by some scholars, namely translation that happens at the demarcation between experts (read scientists) and decision-makers (Guston 2001; Cash et al. 2003; Ison et al. 2007). However, this article makes the point that although the ability to (re)frame conservation is important, it is in understanding the attributes of the wider structures, in which these processes take place that true synergies between different forms of knowledge are enabled. Put differently, the nature of the boundary work changes with context; outside the *bai*, men behave differently, when out on the lagoon in the act of fishing, they may be much more direct (Johannes 1981). Moreover, the Palauan context for decision-making is not static and this parallel system with different knowledge governance regimes for different audiences may face increasing strain as the audience for Palauan conservation changes.

Dynamics: a Changing Audience for Palauan Conservation?

Although currently the audience for Palauan conservation is largely spoken of as internal, there was some indication that its external audience was growing. There was a notable push from some actors towards a more techno-rational approach, which may shift the balance between *Bul* (and other customary knowledge institutions) and technical approaches. This shift is demonstrated by attempts to either regulate outsiders (tourists, foreign fishers) or to promote Palauan conservation to international donors and scientists. In both instances, these groups continue to increase their presence with increased illegal fishing incursions (Remengesau 2015), the number of tourists visiting Palau swelling (Government of Palau 2015) and international green NGOs such as TNC, Pew Charitable Trust, RARE and One Reef expanding their Palauan operations (interview data).

In addition to this, the internal audience in Palau is changing, as more local environmental professionals are western educated and younger generations are being introduced to environmental science in school (Bhandari and Abe 2000). These processes have been underway for some time now but the cumulative pressure of these developments makes a change in the current organisation of knowledge governance increasingly likely. Thus, as the audience for Palauan conservation changes (both internally and externally), customary knowledge may either have to form a greater reliance on science and more technical

approaches or it may need to speak more directly to these audiences to maintain influence over conservation practice.

The degree of integration which this knowledge system should undertake is somewhat unclear. Pretty calls for greater integration between science and local-customary knowledge in order to promote more resilient cultural institutions for conservation (Pretty 2011:127). As an extension of this, greater cooperation between the two might enable both bodies of knowledge to better address both internal and external audiences. For example, complementing customary knowledge with scientific theories of global change may help to better inform local communities about the contribution of protected areas to climate change resilience (McMillen et al. 2014). This is supported by studies in the Arctic, where indigenous knowledge is still an important dimension of lived experience. Robards et al. (2018) examine how in some Arctic areas, knowledge co-production between indigenous and modern 'scientific' sources can lead to more effective adaptations to environmental and economic change. They emphasise the importance of boundary organisations and the consistent provision of sufficient funds, transcending short-term funding cycles.

However, perhaps, as Cobern and Loving posit, there is a benefit to stopping the complete integration of customary and scientific understandings of natural phenomena (Cobern and Loving 2001). At present, it appears that the dual nature of conservation knowledge in Palau works quite well in ensuring both internal and external support for resource management. Drew and Henne note that the current divergence of conservation science and TEK is largely a product of their differing epistemologies, which bring different understandings (Drew and Henne 2006). These understandings are often complementary but they are still derived through different processes. Greater integration brings with it the risk that scientific processes may supplant customary knowledge, which in turn, threatens the ownership associated with Palauan conservation. The analysis in this study suggests that maintaining these parallel and complementary knowledge systems may become more difficult as external pressures on conservation increase, and emerging generations of Palauan communities seek international tertiary education. The countervailing force is largely the community's deep respect for customary knowledge and *bul*, which has demonstrated strong resilience through colonialism as well as current independence. The analysis presented here can help to reveal the benefits and risks of hybridisation and integration.

What Does 'Conservation' Mean?

The written management plans for each site emphasised goals such as increasing populations of target species or adding to overall ecological function—that is, conservation' in the sense used in 'modern' conservation biology. Such goals can be objectively measured, provided resources are available to do so. For example, Friedlander et al. (2017) found that no-take MPAs in Palau had, on average, nearly twice the biomass of resource fishes (i.e. those important commercially, culturally, or for subsistence) compared with nearby unprotected areas, with the most important determinates of no-take MPA success in conserving resource fish biomass being MPA size and years of protection. They further concluded that the extensive network of MPAs in Palau likely provides important conservation and tourism benefits to the Republic, and may also provide fisheries benefits by protecting spawning aggregation sites, and potentially through adult spillover.

However, as noted under 'effectiveness' in the Results section of this paper, Palauan participants did not see amassing scientific data as a social good on its own terms. Rather, as with LMMAs elsewhere in the Pacific, they perceived management of a site to be effective only if it provided tangible outcomes for the local community. In general, the two benefits of an LMMA most often sought by a local community are food security and/or a sustainable income source. This raises the question of how different institutions may interpret 'conservation' differently—where communities do not recognise (or endorse) a separation of people and nature, conservation can be framed equally in terms of human social benefit as it can in ecological benefit. The two prosper and thrive, or decline, together. However, where national or international agencies adopt a view that conservation of nature is separate from conservation of human livelihoods, the implication can often be that increasing human social benefit comes at the cost of ecological benefit. These conflicting interpretations of conservation indicate the more fundamental differences that lie beneath the surface of often apparently harmonious integration, and should be understood in their respective social and ecological contexts.

Conclusion

This analysis—based on knowledge governance—shows how societal rules and norms impact on environmental decision-making both within this case study and more broadly. Palauan conservation presents an interesting case study for exploring such questions because traditional and techno-rational framings coexist within its decision-making context.

At present, in Palau, there is a perception that the customary and techno-rational bodies of knowledge operate largely in parallel, with one geared towards internal audiences (Palauan resource-owners) and the other towards

external audiences (international donors, fishers and tourists) for Palauan conservation. The result of this is that in practice, they observe quite different knowledge governance rules and expectations. In a context, where there was an emphasis on ownership, be it in terms of continuity, tangible benefits for local communities or the endorsement of local customary experts, it was much harder for science to gain traction when compared to customary knowledge of conservation. In order to garner internal and external support for conservation, Palauans navigated these different knowledge governance regimes by reframing knowledge accordingly. Thanks to these pragmatic acts of translation by Palauan conservationists, for the moment, this model of a parallel systems of traditional ecological knowledge and science informing different audiences for conservation seems to function.

Although this study developed a 'snapshot' in time of the current knowledge governance arrangements, by identifying the key processes and relationships under the seven thematic categories, we were able to consider the dynamics that may affect these processes through time. The dual nature of the knowledge governance system is coming under pressure as the external audience for Palauan conservation grows and locals are increasingly adopting scientific conservation language, practices and values. This may lead to greater integration between the two which could potentially generate a more robust conservation regime or the erosion of customary conservation institutions like *Bul*. For the parallel system of conservation knowledge to continue, future generations of customary leaders and officials will need to become even more adept at reconciling these two institutions.

This research demonstrates the potential of knowledge governance as a framework that identifies key elements of both the relationships between science and local-customary knowledge and the ways that societies enact knowledge more broadly. Building greater awareness of the multifaceted nature of the social, cultural and political rules and norms that shape conservation decision-making can help to foster these relationships in ways that support a balanced and sensitive approach to maintaining and enriching local knowledge while integrating key insights from science.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval The methodology of this project was approved in May 2015 by the Australian National University Human Research Ethics Committee under Protocol 2015/172, which is in accordance with the Helsinki declaration of 1964. Consequently, informed consent was obtained from all individual participants included in the study, and a preliminary report on our findings was provided to participants. Further details of ethical procedures are given in the Online Resource (Appendix E).

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