ISSN 1025-7497

Secretariat of the Pacific Community

TRADITIONAL

Marine Resource Management and Knowledge

Number 17 — December 2004

INFORMATION BULLETIN

Group Coordinator and Bulletin Editor: Kenneth Ruddle, Katsuragi 2-24-20, Kita-ku, Kobe-shi, Hyogo-ken 651-1223, Japan; Email: mb5k-rddl@asahi-net.or.jp]. **Production**: Information Section, Marine Resources Division, SPC, B.P. D5, 98848 Noumea Cedex, New Caledonia. [Fax: +687 263818; E-mail: cfpinfo@spc.int]. The bulletin is also available at: <http://www.spc.int/coastfish> . **Produced with financial assistance from France.**

Editor's note

Finally, I think we can celebrate, for this is the first issue of this particular Special Interest Group Bulletin that is based entirely on submitted manuscripts. Not only that, we overflowed, and have had to delay some articles until the next issue. But gentle reader, please don't relax even a little, for this laudable trend will never continue without your constant efforts.

In the first article, *A cultural consensus analysis of marine ecological knowledge in the Solomon Islands*, Kevin L. Grant and Marc L. Miller examine the merits of "cultural consensus analysis" and apply it to a case study of the ecological knowledge of Solomon Islanders. The authors are particularly interested in any differences between officially protected and unprotected areas, based on the assertions that practical, behaviour-oriented, and observation-based, local marine environmental knowledge is relevant to fisheries management and that the success or failure of conservation efforts depends largely on the attitudes of communities.

In *Tabus or not taboos?: How to use traditional environmental knowledge to support sustainable development of marine resources in Melanesia*, Anne Caillaud et al. summarise the results of a workshop on Traditional Knowledge and Coastal Resource Conservation for Countries and States of the Melanesian Spearhead Group, held at the International Marine Project Activities Centre (IMPAC) in Townsville, Australia, during March–April 2004. The workshop sought underlying principles and themes to enhance the use and recognition of local or traditional knowledge and laws to improve biodiversity conservation and management of coastal resources. The case studies collated in this article examine linkages between customary laws, especially fisheries management, and existing government regulations, the objective being to ensure that those regu-

Inside this issue

A cultural consensus analysis of marine ecological knowledge in the Solomon Islands
K.L. Grant and M.L. Miller **p. 3**

Tabus or not taboos? How to use traditional environmental knowledge to support sustainable development of marine resources in Melanesia
A. Caillaud et al. **p. 14**

- Introduction p. 14
- Section 1: Incorporating traditional knowledge into government law (Case Studies 1–8) p. 15
- Section 2: Community involvement: community-based co-management of marine resources (Case Studies 9–11) p. 26
- Section 3: Traditional knowledge in an international regime (Case Studies 12–14) p. 30
- Discussion p. 32

lations fully embrace customary practices. The studies demonstrate where local or traditional and customary management practices have been recognised within national laws, and suggest how appropriate local or traditional aspects can be drafted into policy and law within the different levels of government (local, provincial or state, national or federal; and international within multilateral environment agreements). The studies could be used to establish better cooperation between traditional and "modern" knowledge and ensure optimal use of national marine resources in other coastal regions.

So much for the contents. In addition, I would like to draw your attention to *SPC Special Interest Group newsletters and bulletins: Guidelines for authors and editors*, which you can download from SPC's website at: http://www.spc.int/coastfish/News/SIG_guidelines.pdf. It should help with your future submissions.

We are also considering instituting some form of referee system for submissions. This is being done because we are well aware that some potential authors (especially those in academic institutions) may not wish to submit to a non-refereed journal because it does nothing for their career advancement. Some of the papers we now receive reflect considerable hard work, and it is a pity that authors cannot use them for promotion. On the other hand, we realise that some authors have no need of this, and we have no wish to deter them from submitting useful and informative articles. However, now may be the time to admit that I have been informally circulating some of the contributions (with authors' names removed) among colleagues, peers and friends to elicit opinions on suitability and quality. So, in effect, I have been operating this bulletin as a semi-refereed journal for several years now. Any opinions on what should be adopted as policy?

Kenneth Ruddle

A cultural consensus analysis of marine ecological knowledge in the Solomon Islands

Kevin L. Grant[1] and Marc L. Miller[2]*

Abstract

Scientific interest in "local" or "traditional" marine knowledge and its applications in fishery and resource management have fostered linkages between the fields of marine biology and cultural anthropology. Ethnographic techniques are useful for investigating local knowledge structures, but these methods are time-consuming. In partial remedy, this paper promotes the technique of cultural consensus analysis. This Solomon Island case study focuses on ecological knowledge regarding the Arnavon Marine Conservation Area (AMCA) and marine areas that are not officially regulated (gazetted). Study respondents reside in the Isabel Island communities of Poro, Guguha, Kia and Allardyce. Results confirm that there are two bodies of marine ecological knowledge for the marine areas in question with two compatible sets of "culturally correct" answers to the ecological propositions of interest. Findings have potential value in the Solomon Island marine protected area context for their significance with regards to communication, resource assessment, human resources, and resource management. Cultural consensus analysis promises to be of methodological value to marine protected area and fishery managers elsewhere, and can support a variety of management and conservation endeavors attuned to the ideal of sustainable development.

Introduction

In the marine context, scientific interest in "local" or "traditional" knowledge originated in the late 1970s. Fundamental questions concerned natural resource ownership and sea tenure systems, and taxonomic distinctions and fisheries systems. It is important to know that the resulting literature reflects a cross-fertilisation between marine biology and cultural anthropology (Johannes 1977, 1978, 1981, 1982; Akimichi 1978; Ruttley 1987; Hviding 1988, 1989; Ruddle 1993; 1994; Aswani 1997, 1998; Foale 1997; Hamilton and Walter 1999).

Today, it is widely accepted that ethnoichthyological, ecological and other forms of local knowledge are pertinent to marine resource management. In the collection of local knowledge data, scientists have promoted the use of ethnographic techniques such as participant observation, social surveys, and both formal and semi-structured interviews. Analyses have been both quantitative and qualitative (Polunin 1984; Ruddle et al. 1992; Johannes and Hviding 2000; Pollnac et al. 2001; Johannes 2002; Sabetian 2002; Aswani and Hamilton 2004). Drawing from the insights of Christie and White (1997) and Clark and Murdoch (1997), Hamilton and Walter have pointed out that these skills are "usually difficult, time consuming and well beyond the professional training of most fisheries scientists, resource planners, and project managers working in island Melanesia" (1999:13). It seems obvious that this observation holds elsewhere in the Pacific and beyond. With this background, this paper discusses the powerful and inexpensive technique of cultural consensus analysis, and reports on local ecological knowledge in the Solomon Islands.

Cultural consensus analysis

In conversational terms, cultural consensus analysis is a formal and mathematically warranted software procedure for examining a database consisting of respondents' "true-false" judgments about a set of propositions. In this case, the propositions in

1. Master of Marine Affairs, School of Marine Affairs, University of Washington, 3707 Brooklyn Ave. NE, Seattle, WA 98105-6715, USA. Email: keving73@u.washington.edu or Kevin.Grant@noaa.gov
* Contact author
2. Professor of Marine Affairs, School of Marine Affairs, University of Washington, USA

question have to do with the ecological knowledge of Solomon Islanders. Importantly, the propositions of interest must concern beliefs (i.e. what people have concluded about reality or what they, in the course of daily life, assume to be true or false) and *not* preferences (i.e. what people desire given alternatives) or value judgments (i.e. what is good or bad).

Cultural consensus analysis is based on a cognitive conceptualisation of culture. It has the potential to be of enormous methodological value for cross-cultural, ethnographic and sociological studies in which fieldworkers seek to describe knowledge structures (also referred to as concordance codes) that have currency in (sub)cultures other than their own. Consensus analysis is well suited for application in environmental and natural resource anthropology (Miller et al. 2004).

Culture

In this paper, we take "culture" to broadly denote what people *learn* and *know* in order to behave practically and appropriately (or knowingly impractically and inappropriately) in society. Somewhat more specifically, culture consists of the organised (i.e. systematised, patterned) distinctions, standards, and rules concerning reality and human choices that people, to varying degrees, share. Culture undergoes change as it is built upon or otherwise modified by individuals, and as its features and (dis)advantages are communicated to others. This definition derives from others within the tradition of cognitive anthropology that have held that the regularities of culture can be investigated scientifically (see: Romney and D'Andrade 1964; Tyler 1969; Spradley 1972; and D'Andrade 1995).[3]

In a well-known paper, Goodenough ([1957] 1964: 36) advanced a cognitive definition of culture:

> "[A] society's culture consists of whatever it is one has to know or believe in order to operate in a manner acceptable to its members, and do so in any role that they accept for any one of themselves. Culture, being what people have to learn, as distinct from their biological heritage, must consist of the end product of learning: knowledge in a most general, if relative, sense of the term. By this definition, we should note that culture is not a material phenomenon; it does not consist of things, people, behavior, or emotions. It is rather an organization of these things. It is the forms of things that people have in mind, their models for perceiving, relating, and otherwise interpreting them."[4]

Goodenough ([1957] 1964: 36) called for a theory of "conceptual models," and suggested that the adequacy of such a theory could be scientifically evaluated:

> "… by our ability to interpret and predict what goes on in a community as measured by how its members, our informants, do so. A further test is our ability ourselves to behave in ways which lead to the kind of responses from the community's members which our theory would lead us to expect. Thus tested, the theory is a valid statement of what you have to know to know in order to operate as a member of the society and is, as such, a valid description of its culture. Its acceptability beyond this depends largely on the aesthetic criteria to which scientists and mathematicians customarily refer by the term 'elegance.'"

In a volume published at about the same time, Goodenough (1963: 258–259) again equated culture with shared rules and perspectives, noting that when most anthropologists speak of a "community's culture" they have in mind:

> "…the things we attribute to its members' heads and hearts in order to make sense out of what they do. … Culture, then, consists of standards for deciding what is, standards for deciding what can be, standards for deciding how one feels about it, standards for deciding what to do about it, and standards for deciding how to go about doing it."

Three decades later, Chick (1997: 286) has reached roughly the same conclusion:

3. In considering the anthropological lexicon, Chick (1997: 284–284) classifies definitions of culture in four categories on a scale of increasing inclusivity: 1) culture as mental; 2) culture as mental and behavioural; 3) culture as mental, behavioural, and material; and 4) culture as information.
4. Goodenough ([1957] 1963: 36) considers "behavior or social, economic, and ceremonial events and arrangements as observed material phenomena" and as artefacts of culture. This view is arguably consistent with that of D'Andrade (2001: 249) who points out that:
   > "[I]t is a mistake to treat culture as consisting of nothing but ideas, meanings, understandings, and so on. Definitions, to be useful should 'carve nature at the joints'. But, cultural ideas/meanings/ knowledge/understandings are always fused to physical manifestations."

> "[M]y guess is that most anthropologists would favor a definition that includes culture as something in the heads of members of particular societies."

Origins of cultural consensus analysis

Consensus analysis has its origins in the confluence of mathematical anthropology and psychometrics (e.g. Romney et al. 1986, Romney et al. 1987; Batchelder and Romney 1988: 4700–4701). As Romney et al. (1996) point out in a recent special inaugural article by members of the National Academy of Sciences that appeared in the *Proceedings of the National Academy of Sciences*:

> "Cultural consensus analysis consists of a family of formally derived mathematical models that simultaneously provide an estimate of the cultural competence or knowledge of each informant and an estimate of the correct answer to each question asked."

Cultural consensus analysis shows great promise in the social sciences not only for what it will help investigators to discover about cognitive structures, but also for its surprisingly small sample size requirements. A first key feature of the cultural consensus theory is that it permits the recovery of culturally correct answers without knowing these in advance, as well as measurements of the competence of respondents. In this regard, Romney et al. (1996: 4701, emphasis added) have noted that:

> "[t]he consensus model provides a way to utilize much of the accumulated knowledge of traditional psychometric test theory without knowing the 'correct' answers in advance. Whereas traditional test theory begins with 'performance' data (i.e. items coded as 'correct' or 'incorrect') consensus theory begins with 'response' data (items coded as given by the informants; for example 'true' or 'false,' with no assumptions about whether the informant is correct or incorrect). The potential implications of this fact for the behavioral sciences may be important. *It means that we are now in a position to measure the knowledge of subjects where we do not know the answers to the questions we ask and to do so with a degree of accuracy comparable to that obtained in traditional test theory.*"

A second key feature of cultural consensus theory is that when the average level of cultural competence of respondents is found to be above 0.5, researchers can be certain of their results at traditional high levels of statistical confidence with sample sizes of between 4 and, say, 30 respondents. As Romney et al. (1986: 333) report:

> "This is the first time, to our knowledge, that we can defend at the formal mathematical level, the use of such small samples for the aggregation of cultural knowledge."

With these advantages, the methodological significance of the development of consensus theory is difficult to overemphasise. Fortunately, the case for cultural consensus analysis is most succinctly made by Romney et al. (1986: 327, emphasis added):

> "The use of the method with small samples of subjects and items is in rather striking contrast to related psychometric methods. For example, Nunnally (1978: 262), among others, recommends sample sizes of 300 to 1000 and the use of a large number of items with 'at least five times as many persons as items,' Lord and Novick (1968) present figures based on a sample of 107,234 cases. Lazarsfeld and Henry (1968) use a small number of questions but say we should have samples of subjects of at least 1000. *Are we really justified in using as few as a half-dozen subjects with only a few dozen items? We feel that the answer is yes for the following reasons: (1) we have a very tight theory whose assumptions are very stringent; (2) we are working with very high-concordance codes where consensus is high; and (3) we are only trying to find one 'correct' answer for a question rather than, say, differentiating questions on a continuous scale of tendency to be 'true' or 'false'.*"

The cultural consensus paradigm

In its most specific meaning, cultural consensus analysis refers to formal mathematical models developed by A.K. Romney and his associates. For an overview of how consensus analysis is linked to a host of data collection techniques (including, for example, pile sort, triad, paired comparison, and other judged similarity tasks that have become standard in cognitive anthropology) and quantitative methods (e.g. multidimensional scaling, hierarchical clustering, quadratic assignment procedure), see Weller and Romney (1988). For integrated personal computer software concerning the transformation and analysis of these types of data, see Borgatti (1996a).

As mentioned above (and when assumptions of the models hold), consensus analysis generates estimates of the amount of cultural knowledge possessed by subjects, and also "correct" answers that characterise the knowledge base under study. In what follows, the core of the cultural consensus analysis paradigm is briefly summarised. For more detail regarding the three assumptions — of common truth, local independence, and homogeneity of items — of the cultural consensus model, see Romney et al. (1986: 317–318).

Cultural consensus models treat a matrix of input data measuring how individuals (each of whom is typically associated with a matrix row) evaluate the "truth" or "falseness" of propositions, the "correct" answers to multiple choice questions, and (when pile-sort data is utilised) whether or not pairs of stimuli "belong together."

Very explicitly, consensus theory enables the researcher to answer three basic questions:

1. Is there enough agreement among respondents about propositions to indicate that all respondents *share a single knowledge base* or cultural code about the propositions? Alternatively, are respondents better characterised as having no consensus about the propositions, or as being committed to more multiple cultural codes?
2. If respondents do share a single cultural code, what are *the response differences* between individual respondents or subgroups of respondents?
3. If respondents do share a single knowledge base, what are *the culturally correct answers* to the propositions?

In addressing these questions, cultural consensus analysis systematically compares the pattern of a particular respondent's responses with patterns of all other respondents. This comparison of row vectors yields three kinds of output:

1. a *competence score* for each respondent indicating the level of knowledge of the cultural code (i.e. the extent to which the respondent's answers are *reliable* estimates of the answer key)
2. an estimated *answer key* displaying the culturally correct answers to propositions presented to respondents
3. a *similarity matrix* displaying the correlations for all pairs of respondents.

Consensus analysis applications

Over the last 15 years, diverse cultural populations and knowledge domains have been studied with consensus analysis. To illustrate, published studies have focused on college students and almanac questions (Romney et al. 1986), Guatemalans and diseases (Romney et al. 1986), folk medical beliefs (Garro 1986), child abuse (Weller et al. 1986), causes of death (Romney et al. 1987), expert and novice knowledge of fish (Boster and Johnson 1989), occupational prestige (Romney 1989), personality beliefs in a college sorority (Iannucci and Romney, 1990), alphabet systems (Jameson and Romney 1990), pollution and food safety (Johnson and Griffith 1996), social networks (Klauer and Batchelder 1996), cross-cultural cognitions of dental pain (Moore et al. 1997), boundaries of Celtic cultures (Caukins 2001), AIDS and other diseases (Weller and Baer 2001), and diabetes (Garro in press), and most recently, a pelagic fishery in Hawaii (Miller et al. 2004).

Against this backdrop, the present study extends cultural consensus theory from the realm of methodological development to that of application, in this case ecological knowledge of Solomon Islanders.

Case study

The research on the ecological knowledge of Solomon Islanders reported in this paper was undertaken in the context of a larger interest in natural resource management and marine protected area management in the Pacific (see, for example, Ruddle 1994; Christie and White 1997; Kelleher 1999; Roberts and Hawkins 2000; Christie et al. 2002; Aswani and Hamilton 2004; Christie 2004). In the Solomon Island case study we were particularly interested in the differences, if any, between areas that were not officially protected (gazetted) and the Arnavon Marine Conservation Area (AMCA – est. 1995). Our work finds modest justification in two recent assertions:

> "The practical, behavior-oriented, and observation-based nature of [Solomon Island] people's knowledge of the marine environment … is relevant to fisheries management … in the sense that it provides an admirable basis for the monitoring of fish stocks." (Hviding and Baines 1994: 28)

> "[In the Solomon Islands] the success or failure of conservation efforts largely depends on the attitudes of the communities owning them." (Sulu et al. in press.)

Setting

The Solomon Islands lie east of Papua New Guinea and northeast of Australia in the South

Figure 1. Solomon Islands, with research sites highlighted

Pacific. It is the third largest archipelago in the South Pacific. Land accounts for only 27,556 km² of the Solomon Island's total area of 1.35 million km². There are nine provinces comprising 992 islands, only 347 of which are populated. Coral reefs and lagoons surround most islands, and tropical rainforest covers approximately 79 per cent of the country (Honan and Harcombe 1997: 21). The field site comprised the Arnavon Islands (AMCA) and the Santa Isabel communities of Poro, Guguha, Kia and Allardyce.

Methods

Local community members were canvassed in order to identify respondents likely to have expert knowledge regarding the local marine environment. Based upon the author's two years of experience in the Solomon Islands as a Peace Corp volunteer, a list of 23 propositions was developed in order to measure marine ecological knowledge pertinent to the Solomon Islands. In one-on-one interviews, respondents (N= 30: 26 villagers, 4 AMCA Conservation Officers – COs) were asked to either "agree" or "disagree" to the 23 statements.[5] It was emphasised that there were no "right" or "wrong" answers and that individual opinions were being sought. Respondents were encouraged to volunteer additional information on the subject, and any supplemental information was recorded in field notes. All interviews were conducted in Pijin, the lingua franca of the Solomon Islands. Consensus analysis of responses supports the conclusion that all 30 respondents share a common cultural knowledge base.

Results

ANTHROPAC 4.92 (Borgatti 1996) software was used to analyze consensus data. Respondents recognised the truth/falseness of the propositions based upon their experiences with the marine environment. The analysis was run twice, once for the 26 respondents (villagers) answering about the marine environment around their villages and once for the four Conservation Officers (COs) regarding the marine environment of the Arnavon Marine Conservation Area (AMCA) — a marine protected area established in 1995. The Conservation Officers were separated in this anal-

5. In order to ensure comprehension of the task, respondents were given alternate phrasings with which to respond, such as "true" or "false", "correct" or "incorrect".

ysis because they responded to the ecological propositions in reference to the AMCA, whereas the other respondents answered in reference to the waters around their villages.

Analyses used both the matches and covariance calculations (Romney et al. 1986). Results were virtually the same. As a rule of thumb, consensus eigenvalue ratios above 3.00 demonstrate consensus among respondents (Borgatti 1996b: 44). Consensus analysis of marine ecological knowledge data based on the matches method resulted in eigenvalue ratios of 5.35 for the villagers and 13.66 for the COs, while analysis based upon the covariance method resulted in eigenvalue ratios of 5.57 for the villagers and 13.34 for the COs. Results verify that among respondents from both groups there exists a common body of marine ecological knowledge.

As noted, once it is determined that a consensus exists among respondents, analysis generates a set of "culturally correct" answers to the propositions in question. It is also possible to rank the respondents by comparing their answers to the culturally correct answer set, and to determine the average estimated knowledge of the respondents. Analysis shows the average estimated knowledge of the villagers to be 0.65. The Conservation Officers had an average estimated knowledge of 0.83. Table 1 shows the propositions used in the marine ecological knowledge survey and provides the culturally correct answers to each proposition, according to both respondent groups. The answer key for each group was identical regardless of the method (matches or covariance) used.

The probability that each of the above answers is the culturally correct answer, according to both respondent groups, is 100 per cent with the exception of question 11, where there was a 60 per cent probability that the culturally correct answer is True.

The culturally correct answers, according to the COs, differed only slightly. The COs answered differently on propositions 1, 4, 5, 7, 9, and 13, yet the probability that their answers are the culturally correct answers — according to "Conservation Officer culture" — is 100 per cent. Not surprisingly, these questions deal with populations of marine organisms, or in the case of number 9, the quality of coral reefs. Since the COs answered the propositions with respect to the Arnavon Marine

Table 1. **Marine ecological knowledge propositions and their culturally correct answers**

Yes/No marine ecological knowledge propositions:	Culturally correct answers	
	Villagers	COs
1. There are more turtles now than any time in the past ten years	**F**	**T**
2. Sea level has not risen over the past decade	F	F
3. Coral is an animal	T	T
4. Grouper populations have increased in the past decade	**F**	**T**
5. Parrotfish populations have declined in the last ten years	**T**	**F**
6. It is easiest to catch crayfish during the day	F	F
7. Beche de mer populations have decreased in the last ten years	**T**	**F**
8. The favourite food of leatherback turtles is jellyfish	T	T
9. The quality of the reef has declined over the past ten years due to anchor damage	**T**	**F**
10. Protected areas will help increase fish catches (outside the protected area)	T	T
11. Sea snakes are not poisonous	T	T
12. The moon does not affect the tides	F	F
13. Trochus populations have increased in the past ten years	**F**	**T**
14. Dolphins are not fish	T	T
15. Mangroves are important nursery habitats for fish	T	T
16. Intensive logging has degraded reefs	T	T
17. Giant clams eat fish	F	F
18. After hatching, male sea turtles never return to land	T	T
19. Salt-water crocodile populations have increased since the ban on hunting them	T	T
20. Parrotfish do not eat coral (stone)	F	F
21. Dugongs eat fish	F	F
22. In the past ten years, cyclones have damaged the coral reef	T	T
23. Sharks never attack people	F	F

Conservation Area, it is logical that they would respond by noting increases in marine species populations and state that the quality of the reef has not declined due to anchor damage (number 9). While all of the propositions are pertinent to the elicitation of cultural consensus regarding marine ecological knowledge, a select few are of particular significance to the concept of marine protected areas. The reasons given by villagers and COs for their (sometimes different) answers to these select marine ecological knowledge propositions include the following[6]:

Proposition 1: There are more turtles now than anytime in the past ten years.

Villagers: False
- "We hunt turtles. Before it was easy, now it's very hard…men eat the [turtle] eggs too."
- "People harvest them for consumption… very much for food. Even the eggs, if they find them they will eat them."
- "People now go to the nesting beaches. If people go there and start a village, they spoil the turtle's place."

Conservation Officers: True
- "[Turtles] were harvested [here] before, then we closed the area so there are many now."

Proposition 2: Sea level has not risen over the past decade.

Villagers and Conservation Officers (agree): False
- "[The sea] has risen a lot in the past ten years. It has caused much destruction of the shoreline…many places where we used to play before are gone now. Under the sea."
- "Now there are some parts that the sea didn't cover before that are covered."
- "Some of the islands that I visit used to be bigger. Now the sea can go inside the islands."

Proposition 4: Grouper populations have increased in the past decade.

Villagers: False
- "Our population was too big, so we take too many [grouper]".
- "We harvest them all the time so it can't increase."

Conservation Officers: True
- "Because I go fishing and now it's hard to miss. You can catch lots if you like." [Subsistence fishing for the Conservation Officers is allowed in the AMCA]

Proposition 5: Parrotfish populations have declined in the past ten years.

Villagers: True
- "Two reasons, one is the gillnet…actually three…the second is the use of a local poisonous leaf, the other is night diving. Before we didn't dive at night. It's easy to get [parrotfish] at night because they sleep on the reef."

Conservation Officers: False
- "I dive there [the AMCA] and there are a lot of parrotfish. And no one can net there now."

Proposition 7: Beche de mer populations have decreased in the last ten years.

Villagers: True
- "People with money come to buy them, so [we] always dive [for] them. If we aren't careful, they'll die out."
- "It is one marine product that [offers] big money, so people take them all the time."

Conservation Officers: False
- "They [populations] have gone up because we protect them."

Proposition 9: The quality of the reef has declined over the past ten years due to anchor damage.

Villagers: True
- "Lots of men [anchor on the reef] and it breaks the coral."
- "There are a lot of men who have an interest in fishing now [due to population increase]…children go fishing by themselves too." [resulting in more fishing pressure]

Conservation Officers: False
- Before this would have been true, but we've closed the area so the corals have recovered. – paraphrase
- "[The area] is closed and we [conservation officers] use mooring buoys."

Proposition 10: Protected areas will help increase fish catches.

Villagers and Conservation Officers (agree): True
- "Suppose we protect our [marine] areas, the fish and shellfish come back."
- "If they close an area, then the fish will go there. We can catch lots of fish close to a protected area."
- "A lot of fish will breed [in protected areas] then the fish will go outside [of the protected area]."

6. Responses were translated, by the lead author, from Solomon Islands Pijin

- "Fish have lots to eat in protected areas…and they won't stay in there all the time. They go in, out. You'll be lucky if you fish close to a protected area."

Proposition 13: Trochus populations have increased in the past ten years.

Villagers: False
- "If you dive these days to find trochus, you'll have a bit of a hard time…you can find them, but not a lot."
- "Over-harvesting. They take the small ones, no matter if it is undersized."
- "Only the small ones are left. Money has spoiled them."

Conservation Officers: True
- "We conduct surveys on [trochus]…you can see big ones, small ones all around now."

Proposition 15: Mangroves are important nursery habitats for fish.

Villagers and Conservation Officers (agree): True
- "Because the roots are a protective place where big fish can't attack small fish."
- "This is the place where any kind of fish from the sea will come to the mangroves to lay its eggs."
- "I dive there and see the young fish."

Proposition 16: Intensive logging has degraded reefs.

Villagers and Conservation Officers (agree): True
- "I strongly agree with that one. I see it here [due to a new logging operation]. The reef is dirty and the fish are gone."
- "When they cut down the trees it spoils the water. Then the water isn't pure. Eventually dust and dirt ruin the coral."
- "Because logging…heavy rains will take oil and rubbish and carry it to the sea."
- All COs agreed that logging is detrimental to reefs, but since there are no logging operations near the AMCA it did not apply.

In addition to determining both consensus and the culturally correct answers to the propositions, the agreement matrix produced by the ANTHROPAC software was submitted to nonmetric multidimensional (Euclidean) scaling in order to graphically represent the extent to which Solomon Island villagers' responses matched one another. Data used were based upon the agreement matrix of villagers using the matches method.

Looking at Figure 2, the positions of the 26 villagers (indicated with letters) are based on the similarity of the villagers' response patterns. The letters P, G, K, and A represent villagers from the communities of Poro, Guguha, Kia and Allardyce, respectively. The letter W represents the only respondent from the Western Province and not from the island of Santa Isabel. In addition, and as noted above, it is possible to determine the average estimated knowledge of the respondents, based upon the culturally correct answers, and therefore rank the respondents. The five highest ranking respondents are indicated by asterisks.

We reiterate our main finding that there is a cultural consensus among the 26 villagers regarding a single ecological reality. Collectively, these villagers share and respond to a common ecological knowledge base. Having said this, the issue of

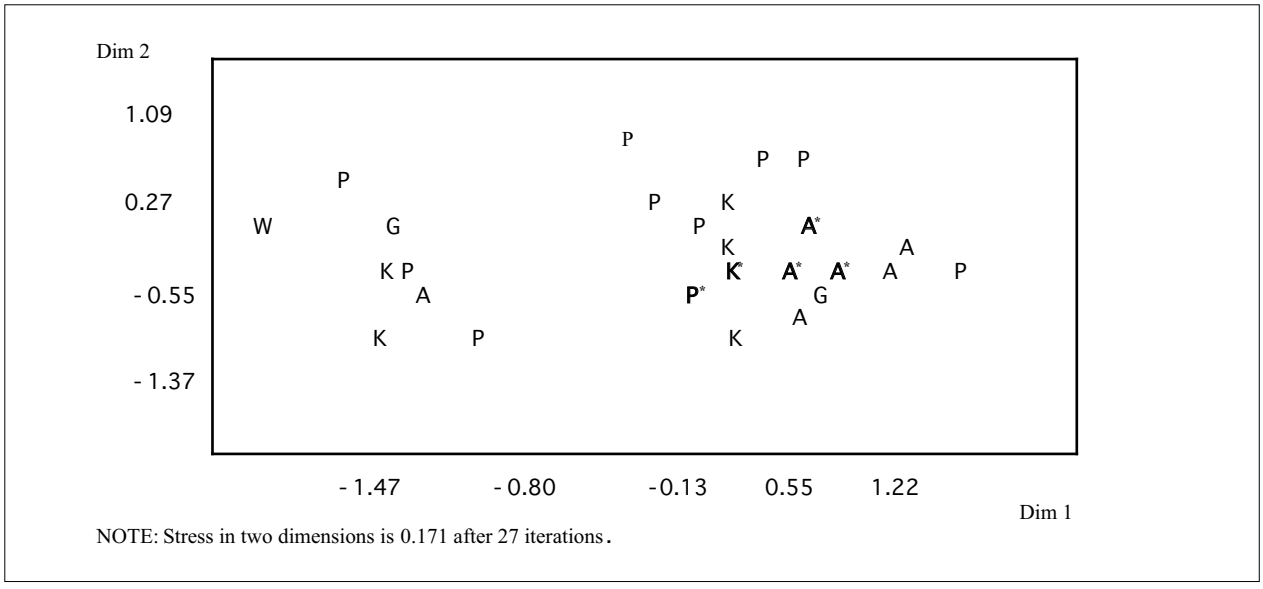


Figure 2. **Nonmetric multidimensional scaling of villagers**

individual differences can be considered. Generally, there is substantial overlap between communities suggesting that village of residence is not a key factor in shaping cognitions. This said, inspection of the scaling output shows that there is a loose grouping of respondents from Allardyce (A) clustered in the centre and right of the plot and another cluster of Kia (K) villagers in the centre. Respondents from Poro (P) are widely distributed. The single respondent from another province (W) is alone on the far left of the plot.

Discussion

In interpreting these results, in the context of marine protected area management in the Solomon Islands, we identify four findings with potential value to resource managers. First, we have determined that there is consensus, among villagers and among Conservation Officers, regarding marine ecological knowledge. This demonstrates a communication significance as one could therefore appeal to fishermen and managers, through their expert knowledge, to change behaviours regarding marine resource extraction. Second, results of some propositions highlight the status of stocks and are therefore important for their *resource assessment significance*. Third, consensus analysis allowed us to determine the "experts among experts" improving the *human resource significance* of each community by identifying those individuals who are particularly knowledgeable regarding the culturally correct marine ecology of their areas. Finally, our findings have *management significance* showing that the Arnavon Marine Conservation Area has been successful in increasing stocks of certain organisms.[7]

Conclusions

In this paper, we have discussed the merits of cultural consensus analysis technique and have employed the method in a Solomon Island application. Substantive results reveal that villagers (and separately, conservation officers) tap a single ecological knowledge base regarding the marine environment. We anticipate that our findings, taken together, can be useful in the context of marine protected area and fishery management.

Looking beyond the Solomon Islands, cultural consensus studies would seem to be useful to many marine protected area and fishery managers elsewhere. The method has great potential for the investigation of knowledge structures — both traditional and scientific — throughout the Pacific. We want to emphasise, however, that the method is equally pertinent to "basic" and "applied" science. Researchers can test theories about cultural universals in the realm of ethnoscience. Do, for example, fishermen and other residents of coastal communities in diverse societies think differently (that is, taxonomically) about aquatic fauna and flora? Do they think differently about changes in the marine environment that are linked to El Niño Southern Oscillation events and global warming?

Finally, cultural consensus analysis can support a diverse variety of management and conservation endeavours attuned to the ideal of sustainable development. Coastal tourism management, environmental management, and, of course, integrated coastal zone management applications come quickly to mind. All marine affairs practitioners should be familiar with this technique even if it is not in their personal methodological arsenal.

Acknowledgements

We would like to thank the wonderful people of the Solomon Islands who offered their time and insights to this project. The residents of Poro (and Putukora), Guguha, Kia and Allardyce were extremely charitable hosts and helped make the fieldwork very enjoyable. We must also thank The Nature Conservancy's Solomon Islands program for its assistance. The project would not have been completed without it. Finally, I must extend my deepest sympathies to the family of the late Michael Evo. His dedication to education in the Solomon Islands was commendable. He was a gracious host and a wonderful friend.

References

Akimichi T. 1978. The ecological aspect of Lau (Solomon Islands) ethnoichthyology. Journal of Polynesian Society 87:310–26.

Aswani S. 1997. Customary sea tenure and artisanal fishing in the Roviana and Vonavona Lagoons, Solomon Islands: The evolutionary ecology of marine resource utilization. PhD dissertation, University of Hawaii, Hawaii.

Aswani S. 1998. Patterns of marine harvest effort in southwestern New Georgia, Solomon Islands: Resource management or optimal foraging? Ocean and Coastal Management 40 (2–3):207–35.

Aswani S. and Hamilton R. 2004. The value of many small vs. few large marine protected areas in the Western Solomon Islands. SPC Traditional Marine Resource Management and Knowledge Information Bulletin 16:3–14.

7. Importantly, villagers from Kia — the community closest to AMCA — were consistent in reporting higher fish catches along the protected area boundaries supporting the existence of a conservation "spillover" effect.

Batchelder W.H. and Romney A.K. 1988. Test theory without an answer key. Psychometrika 53 (1):71–92.

Borgatti S.P. 1996a. ANTHROPAC 4.92. (Analytic Technologies, Natick, MA).

Borgatti S.P. 1996b. ANTHROPAC 4.0 Methods Guide. Natick, MA: Analytic Technologies.

Boster J.S. and Johnson J.C. 1989. Form or function: A comparison of expert and novice judgments of similarity among fish. American Anthropologist 91:866–889.

Caukins D.D. 2001. Consensus, clines, and edges in Celtic culture. Cross-Cultural Research 35 (2):109–126.

Chick G. 1997. Cultural complexity: The concept and its measurement. *Cross-Cultural Research*, 31: 4: 275-307.

Christie P. in press. Marine protected areas as biological successes and social failures in Southeast Asia. American Fisheries Society Symposium.

Christie P. and White A.T. 1997. Trends in development of coastal area management in tropical countries: from central to community orientation. Coastal Management 25:155–181.

Christie P., White A. and Deguit E. 2002. Starting point or solution? Community-based marine protected areas in the Philippines. Journal of Environmental Management 66:441–454.

Clark J. and Murdoch J. 1997. Local knowledge and the precarious extension of scientific networks: a reflection on three case studies. Sociologia Ruralis 37(1):39–60.

D'Andrade R.G. 1995. The development of cognitive anthropology. New York: Cambridge University Press.

D'Andrade R.G. 2001. The sad story of anthropology 1950–1999. Cross-Cultural Research 34(3):219–232.

Foale S. 1997. Ownership and management of traditional Trochus fisheries at West Gela, Solomon islands. p. 266–272. In: Hancock D.A., Smith D.C., Beumer J.P. (eds). Developing and sustaining world fishery resources: the state of science and management. Second world fisheries congress, Brisbane. 1996, vol.2. Melbourne, Australia: CSIRO.

Garro L. 1986. Intracultural variation in folk medical knowledge. American Anthropologist 88:351–370.

Garro L. in press. Using consensus theory and schema theory in a three-community study of knowledge about diabetes. Ethnology [Paper originally presented at the Annual Meeting of the Society for Cross-Cultural Research, Santa Fe, NM; 1999].

Goodenough W.H. [1957] 1964. Cultural anthropology and linguistics. p. 36-39. In: Hymes D. (ed.). Language in culture and society: A reader in linguistics and anthropology. New York: Harper and Row. [reprinted from Garvin P.L. (ed.) Report of the seventh annual round table meeting on linguistics and language study. (Monograph Series on Languages and Linguistics, No. 9), Washington, D.C.: Georgetown University. 167–173]

Goodenough W.H. 1963. Cooperation and change: An anthropological approach to community development. New York: Russell Sage Foundation.

Hamilton R. and Walter R. 1999. Indigenous ecological knowledge and its role in fisheries research design: A case study from Roviana Lagoon, Western Province, Solomon Islands. SPC Traditional Marine Resource Management and Knowledge Information Bulletin 11:13–25.

Honan M. and Harcombe D. 1997. Lonely Planet: Solomon Islands. 3rd ed. Lonely Planet Publications: Hawthorn, Australia.

Hviding E. 1988. Marine tenure and resource development in Marovo Lagoon, Solomon Islands: Traditional knowledge, use and management of marine resources, with implications for contemporary development. FFA Report No. 88. Honiara. Forum Fisheries Agency. 35 p.

Hviding E. 1989. Keeping the sea: aspects of marine tenure in Marovo Lagoon, Solomon Islands. p. 7–10. In: Ruddle K. and Johannes R.E. (eds.). Traditional marine resource management in the Pacific Basin: An anthology. Jakarta: UNESCO/Reg. Off. Sci. Technol. SE Asia. 410 p.

Hviding E. and Baines G.B.K. 1994. Community-based fisheries management, tradition and the challenges of development in Marovo, Solomon Islands. Development and Change 25:13–39.

Iannucci A.L. and Romney A.K. 1990. Consensus in the judgment of personality traits among friends and acquaintances. Journal of Quantitative Anthropology 4:279–295.

Jameson K. and Romney A.K. 1990. Consensus on semiotic models of alphabetic systems. Journal of Quantitative Anthropology 2:289–303.

Johannes R.E. 1977. Traditional law of the sea in Micronesia. Micronesia 13:121–27.

Johannes R.E. 1978. Traditional marine conservation methods in Oceania and their demise. Annual Review of Ecology and Systematics 9:349–64.

Johannes R.E. 1981. Words of the lagoon: Fishing and marine lore in the Palau district of Micronesia. Berkeley: University of California Press.

Johannes R.E. 1982. Traditional conservation methods and protected marine areas in Oceania. Ambio 11(5):258–61.

Johannes R.E. 2002. The renaissance of community-based marine resource management in Oceania. Annual Review of Ecological Systems 33:317–340.

Johannes R.E. and Hviding E. 2000. Traditional knowledge possessed by the fishers of Marovo Lagoon, Solomon Islands, concerning fish aggregating behaviour. SPC Traditional Marine Resource Management and Knowledge Information Bulletin 5:8–15.

Johnson J.C. and Griffith D.C. 1996. Pollution, food safety, and the distribution of knowledge. Human Ecology 24(1):87–108.

Kelleher G. (ed.) 1999. Guidelines for marine protected areas. World Commission on Protected Areas Best Practice Protected Area Guidelines Series No. 3. IUCN–World Conservation Union.

Klauer C. and Batchelder W.H. 1996. Structural analysis of subjective categorical data. Psychometrika 61(2):199–240.

Lazarsfeld P.F. and Henry N.W. 1968. Latent structure analysis. Boston: Houghton Mifflin.

Lord F.M. and Novick M.R. 1968. Statistical theories of mental test scores. Reading, MA: Addison-Wesley.

Miller M.L., Kanko J., Bartram P., Marks J. and D. Brewer. 2004. Cultural consensus analysis and environmental anthropology: Yellowfin tuna fishery management in Hawaii. Cross-Cultural Research 38(3):289–314.

Moore R., Brodsgaard Mao T.-K., Miller M. L. and Dworkin S.F. 1997. Consensus analysis: Reliability, validity, and informant accuracy in use of American and Mandarin Chinese pain descriptors. Annals of Behavioral Medicine 19(3):295–300.

Nunnally J.C. 1978. Psychometric theory. New York: McGraw-Hill, New York.

Pollnac R.B., Crawford B.L. and Gorospe M.L.G. 2001. Discovering factors that influence the success of community-based marine protected areas in the Visayas, Philippines. Ocean & Coastal Management 44(11-12):683–710.

Polunin N. 1984. Do traditional 'reserves' conserve? A view of Indonesia and New Guinea evidence. In: Ruddle K and Akimichi T. (eds). Maritime institutions in the Western Pacific. Senri Ethnological Studies 17. Osaka: National Museum of Ethnology.

Roberts C.M. and Hawkins J.P. 2000. Fully-protected marine reserves: a guide. WWF Endangered Seas Campaign. Washington D.C.

Romney A.K. and D'Andrade R.G. (eds.). 1964. Transcultural studies in cognition (Special Publication) American Anthropologist 66:3(Part 2).

Romney A.K., Batchelder W.H. and Weller S.C. 1987. Recent applications of cultural consensus theory. American Behavioral Scientist 31(2):163–177.

Romney A.K., Boyd J.P., Moore C.C., Batchelder W.H. and Brazil T.J. 1996. Culture as shared cognitive representation. Proceedings of the National Academy of Sciences 93:4699–4705.

Romney A.K., Weller S.C. and Batchelder W.H. 1986. Culture as consensus: A theory of culture and informant accuracy. American Anthropologist 88:313–338.

Ruddle K. 1993. The transmission of traditional ecological knowledge. p. 17–31. In: Dyer C.L. and Ingles J.T. (eds). Traditional ecological knowledge: Concepts and cases. Ottowa. International Development Research Center.

Ruddle K. 1994. A guide to the literature on traditional community-based fishery management in the Asia-Pacific tropics. FAO Fish. Circ. No. 869. 114 p.

Ruddle K., Hviding E. and Johannes R.E. 1992. Marine resources management in the context of customary tenure. Marine Resource Economics 7:249–73.

Ruttley H.L. 1987. Analysis of replies to a questionnaire on customary fishing rights in the Solomon Islands, Fisheries Law Advisory Programme, Western Pacific and South China Sea Region TCP/SOI/6601(A)FL/WPSCS/87/16, Rome: Food and Agriculture Organization of the United Nations.

Sabetian A. 2002. The importance of ethnographic knowledge to fishery research design and management in the South Pacific: A case study from Kolombangara island, Solomon Islands. Traditional Marine Resource Management and Knowledge Information Bulletin 14:22–34.

Spradley J.P. (ed.) 1972. Culture and cognition: Rules, maps, and plans. San Francisco: Chandler Publishing Company.

Sulu R., Hay C., Ramohia P. and Lam M. 2002. Status of Solomon Islands coral reefs. (in press).

Tyler S.A. (ed.). 1969. Cognitive anthropology. New York: Holt, Rinehart & Winston.

Weller S.C. and Baer R.D. 2001. Intra- and intercultural variation in the definition of five illnesses: AIDS, diabetes, the common cold, empacho, and mal de ojo. Cross-Cultural Research 35(2):201–226.

Weller S.C. and Romney A.K. 1988. Systematic data collection. Newbury Park, CA: Sage.

Weller S.C., Romney A.K. and Orr D.P. 1986. The myth of a sub-culture of corporal punishment. Human Organization 46:39–47.

Tabus or not taboos?

How to use traditional environmental knowledge to support sustainable development of marine resources in Melanesia

*Anne Caillaud, Sarimin Boengkih, Elizabeth Evans-Illidge, John Genolagani, Paul Havemann, Douveri Henao, Eric Kwa, Donna Llewell, Alma Ridep-Morris, Justin Rose, Russell Nari, Posa Skelton, Robin South, Reuben Sulu, Alifereti Tawake, Brendan Tobin, Silika Tuivanuavou and Clive Wilkinson**

International Marine Project Activities Centre, PO Box 772, Townsville 4810 Australia

INTRODUCTION

Melanesian communities have long histories of interaction with the natural environment. Their unique traditional knowledge and cultural practices have been developed over many centuries and transmitted from generation to generation. Many Melanesian communities developed management practices to ensure the sustainability of fisheries resources, and these practices were based on detailed biological knowledge of the species involved. Today, traditional marine resource management continues to be practiced by communities and contributes extensively to the conservation of local resources and the spiritual, cultural and economic well-being of villagers. The role of customary owners is recognised within the constitutions of Melanesian countries, some of which give primary recognition to customary law.

Yet this deep-rooted knowledge is now threatened. Many government regulations in Melanesia apply conventional western management concepts and models. By failing to properly take into account customary practices or traditional knowledge, these regulations serve to greatly weaken local authorities. The introduction of new fishing techniques and commercial fishing attitudes have destabilised traditional management and resulted in a reduced respect for traditional chiefs and elders, especially among the youth. Moreover, communities often lack adequate scientific information on which to base management decisions. Thus, there is a need to harmonise traditional and modern practices (as emphasised in government laws). This harmonisation process should incorporate the best practices of traditional marine resource management, with a view to ensuring sustainable development.

These issues were discussed at a workshop on Traditional Knowledge and Coastal Resource Conservation for Countries and States of the Melanesian Spearhead Group, held at IMPAC (International Marine Project Activities Centre) in Townsville, Australia, in March/April 2004. The workshop sought to determine the underlying principles and themes that could be used to enhance the use and recognition of traditional knowledge and laws, with a goal of improving biodiversity conservation and management of coastal resources. The case studies from the workshop explore the links between customary laws — especially those relating to fisheries management — and existing government regulations, with a view to ensuring that government regulations take full account of customary practices. Melanesian case studies are complemented with case studies from other regions, which provide useful examples.

The case studies demonstrate where traditional and customary management practices have been recognised within national laws, and suggest how appropriate aspects of traditional practices can be drafted into policy and law within the different tiers of government (local; provincial or state; national or federal; and international within multilateral environment agreements - MEAs). The case studies provide examples of how better cooperation could be established between traditional and "modern" management practices, thus ensuring optimal use of marine resources in other coastal regions of the world.

The first eight case studies (Section 1) from Melanesia, Micronesia and Polynesia focus on incorporating traditional knowledge into government laws. These case studies provide examples of synergy between customary and government

* Corresponding author: clive.wilkinson@impac.org.au

law, revealing successes as well as limits of the varied initiatives.

Section 2 case studies focus on community involvement in the management of marine resources. They show the need for co-management and the empowerment of communities, notably through decentralisation processes. Co-management can prove to be a success, as in Fiji, but intersectoral problems can have a negative effect on cooperation, as shown in the second case study from Papua New Guinea.

The solution may rest in the establishment of an international regime protecting traditional knowledge, which is the focus of Section 3. The last case study explores the issue of access and benefit sharing, and intellectual property rights, through the example of the Australian Institute of Marine Science.

SECTION 1: INCORPORATING TRADITIONAL KNOWLEDGE INTO GOVERNMENT LAW

Case Study 1

Merging traditional resource management approaches and practices with the formal legal system in Vanuatu

Russell Nari[1]

Traditional laws and conservation practices

Vanuatu is a multicultural nation, where more than 100 languages are in use in 80 different islands. Although it is threatened, traditional culture remains active and traditions and practices continue to be passed orally from generation to generation.

Pre-western contact

A wide range of traditional conservation approaches and practices existed in Vanuatu in the past. Two general types of resource management systems were in place: direct management and indirect management. Direct management occurred as a result of direct observations (and a perception of a change in resource status, or degradation of ecosystems), which led to decisions to take relevant, corrective action (e.g. declaring a ban — taboo or tabu). Indirect management had a more spiritual and cultural basis, and conservation measures were established via ritual and initiation ceremonies. Indirect resource management practices included the establishment of taboo sites, and taboos imposed by customs following particular events such as an epidemic, a murder, or a pig killing ceremony. Direct practices included periodic taboos imposed by chiefs or landowners, and symbolised by recognised markers.

What remains today?

Although traditional resource management practices continue to be used in Vanuatu, they are threatened by development. Taboo sites and periodic taboos continue to be important, although concerns are continually raised regarding the decline in respect for taboo sites. Customary taboos have also declined due to the acceptance of Christianity and European mores. Differences in perceptions between traditional and western cultures about resources have led to considerable disagreement and confusion about marine management. However, the key underlying values of traditional resource management contain some elements of the western principle of "sustainable development". These values (livelihood, equity, responsibility and cooperation) are anchored by the four main pillars of society's existence: security of tenure; inheritance and use rights; site based focus and affinity with the land; and decision-making processes and decision-makers. However, these traditional values have been challenged by a lack of clear resource management and development policy directions at the national level, western education, the *wantok* system (especially rural-urban), and colonialism.

Interface between traditional and governmental laws: Issues and challenges

Traditional knowledge and practices can be useful in two key areas: education, and the design and implementation of an appropriate sustainable community resource management model.

Education in Vanuatu has suffered because the educational system, which was based on a western

1. Environment Unit PMB 9063 Port Vila, Vanuatu. Email: environ@vanuatu.com.vu

educational model, did not make allowance for, or respect of the country's culture and history. The current Education Master Plan (2000–2010) recognises these shortfalls, and consequently, there are now opportunities to incorporate traditional knowledge into national education.

The formal legal system faces the same problem because Vanuatu is in a transitional period in terms of its economic and socio-political development. The newly gazetted Environmental Management and Conservation Act (2002) strives to integrate traditional resource management approaches and practices into the formal legal system. It consists of laws designed to protect, conserve, develop and manage Vanuatu's environment for all people, and is based on the fundamental traditional principles and values that underpin traditional concepts and practices. The act consists of three major components:

1. Environmental impact assessment (EIA). Aimed at reducing conflicts, the law recognises an additional role for each agency, and gives additional powers to provinces and municipalities;
2. Biodiversity and bioprospecting. This component manages the activities of researchers in the country via a permit system. The goal is to ensure that government and communities have access to research results, and to help prevent research piracy;
3. Conservation of biodiversity. This component reinforces traditional resource management. Conservation is often based on perceptions, with the rules, boundaries and enforcement left to communities, which decide the width of protected areas, as well as the permitted activities, penalties, courts and registration. There is no law on enforcement: the government only provides support and back up, and there is, therefore, considerable flexibility.

Lessons learned and recommendations

Sustainable resource management in Vanuatu must be based on traditional resource management principles and values to be successful. However, these traditional resource management principles and values have been challenged by western ideologies, lifestyles and ethics. The integrated resource management systems currently implemented under the Environmental Management and Conservation Act (2002) constitute the most appropriate resource management system for rural Vanuatu; one that seeks to unify the economic, environmental and social objectives that underlie the philosophy behind sustainable development.

Case Study 2

Traditional management of marine resources in Palau

Alma Ridep-Morris[2]

Traditional laws and conservation practices

Pre-western contact

Palau was traditionally divided into *beluu* (villages), where a village council was responsible for managing public domain lands. Palauans have always been known as conservation-minded people and were taught to take only what they needed and leave the rest for future use.

The major traditional conservation practices were moratoriums (*buls*) and *taboos*. *Buls* were put into effect by the village *rubaks* (traditional chiefs) to help manage resources. For example, a vertical coconut frond buried in the soil indicated to the villagers that there was a ban in effect. Traditional chiefs had an intimate knowledge of the spawning season of fish species, and would enact a *bul* to ensure that resources were naturally replenished during spawning seasons, thus guaranteeing sustained supplies of fish for the long-term.

Palauans had certain foods that were or are still taboo to them. Different reasons were given for the taboo: the animal was a protective spirit, or it was bad to eat certain foods during pregnancy or illness.

The nature of traditional management systems ensured more effective engagement of resource users in management decisions. As a result, decisions were more relevant, compliance with rules was improved, conflicts were reduced, and economic development paths were more in line with the desires of the people. Relatively decentralised and exclusive tenure systems lent themselves for better maintenance and application of the vast body of ecological knowledge gained by genera-

2. Bureau of Marine Resources, Ministry of Resources and Development, PO Box 359, Koror, PW 96940, Republic of Palau. Email: almarm@palaunet.com

tions of people in intimate contact with the resources they relied on.

What remains today?

Traditional management is still in practice today. There have been several recent examples of traditional chiefs exerting their authority over marine resources. The chiefs of Ngarchelong and Kayangel negotiated an agreement to share fishing grounds, and together imposed a closure over a number of reef channels and areas known to be fish spawning aggregation sites. Within these two states, respect for the law and for chiefs is strong, and compliance is believed to be high. But the more meaningful test of this and similar customary laws is in compliance by fishers from other states. Such a test occurred when a fisher from Koror was caught violating the Kayangel/Ngarchelong fishing ground closure. The chiefs of Ngarchelong confiscated his boat and fishing gear. After negotiations between the chiefs of Koror and Ngarchelong, a fine was paid to Ngarchelong.

However, the power of traditional chiefs is beginning to erode with the development of a strong centralised national government. Therefore, traditional chiefs are now being integrated into the state governments to retain more influence.

Interface between traditional and governmental laws: Issues and challenges

According to Palau's constitution, the states are given "exclusive ownership" of inshore resources (measured from the land seaward to 12 nautical miles from traditional baselines). Therefore, management of marine resources lies with the states.

The Ngaremeduu Conservation Area involves several states, including Ngatpang. This state has a very traditional government that actively participates in management decisions regarding the conservation area. The laws enacted by the states involved in the Ngaremeduu Conservation Area encourage traditional management practices in the conservation area, including sustainable development. A compromise between western and customary models is being achieved through the inclusion of traditional chiefs in legislatures and state government bodies. Other regulations are in place and new ones are being initiated that will help strengthen customary management of resources and knowledge.

The Marine Protection Act of 1994

An example of a regulation that is in place and that helps strengthen customary management of resources and knowledge is the Marine Protection Act (MPA) of 1994. The MPA incorporated traditional knowledge of spawning periods, and imposed seasonal closures for important fish species. It also imposes size limits on certain marine resources.

Protected Areas Network Act

The development of a balance of power between the states and the national government is slowly evolving, and mechanisms are being developed that encourage cooperation. The Protected Areas Network Act (passed in 2003), strengthens customary management of resources and knowledge. The PAN serves as a framework that encourages collaboration between Palau's national and state governments on protection of the country's marine and terrestrial biodiversity. It will help address local resource management issues through the establishment of an interconnected network of protected areas, and will support states' efforts to effectively manage their natural resources.

Boundaries, enforcement, penalties and conflict resolutions

Marine enforcement is very costly and states may not be able to afford the expenses involved; therefore, state governments usually request that the national government enforce regulations and impose penalties. Conflicts are increasingly being resolved through the court system instead of through customary means; thus the courts have become part of the customary process of dispute resolution.

Lessons learned and recommendations

Palau is currently seeking a balance between government and traditional leadership. Many customary rules used in the past (such as temporary fishing closures over particular areas), are consistent with modern legal and fisheries management methods, and are being increasingly used today. One important expression of Palau's customary authorities, rules and processes is its marine tenure patterns, which feature village-level control. This is a critical aspect of custom in terms of marine resource management, and it is completely consistent with Palau's constitution.

Case Study 3

The Loyalty Islands environment charter in Kanaky-New Caledonia

Sarimin Boengkih[3]

Traditional laws and conservation practices

Pre-western contact

Melanesians occupied the territory of New Caledonia for more than 3000 years before the arrival of the French "colons" in the middle of the 19th century. Traditional knowledge and conservation practices had been developed and refined over centuries before the first Europeans arrived in New Caledonia. Local traditional fisheries management techniques were adapted to local conditions and accorded well with the environment; according to what is termed a system of "sustainable development".

What remains today?

Subsistence fishing still forms an important part of traditional Kanak life, although there has been a very clear decline in traditional customs. This can be explained by poor transmission of traditional knowledge from generation to generation due to a westernised education that ignores or bypasses traditional culture, and by the introduction of new fishing technologies that are more efficient than traditional methods. The authority of traditional chiefs is progressively being eroded and superseded by national authorities. However, the Noumea Accord of 1998 recognised the customary native land system and established legal customary institutions (including a customary senate and customary councils). Kanak customary law is applied in parallel to the French law. The Noumea Accord divided New Caledonia into three provinces: the Northern Province, the Southern Province, and the Loyalty Islands Province. The provinces are governed by a congress, which consists of elected members from local assemblies. The congress has legislative powers and adopts the traditional local government laws.

Interface between traditional and governmental laws: Issues and challenges

The latest attempt to combine traditional and national law was the Loyalty Islands Environment Charter. This concept was first considered in the 1970s by the then Kanak leader, Jean-Marie Tjibaou. The Environment Charter was derived from French law, with adaptations for Kanak culture and traditions. The philosophy of this law reflects traditional "sustainable development" and community participation in decision making that guides the Loyalty Islands Kanak communities. It is a consensus between the different Loyalty Islands stakeholders and is recognised as a solemn commitment by the various partners (civil society, French State, research institutes, etc.) in development that acknowledges the rights of all participants. The charter will lead to the initiation of a coherent development scheme that recognises the current indigenous practices of the Loyalty Islands, and will create meaningful exchanges and consultation.

Boundaries, enforcement, penalties and conflict resolutions

The charter includes: the quality of life in the Loyalty Islands; the preservation of the environment; management of water resources; soil and sub-soil management; education, training and information; and contribution to research and technology. It proposes the creation of a Development Council, with a mission to monitor the development indicators, implement orientations defined by the Council, and deal with communication and information issues. The Loyalty Islands Environment Charter is to be integrated into French law, and is the first tool to combine traditional systems with French government laws. French President Jacques Chirac signed it, solemnly committing France to protect traditional knowledge and encourage Kanak customs. The charter complies with the proposal by the French President for a French Republic Environment Charter to be integrated in the preamble of the constitution.

Lessons learned and recommendations

The Loyalty Islands Environment Charter is a major step towards recognising of traditional knowledge and customs at the national level. The goals and principles of the charter are to:

- value and recognise cultural heritage;
- favour the expressions of Kanak culture;
- encourage the teaching of Kanak languages;
- protect traditional knowledge and skills;
- develop traditional arts;
- conduct programmes of research on Kanak identity;

3. Agence Kanak de Développement, BP 2321, 98846 Noumea, New Caledonia. Email: boengkih@canl.nc

- support scientific projects for the protection and development of the environment;
- promote technologies that respect the environment and renewable energies;
- favour applied scientific research;
- initiate partnerships of research, society and industry;
- achieve a transfer of appropriate scientific technologies;
- support modern methods of training and communication for sustainable development;
- preserve biodiversity;
- manage an exceptional environmental heritage of world interest;
- develop resources for long-term exploitation;
- upgrade the knowledge and the comprehension of natural phenomena; and
- integrate the management of sustainable development in the decision-making process.

Case Study 4

Fisheries bylaws in Samoa

Posa Skelton[4] and Robin South[4]

Customary laws and conservation practices

Pre-western contact

In pre-contact times, Samoa was divided into divisions and ruled by paramount chiefs. Samoans had strong and intimate beliefs in deities. Tongans ruled Samoa for about 600 years (400–1000 AD), after which Samoans resumed control of their country; but divisional or factional infighting persisted. This led to the shaping and strengthening of social interactions that were followed by subsequent generations.

Today, Samoa is a hierarchical society where the chiefs (*matai*) govern village affairs. Two kinds of chiefs — the oratory chief (*tulafale*) and the high chief (*ali'i*) — have very different functions. All village land is controlled by the chiefs. There are three types of customary land: 1) settlement land (residential); 2) plantation land; 3) village land (from mountain top to fringing reefs; a concept equivalent to *vanua* in Fiji). The residential and plantation lands are controlled by family chiefs, whereas village land is controlled by village chiefs.

Papalagi *(European) influence*

Initial contact between Samoans and Europeans resulted in conflicts and subsequent alienation of the country to outside explorers. This was relatively short-lived, and whalers and traders re-opened communication with Samoa. The missionaries' arrival in the 1830s began a revolution in which many customs and traditional practices perished. Codified laws to govern trade with outsiders were first passed in 1838. Factional infighting between various paramount chiefs continued, and saw America and Great Britain supporting one side and Germany the other. The Steinberger Constitution, drawn up by US Colonel A.B. Steinberger, governed Samoa from 1873 until 1876 (when he was deported). The Berlin Treaty, drawn up in 1889, gave token recognition to the nation's independence, but all decisions had to be approved by Germany, Great Britain and America. In 1900, Samoa was divided, with Tutuila and the Manu'a Group becoming an American protectorate, whereas Upolu and Savai'i formed German Samoa before New Zealand took over in 1914. In 1946 the United Nations assumed responsibility until independence on 1 January 1962, as Western Samoa.

Interface between traditional and governmental laws: issues and challenges

The supreme law, the Constitution of the Independent State of Western Samoa 1960, provides the foundation for national administrations. Laws prior to independence (mostly of New Zealand/British origin) continued to be enforced until they were repealed or amended.

The coastal and marine ecosystems of Samoa have been a mainstay for the people for many generations. Over the last 50 years, rapid development has led to a large increase in population, and significant changes to traditional lifestyles. The market economy has became a dominant force that is having negative impact on the traditional social settings and obligations.

The Fisheries Act (1988) and the Fisheries Regulations (1995) were enacted to manage fisheries resources. In the mid-1990s and with the assistance

4. International Ocean Institute (Australia), PO Box 1539, Townsville, QLD 4810, Australia. Emails: posa.skelton@impac.org.au; robin.south@impac.org.au

of the Australian Government, Samoa developed a programme for the establishment of village fisheries management plans. Through this programme,the government encouraged participation by the *fono* (council of chiefs) and other users (i.e. untitled men and women's groups) in decision making. Separate meetings allowed for a free flow of discussions, and a representative from each group was selected to form the Fisheries Management and Advisory Committee (FMAC). The overall objective was to develop a Fisheries Management Plan to enable villages to manage their resources.

The process of developing a Fisheries Management Plan can take from three months to over a year, from the plan's initial introduction to its formal adoption. Decisions regarding both critical issues and solutions are made by villagers. The establishment of fish reserves (which are declared taboo for a period of time) is one management option; with the villagers being responsible for enforcement. As was done traditionally, villagers impose penalties for law-breakers, including fines of pigs, chickens or money. This system worked well for villagers initially, but proved difficult to enforce when offenders were outsiders (non-village people). Clause 104 of the constitution stipulates that all lands lying below the high water mark are public, meaning that outsiders can fish within the village coastal zone, including in taboo fish reserves. Villagers thus found it difficult to impose their fines on members of another village. To overcome this problem, the government introduced village-level fisheries bylaws. The bylaws are village specific and often include activities that cannot be carried out within the village coast. To date, 83 villages are participating, with 62 villages agreeing to set up fish reserves as part of their Management Plan. This network of 62 reserves provides a good conservation strategy for Samoa's marine resources.

The fisheries bylaws are subsidiary to national legislation; hence they must not contravene any provisions of national laws. The bylaws continue to rely on government support especially when there is a dispute between parties (e.g. between the *fono* and an offender from another village). In this case the village will take their complaint to the Fisheries Division, which then takes the matter to the formal court system.

Lessons learned

Engaging the traditional decision makers (chiefs) ensures that decisions and undertakings are effectively implemented at the village level; the rich knowledge and experience of these two groups ensure that informed decisions are made. The bylaws strengthen villages' ability to manage their resources, and some customs that may have been lost (e.g. fishing harvesting methods) become revitalised.

Case Study 5

Traditional law and the environment in the Solomon Islands

Reuben Sulu[5]

Traditional laws and conservation practices

Pre-western contact

Despite the diverse and heterogeneous nature of the Solomon Islands, the basic principles behind the different tenure systems and resource management regimes were generally similar. Land and adjacent coastal areas such as coral reefs and lagoons were owned under a kinship group (tribe, clan or line) ownership system[6].

Traditional management of resources was usually done through the customary tenure system. The main customary conservation practices were:

1. Sacred sites: movement into and within these sites was usually restricted to certain people or customary priests only. These sites then automatically served as unofficial protected sites;
2. Social prohibitions: prohibitions or restrictions on the consumption of certain species by some social groups (these could be continuous or limited to certain times of the year); and
3. Serial or sequential prohibitions, which rotated areas and limited access to some groups for harvesting resources.

The most commonly practiced were the system of temporary closures, or sequential prohibitions or limited access on harvesting of resources.

5. Institute of Marine Resources, University of the South Pacific, PO Box 1168, Suva, Fiji Islands. Email: sulu_r@usp.ac.fj
6. Coral reefs, lagoons and adjacent coastal areas are usually seen as an extension of the land.

What remains today?

As a result of change in beliefs, perceptions and expectations, prohibitions relating to sacred sites and social groups are no longer observed. These social changes have also resulted in the demise of the traditional leadership system, and the rapid erosion of traditional law and management systems; research is needed to ascertain their current status.

Challenges in documenting traditional law include:

- The secretive nature of such knowledge. This results in people jealously guarding their knowledge and being very reluctant to divulge such information. (Traditional knowledge and information are only passed to heirs or a few immediate family members and relatives.)
- Solomon Islanders' lack of capacity and resources to record this knowledge in their own or a foreign language, such as English.

Interface between traditional and governmental laws: Issues and challenges

The Constitution (section 75 (1)), the Provincial Act 1981 s.3 (7) and the Fisheries Act (No 6 of 1998) all recognise customary laws. Indigenous people are defined, however, as "rights holders" rather than "owners"; therefore, under the law they hold rights but do not own land. The concept of ownership derives from early laws in the late 19th century, where it was asserted: "crown ownership of the foreshore and the seabed is a common law principle". A court case in 1951, in which an indigenous Solomon Islander accused a westerner of taking trochus illegally, changed this view of land tenure. The court awarded the decision to the indigenous man and, therefore, recognised customary ownership of the reef. Another case involved a dispute over customary ownership of land below the high water mark. In this situation, a native owner opposed a timber company, which was alleged to have damaged marine resources during the processes of shipping logs. The court (in 1989) found against the plaintiff, finding that he failed to prove the existence of customary rights over the area, and that the disputed area was seabed and not land.

The Western Province Resource Management Ordinance was instituted in 1994 to provide for the proper management of resources and to empower customary owners in the management of lands. Part III of this ordinance (Customary Land Resources Management Orders, CLRMO), which refers to this empowerment, is an attempt to blend and synergise modern and traditional law, while seeking to retain the flexibility of the former. The CLRMO process involves the community as well as local governments and, although it still faces some challenges, it is the first step towards a successful "collaboration" between customary and governmental laws.

Boundaries, enforcement, penalties and conflict resolutions

Boundaries of areas owned under customary law are marked by rocks, trees, streams, rivers and, most important of all, sacrificial alters and/or other sacred sites. Such areas are not restricted to land but also include sea areas, reefs and island shelves.

Customary laws are enforced through the community social structures. Traditionally, conflicts were resolved by discussions and dialogues between elders and chiefs, and penalties for disobeying traditional laws may have included public shaming, flogging or banishment. Today, it is difficult to impose penalties on dissidents who disobey traditional laws, especially those relating to resource management, with the result that people who disobey these rules normally go unpunished. Hopefully, the CLRMO can help to resolve this issue, with conflicts resolved through the courts system (from local courts to the Appeals Court).

Lessons learned and recommendations

Principles of customary marine tenure and resource management in the Solomon Islands are similar to other Melanesian countries discussed in this report;

- The breakdown in social structures and values has resulted in the breakdown of the traditional management systems. The effective management of resources in the future will require recognition and empowering of traditional laws by the national government. A hybrid between modern and traditional law, and science is required. However, even though legal frameworks or structures exist for empowering traditional resource owners to manage resources, awareness needs to be developed about such legal or governance structures. For various reasons (including disagreements and land disputes), it may not be easy for communities to take advantage of such structures.
- Equitable sharing of benefits from resources is an important part of resource management.

Case Study 6

Customary law on Malo, South Santo, Vanuatu, and the protection of the marine environment

Donna Llewell[7]

Traditional laws and conservation practices

Pre-western contact

On the island of Malo, customary rights to fish and use the marine environment rested with specific *man blong solwota* (men of the sea). Marine resources were harvested to feed the immediate and extended family of a fisherman; for sale or exchange in and around the fisherman's village; and for exchange more widely to obtain other food and/or resources from interior parts of the island (i.e. from the bush and gardens).

Many different methods were used, including netting, bow and arrow, spearing, poisoning, stoning, and other specific customary methods. In some communities, distinctive demarcation signs called *namele* were (and are still) used to indicate protection of an area, species protection, or customary land disputes. Protection may have been put in effect for months, seasons or years (ranging from 1–5 years). Certain ceremonial or special community events led the high chief to relax the restrictions for a specified period (usually one or two days). Tabus were put in place by chiefly authority and were applied over entire marine ecosystems in designated areas, for a designated timeframe.

What remains today?

Today, diving with a mask and snorkel for shellfish, lobster and crab is common, but traditional customs are also practised. For example, tabus are still commonly used throughout Vanuatu, and significant time and resources have been invested in researching and recording the application and variation of tabus throughout the country. Notably, there are many regional and island variations of tabus. In some cases, the entire environment is tabu, while in other cases, only portions of the environment and/or certain species are protected. This approach is valid and effective because it emanates from within the community, rather than being imposed from the outside. It forms a basis for community education and awareness, and also empowers the community to own and take responsibility for the initiative and to observe traditional law.

Interface between traditional and governmental laws: Issues and challenges

Traditional practices are not expressly recognised by the Vanuatu government, however, there is high-level recognition of the application of customary law in the constitution. Relevant parts of the Fisheries Act do not expressly recognise traditional laws, but as a matter of policy, government agencies have fully engaged and given technical assistance to the community in these cases.

Although the Fisheries Act is based on western theories of marine protection, and drafted according to western convention, the act recognises customary owners of marine areas, and requires that they be consulted when areas are declared protected under the act.

Conservation initiatives in Malekula

In Malekula, chiefs, communities and various government officials recently met and decided to impose a tabu on the customary marine environment and adjacent mangrove forests for a year. The tabu was declared after government officials engaged with local chiefs and communities and provided them with technical and scientific information. This helped local communities understand that their marine environment is potentially vulnerable; they also gained an understanding of management options. The government officials empowered chiefs and communities by giving them responsibility for the initiative, and by allowing the tabu to be enforced under chiefly authority. Establishment of a comprehensive monitoring programme has served to give chiefs and communities the means to make informed decisions in the future. This example of co-management is a step forward towards the "incorporation of traditional management systems into overall fisheries management strategies"[8] and therefore codified law.

Boundaries, enforcement, penalties and conflict resolutions

In the Malekula Case Study, enforcement, penalty and conflict resolution mechanisms will also come

7. WanTok Environment Centre (NGO), Santo, Vanuatu. Email: donna.llewell@positiveearth.org
8. The Ray Parkinson, Memorial Lectures 1992. Marine Resources and Development. South, G.R. (ed) PIMRIS, University of the South Pacific, Suva, 149 p.

under the authority of the chief and traditional law. Fisheries Regulations (that provide national protection regulations for specific species through size limits, quota and/or absolute protection) coexist with traditional enforcement mechanisms. Potential gaps in enforcement remain, however, as there would be no enforcement and/or penalties if a species is covered under the regulations, and if a general breach of the tabu (as a legally marine protected area) has not taken place.

Lessons learned and recommendations

- For traditional law and practices to be effective and to contribute to environmental management, they must be established and managed from within the affected community.
- Absence of codification need not prevent governments from engaging with communities that are seeking to apply their traditional laws.
- Government agencies and NGOs will be a source of valuable science-based information, technical expertise, and assistance that is vital to the overall success of traditionally-based management efforts.
- Gaps or conflicts persist between traditional enforcement and the capacity of government agencies to impose penalties or engage in dispute resolution, as a government agency may have limited powers granted to them under legislation and/or regulations.

Case Study 7

Kaitiakitanga: customary fisheries management in New Zealand

Paul Havemann[9]

Traditional laws and conservation practices

Pre-western contact

Kaitiakitanga is a traditional Maori concept capturing rights and responsibilities for being the custodian and steward of the well-being of places, resources and species. *Kaitiakitanga* is deeply embedded into Maori culture, as part of the intermingled laws, knowledge and protocols ruling society, called *tikanga Maori*. The concept of *kaitikitanga* has traditionally been of particular siginificance to the sustainable management of fisheries resources. The Treaty of Waitangi signed by Maori chiefs in February 1840 recognised Maori sovereignty over fisheries. However, Maori fisheries rights like rights to land, underwent a process of denial and erosion from 1840 onwards. Only six per cent of New Zealand land is in the hands of Maori today.

By the 1920s, the Government had ceased recognising customary rights over fisheries. State recognition of these rights began in the 1980s, when the government admitted its past breaches of the Treaty. Since the 1980s governments have sought ways to accommodate the Maori Treaty rights within New Zealand's legal and resource management framework. Maori own 52 per cent of the commercial fishing enterprises in recognition of their Treaty rights. *Kaitiakitanga* as a concept that has been incorporated into state laws to promote recognition of Maori rights and participation in resource management at the local level.

Interface between traditional and governmental laws: Issues and challenges

Kaitiakitanga has been recognised by law in the Resource Management Act (1991) and in the Fisheries Act of 1996. The last act interprets *kaitiakitanga* as "the exercise of guardianship; and, in relation to any fisheries resources, includes the ethic of stewardship based on the nature of the resources, as exercised by the appropriate *tangata whenua* [people of the land] in accordance with *tikanga Maori*".

Kaitiakitanga is a vehicle for Maori stakeholder participation in land-based planning, resource development, general fisheries and non-commercial fisheries establishment and management, but also serves as a tool for recognising Maori customary fishing, and for empowering Maori communities to manage and police customary fisheries.

Boundaries, enforcement, penalties and conflict resolutions

Under the Fisheries Act local Trust Board Committees can now appoint a team of Maori

9. Faculty of Law, Business & Creative Arts, James Cook University, Townsville Qld 4811, Australia.
Email: paul.havemann@jcu.edu.au

experts (*kaitiaki*) to administer and enforce rules in traditionally controlled areas, depending on local capacity. This team may assist fisheries officers and give access permission to indigenous areas, and propose the creation of reserves, management plans, and bylaws. This process of devolving fisheries management to the local level is reasserting local control over customary fisheries; however, the Maori Land Court or, the Minister of Fisheries, keeps control by maintaining a veto and major decision power. One of the benefits of this policy is the gathering of data from customary owners and the improvement of traditional management skills in both traditional and commercial fishing. Traditional knowledge can also be taken as an indicator for the conservation of resources, and be linked with science knowledge through observation (e.g. stock evaluation).

Lessons learned and recommendations

A few principles can be derived from this case study, which strike a chord with Principle 22 of the Rio World Summit Declaration of 1992, and Article 1 of the International Labour Organisation Convention 169 on international regulations recognising the rights of indigenous people. These principles call for:

- local participation in governance with a goal of ecological sustainability;
- local management with local knowledge for local needs;
- respect for and incorporation of traditional knowledge, institutions, custom and laws into conservation; and
- planning policy and implementation that serves to integrate local, national and international ecological conservation.

Case Study 8

Pohnpei watershed management: A case study of legal and institutional reform for co-management in the Pacific

Justin Rose[10]

Pohnpei is one of the four states of the Federated States of Micronesia (FSM). Pohnpei's main island has a population of around 30,000 people, a surface area of 343 km^2, and 200 villages in five municipalities. Since the mid 1970s there has been nearly a 66% loss of intact catchment forest in Pohnpei. Downstream impacts have been severe and include erosion, sedimentation of mangroves and reefs, contamination of water supplies, loss of habitat for endemic species and threats to biodiversity. The primary cause of forest disturbance and clearing is the dramatic increase in kava (sakau) production. Kava consumption has expanded beyond ceremonial uses and is now a popular recreational drug.

Traditional laws and conservation practices

Traditional authority in Pohnpei

Pohnpei is divided into 200 *kousapw* (villages) and 5 *wehi* (traditional kingdoms). Customary authority in Pohnpei resides with the island's traditional title holders, whose roles and responsibilities are allocated and organised within complex hierarchical systems that operate in each *kouspaw* and *wehi*. While the *nahmwarki* (paramount chief) is the symbolic owner of all land within a *wehi*, the *kousapw* is the centre of social organisation and culture.

Traditional titles, while earmarked for men of particular matriarchal lineages, are earned through community service, displays of traditional skills and accumulation of traditional knowledge. Title holders were accountable to their constituents and titles could be revoked if the holders failed to perform their duties adequately. Historically, specific title holders were responsible for management of natural resources.

A society in transition

At the time of FSM's independence in the early 1980s, the Pohnpei state government took over governance of the island from the Trust Territory administration. The adoption of a western-style legal system and institutional structure reflected the need for Pohnpei and FSM to operate within modern economic and political contexts. The young Pohnpei state government is in some respects a model of good governance and democracy, with effective systems of administration and a general respect for the law.

10. Conservation Law Specialist, PO Box 35 Thora, NSW 2454, Australia. Email: justinrose1@bigpond.com.au

The government faces severe difficulties, however, in the areas where the authority of Pohnpei's state government stands in direct conflict with that of Pohnpei's traditional title holders. These areas of governance include some aspects of land, family and criminal law, as well as conservation and natural resource management. As noted recently by John Hagelman (former FSM President) "the paramount chiefs are still the undisputed rulers in their kingdoms".

Interface between traditional and state laws: Issues and challenges

Early attempts by the Pohnpei state government to delineate watershed boundaries were a failure. The Pohnpei Watershed Forest Reserve and Mangrove Protection Act of 1987 was poorly received by the villagers (carrying guns and machetes), as they perceived it as "a government land grab in direct conflict with traditional Pohnpei resource use and authority".

There was then a thorough process of consultation and participatory planning that reoriented catchment management towards government-community collaboration. All stakeholders contributed to and approved the Pohnpei Watershed Management Strategy 1996–2000, followed by implementation of the Pohnpei Community Conservation and Compatible Management Project 2000–2004 (supported by the Global Environment Facility and The Nature Conservancy.

In 2001, after attempted legal reform at the state-level collapsed due to a lack of consensus, a co-management system was implemented in Madolenihmw Municipality. Madolenihmw's primary strengths are high quality leadership and good relations between the municipal government and traditional leaders. In 2002, the Madolenihmw Protected Areas Act was passed, institutionalising the collaborative process and embodying a bottom-up approach to forest, coastal and marine conservation. The Sehnpen/Lehdau Mangrove Reserve became the first protected area to be declared under the Act in 2003. Madolenihmw's second-highest title holder gave the following perspective: "the greatest legacy of this process is that Pohnpeians are regaining control of their own resources".

Lessons learned and recommendations

- The persistent fact of FSM's legal pluralism: if the customary and governmental authority systems are not in harmony over control of resource use, they will probably be in conflict.
- "Legitimacy" is the key to effective authority: "what the rules are" is in many situations less important than "who decides the rules" and "who enforces the rules".
- One key to legal reform for collaborative natural resource management in FSM is local ownership of the negotiation and design of the regulatory system. Off-the-shelf solutions are likely to be met with little interest.
- If co-management systems develop in FSM, it will be via a complex adaptive process involving hundreds of communities working in partnership with government agencies, experimenting with rules, monitoring, sanctions and regulatory processes over time.
- A central principle when drafting laws to implement co-management is to build upon the respective strengths and shore up the weaknesses of both the customary and governmental institutions.

Conclusion

Two issues are central to understanding Pohnpei's troubles in achieving effective conservation and natural resource management. The first is that Pohnpei, as a collection of societies that lack (or are free from) the intellectual, cultural and historical traditions supporting centralised authority over local resources. The second is that Pohnpei does not command the necessary regulatory capacity and infrastructure to enable its government to genuinely control the everyday uses of the resource they govern. Any process of legal or administrative reform that could adequately address these deficiencies must aim to harmonise customary and governmental authority.

The recent reform in Pohnpei has provided a bridge between the "western" approach to resource management adopted by the young government, and the Pohnpeian traditional resource management system, characterised by decentralisation and consensus decision-making based on thousands of years of traditional knowledge. The approach is in many ways an act of reconciliation, reconfirming those aspects of both political systems that are considered legitimate.

SECTION 2:
COMMUNITY INVOLVEMENT: COMMUNITY-BASED CO-MANAGEMENT OF MARINE RESOURCES

Case Study 9

Community involvement in the implementation of ocean policies: The Fiji Locally Managed Marine Areas network

Alifereti Tawake[11] and Silika Tuivanuavou

Traditionally, Fijian customary society is structured in four levels: the district (*vanua);* the tribe (*yavusa)*; the clan (*mataqali*); and the family (*tokatoka*). Land was traditionally owned by the *vanua* until 1880 when the Great Council of Chiefs (GCC) resolved that the Native Lands should be registered under the *mataqali*. A few cases of customary ownership by the *tokatoka* and *yavusa* remain within the western provinces.

Colonial influence increased from 1874 to 1970, and both land and landowners were registered. Today, national law fully recognises the rights of customary owners; the 1999 constitution mentions customary laws and rights, and many acts protect these rights (e.g. the Fijian Affairs Act, Native Lands Act and Native Lands Trust Act.)

Status of biodiversity and threats

The ocean is part of the heritage and identity of Fijian communities, and marine resources are of great importance, historically, culturally and economically. The conservation of marine resources is also imperative to fulfil the needs of the population and to develop long-term tourism. However, numerous concerns over the status of these resources have been raised. Fishing has become more intensive, leading to a dependence on canned seafood, and a drastic decline in subsistence fishing (*qoliqoli*) over the past five years. Today, people must travel farther and spend more time and money to find good fishing areas, and family and *vanua* commitments are not met, causing major conflicts. Loss of resources unfortunately entails a loss of traditional knowledge and cultural identity in the Fijian communities.

Threats to marine resources include overfishing, pollution, harvesting of corals and mangrove destruction. These are accompanied by a lack of community awareness and a lack of alternative livelihood options.

Empowering communities: legislation and management plans

Communities, assisted by NGOs and government ministries, are now developing a network of locally managed marine areas (LMMAs) within their traditional fishing grounds. The goal of each LMMA is to ensure both a healthy ecosystem and community, with abundant marine and fish stocks, and sustainable fisheries. This bottom-up approach of marine management results in sustainable development in coastal communities, and encourages better understanding of customary management in socioeconomic terms. Fiji LMMAs are being extended throughout the country. The process begins with a request from the community, which identifies the issues and plans the actions. Communities are thus fully involved in the *qoliqoli* monitoring and management plan, which can include long-term tabu areas, reduction of licences and banning of destructive fishing measures.

The activities of the LMMAs are not limited to marine management, but include capacity building, awareness raising, policy lessons (shared at the national level, including through the GCC), and sharing of information with international networks. The GCC is always involved and assists in the implementation of the FLMMA. Success of FLMMAs is measured in terms of species, habitat and ecosystem health, reduction of threats, and the overall wellbeing of people. In Verata for instance, the mission of the FLMMA is to rehabilitate degraded habitats and replace important species. An adaptive management cycle that included management and monitoring plans was used in this instance. The management plan identified threats and recorded key interventions; the monitoring plan involved communities and included biological and socioeconomic surveys. The results are used to adapt management approaches; for example a temporary tabu might be converted to a permanent protection measure,

11. Fiji Locally Managed Marine Area (FLMMA) network, Native Land Trust Board, Suva, Fiji. Email: tawake_a@usp.ac.fj; silika@nltb.com.fj

or farming might be encouraged as a way of reducing dependency on marine resources. These types of measures have led to a 35% increase in household incomes between 1998 and 2002.

Lessons learned and recommendations

In the past six years, thanks to the development of LMMAs, the number of tabu sites and *qoliqolis* has increased significantly; the number of skilled practitioners is more than 30; and people are now eager to work cooperatively and to commit to the protection of marine resources.

The first marine protected area in Fiji was gazetted recently (September 2002) but many problems remain in protected areas, including poaching, meeting community needs, and reversal of tabu designation. Some of the challenges include harmonising the work with existing national projects and finding ways to maintain *qoliqolis* in the future. The main recommendations are to:

- Encourage the scientific community to develop the means by which local communities can evaluate the effectiveness of their management actions; and
- Communicate evaluation results periodically to communities in a simplified and user-friendly way in order to allow adaptive management and learning to occur.

Case Study 10

Traditional and modern law: A marriage in progress – The draft Talasea Local Government Marine Environment Law (Papua New Guinea)

Eric Kwa[12]

Status of biodiversity and threats

Kimbe Bay contains several interacting ecosystems and is one of the region's most biodiverse areas. It is also the subject of extensive scientific and socioeconomic studies. The region includes barrier reefs, fringing reefs and atolls, with more than 404 coral species, 543 fish species and more than 10 species of whales and dolphins. Kimbe Bay includes mangroves, beaches, seagrass and freshwater areas, and diverse freshwater and estuarine fish fauna.

Empowering communities: legislation and management plans

The Nature Conservancy (TNC) initiated a programme with the aim of "harnessing traditional community values to protect and maintain the biological and cultural heritage of the Stettin Bay and wider Kimbe Bay regions". TNC has realised that there is a need for a legal framework, that could encompass some traditional management components and at the same time complement existing national laws.

Local-level governments (LLGs) come third in PNG's legal, political and administrative structure, which includes three tiers of government (national, provincial and local level). The constitution, the Organic Law and national laws define the legal, administrative and financial powers of LLGs. LLGs are empowered under this legal regime to enact local environmental laws for the protection and management of marine and terrestrial biodiversity.

Talasea Rural Local-level Government has utilised this legal framework to develop local marine environmental legislation aimed at protecting and sustainably using the marine biological resources in the Kimbe Bay area. The draft law seeks to incorporate traditional knowledge and practices in the formal framework, with the goal of promoting sustainable resource use and management in Kimbe Bay. The draft Talasea LLG law will:

- establish and declare locally managed marine areas (LMMAs) and a network of marine protected areas (MPAs) within the proximity of Talasea LLG;
- assist Talasea locals to regulate marine resource use within the context of increasing populations and impacts from land-based activities; and
- allow communities and clans to manage their resources on a sustainable basis.

The process of declaring LMMAs starts with a request from the clans to the LLG, which refers the request to the Locally Managed Marine Area Committee (LMMAC). The LMMAC is appointed for five years and comprises three to five members from the clan, as well as members of NGOs, churches, Ward Development Committee (WDC),

12. School of Law, University of Papua New Guinea, PO Box 320, University PO, NCD, PNG. Email: kwaeric@hotmail.com

the LLG, women and youth groups. This group ensures liaison between clans and LMMAs, and takes into account both scientific and traditional knowledge. LMMAs are declared by the LLG but are managed and monitored by the LMMAC. Once declared, the LMMA is integrated into the governmental process. It is envisaged that the National Fisheries Authority will provide training for LMMAC members, appoint Local Marine Rangers for the Talasea LLG, oversee monitoring and enforcement, and provide funding support.

Planning for sustainable development in LMMAs has been established, and takes into account the marine resources owners, the local advisory committee, the Talasea LLG and the WDC. The LMMAC thus, contributes to institutional strengthening.

Lessons learned and recommendations

This devolution of power allows communities to act on their own initiative and contribute to the process of community empowerment. Communities can be asked to propose a reef closure according to their traditional knowledge, and this can be compared with proposals based on scientific knowledge; closed areas are often surrounded by buffer zones established by the village to protect specific resources (e.g. fish spawning aggregations). Monitoring and enforcement is the responsibility of villagers and fisheries wardens, with LMMA rules incorporating customary practices established by the LMMAC in close consultation with the clans.

However, problems with respect to LMMA management remain. The first problem is monitoring and enforcement, as the main offenders are usually the locals. TNC is implementing a programme of local awareness raising to assist local communities with enforcement. A second problem is the destruction of mangrove areas by settlers from other parts of PNG. Such violations have to be resolved through the village courts system, which have the power to punish people according to local customs, can impose fines that are not necessarily monetary, as locals often do not have cash.

Case Study 11

Biodiversity and sustainable use of marine biodiversity in PNG: Policy and legal implications

John Genolagani[13] and Douveri Henao[14]

Status of biodiversity and threats

PNG is a biodiversity "hot spot" and has the second largest diversity of species in the Pacific. With 40,000 km^2 of reefs and a natural forest land cover of almost 77%, it hosts 7% of the world's species of plants and terrestrial life forms. PNG's natural habitats are as beautiful as they are diverse, including beaches and ridges, swamps, lowlands, foothills and mountains. It is estimated that approximately 60% of PNG's plants are endemic. The country hosts 20,000 plant species, 800 species of corals, 304 mammal species and 733 species of birds.

Major threats to this exceptional biodiversity include unsustainable logging practices, large-scale mining, destructive fishing and other harmful subsistence practices, and industrial and natural disasters. PNG has been looking for models of sustainable fisheries for over 15 years, but few have been implemented, and destructive practices continue. PNG no longer uses quota systems to regulate resource access but instead, limits the number of days when fishing is allowed to 4000 days. This national strategy is based on scientific data. Traditional practices are often beneficial in terms of marine management, but can also be destructive (e.g. slash and burn agricultural practices, or the use of *imora*, a poisonous plant, for fishing), which is so destructive that it has all but eliminated a spawning aggregation site.

Empowering communities: legislation and management plans

Many policies on biodiversity conservation and sustainable use exist in PNG, from the Environment and Conservation Policy (developed in 1976) to the Medium Term Development Strategy (MTSD) planned for the 2003–2007 period; the latter includes recommendations from the Convention on Biological Diversity that focus on agriculture. Although none of these policies are

13. Department and Conservation, Port Moresby, Papua New Guinea. Email: jgeno@daltron.com.pg
14. Department of Attorney General, Office of State Solicitor, Port Moresby, Papua New Guinea. Email: dmhenao@datec.net.pg

specifically focused on cross-sectoral biodiversity issues, considerable effort has been placed on trade and environment connections, which is a central issue in biodiversity conservation. International organisations have often been the impetus for PNG's policies; for instance, development of the Mining Policy was funded by the World Bank. However, government officials have often been driving the implementation and enforcement processes. Compromises have sometimes been reached between indigenous people and inter-governmental organisations, while international protocols, such as the Cartagena Protocol, have led government officials to develop domestic policies in a more sustainable manner.

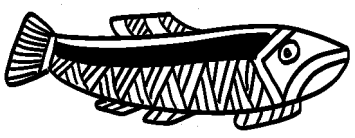
Many general and specific PNG laws (Acts) include the concept of biodiversity, notably by adapting multilateral environmental agreements to the PNG context. These include the Physical Planning Act (1988), the Environment Act (2000), the Fisheries, Land, Mining and Forestry Acts (respectively 1998, 1996, 1992, and 1991), the International Trade (Fauna and Flora) (Amendment) Act of 2003 (which refers to CITES), the National Parks Act, and the Crocodile Act.

To circumvent criticisms that these acts were too sectoral and too hierarchical, a Decentralization Framework was established, designed to give more power to local governments. The provincial and local level governments were given legislative power, the opportunity of participating in policy making, and the right to consult on development initiatives. This participatory and consultative approach was reaffirmed in enabling legislation, including the Provincial Administration Act. This act, aimed to devolve law making and implementation to the local level through administration, financial and political mechanisms, but did not give sufficient recognition to the wards and the clans, which are the real masters of indigenous laws. Consequently, decentralisation did not result in community empowerment, and was ultimately a disappointment.

Lessons learned and recommendations

Existing national policies and legal frameworks are inadequate as they are sectoral in nature and not appropriately decentralised, and there is no policy and legal regime for effective decentralisation. Therefore, reforms are needed in PNG (and in other Pacific countries) in the areas of integrated biodiversity policy and law, biodiversity management, access benefit sharing and intellectual property rights, research and development, and biodiversity governance.

- The challenge today is to find mechanisms to seek cooperation between all sectors to operate under a single authority so as to resolve the problem of disparate approaches on customary law and traditional knowledge of marine management at the different levels of government.
- The PNG government needs to learn and produce new policies on traditional practices, but most of all it needs to link policy and law with the people, notably for biodiversity governance, where decentralisation is vital.
- There is a lack of capacity to translate scientific knowledge into policy, because degree programmes are too sectoral; but linking sciences and laws requires competencies in both subjects. There is now a pressing need to set up some cross-sectoral discipline training and increase capacity in marine policy formulation.
- Another problem lies in PNG's cultural diversity: the national constitution had to take into account 800 languages and 2000 cultures and took two years to draft. Unfortunately, many good customs were swept aside. This could be explained by the unwillingness of customary delegates to speak up in front of authorities during joint meetings; they may fail to assert their rights; or agree, but in practice never take actions not in accordance with their cultures. Encouragingly, a range of NGOs are now trying to safeguard the fading traditional practices.



SECTION 3: TRADITIONAL KNOWLEDGE IN AN INTERNATIONAL REGIME

Case Study 12

Towards legal protection of traditional knowledge: Lessons from Peru

Brendan Tobin[15]

Status of traditional knowledge

There are a number of fundamental conflicts between the current intellectual property rights (IPR) system and indigenous peoples' rights over their traditional knowledge (TK), in particular knowledge related to biological resources. The root of such conflicts may, in part, arise from divergent views regarding the nature of natural resources and rights over them. Non-indigenous peoples from the developed world tend to perceive anything that can be commercially exploited as a resource that must be exploited to the full, and in doing they seek to establish property rights over these resources. Indigenous people tend to view all resources as a gift from Mother Earth, to be cared for by today's generation who hold them in trust for future generations, and that as such they cannot be owned.

In this world of differing values, numerous internal and external forces are changing the lives and societies of local communities and threatening traditional knowledge. External threats include: biopiracy; development policies that promote exclusively non-indigenous education, health, agriculture and fisheries extension programmes; market forces; and intolerant religious organisations. Internal threats include: lack of use and renewal of traditional cultures; loss of control, notably over education; cultural disintegration or isolation; and territorial impacts. Responding to these multiple challenges requires innovative action by states as well as a concerted effort by indigenous peoples to revive their fading knowledge systems.

Protecting traditional knowledge in Peru

A comprehensive legal regime to protect the collective knowledge of indigenous peoples was adopted by Peru in August 2002. This law, the first of its kind, is based upon a number of key underlying concepts:

- Rights over TK stem from the existence of the knowledge and not from any act of government. The role of the law is therefore declaratory in nature;
- TK is the cultural patrimony of indigenous peoples and should, therefore, be used for the benefit of present and future generations;
- Access to TK for commercial purposes requires the prior informed consent of indigenous peoples;
- Indigenous peoples are entitled to share the benefits derived from use for their TK, whether or not it is in the public domain;
- TK may be seen as a form of trade secret and the state may act to prevent unapproved use; and
- Registers may play a role in protection of TK, and can be set up as open or confidential and may also be held by local communities.

The process for development of this law brought to light a number of conflicts, including:

- Conflicts of *cultural perception* regarding the nature of traditional knowledge;
- Conflicts of *legal vision* with regard to the nature of rights to be granted over knowledge as cultural patrimony, the role of customary law, the application of the principle of the public domain, over the definition of objectives, and the role of registration in the protection of TK; and
- Conflicts between the *rights* of indigenous peoples over their knowledge and the *interests* of those interested in accessing and using TK. This should not be seen as a balancing act as protection of rights must precede consideration of interests.

An international regime to protect traditional knowledge

To date there exists no comprehensive international regime to recognise and protect rights over traditional knowledge. Work is ongoing, within the framework of the Convention on Biological Diversity (CBD) and at the World Intellectual Property Organization (WIPO) Intergovernmental Committee on Intellectual Property, Genetic Resources, Traditional Knowledge and Folklore (IGC), to explore possible mechanisms for the protection of TK. These processes face the task of try-

15. Institute of Advanced Studies, United Nations University, Yokohama, Japan. Email: tobin@ias.unu.edu

ing to develop a global system for protection that responds to a multiplicity of national legal systems, and an even wider range of customary law and practice of indigenous peoples.

The Peruvian experience provides clear evidence of the importance of ensuring the participation of indigenous peoples from the outset in any process for development of TK law[16]. As customary laws are as numerous as indigenous peoples any international regime will have to be based on flexibility. A global regime may include: customary law; access and benefit sharing law; *sui generis* regimes to protect traditional knowledge and strengthen traditional knowledge and innovation systems[17]; international umbrella regulations; an ombudsman's office; measures in user/recipient countries; and users' codes of conduct. Such a regime will need to be developed with due attention given to international human rights law and policy, in particular that relating to indigenous peoples.

Lessons learned and recommendations

- The role of States in the development of *sui generis* legislation must be that of facilitator and not arbiter of rights. Any *sui generis* regime must be developed in close cooperation with, and reflect the aspirations, interests and rights of indigenous peoples.
- Access to, and use of, TK should conform to the customary law of indigenous peoples.
- Any process for development of a regime to protect traditional knowledge must be guided by international human rights law, including "soft" law (e.g. conventions and agreements that do not include penalties).
- The scope of any regime should include traditional knowledge within the public domain, unless otherwise decided by indigenous peoples.
- Any functional regime will require regulatory frameworks in both provider/source and user/recipient countries coupled with international enforcement procedures.

Case Study 13

The role of customary law and practice in international ABS and TK governance

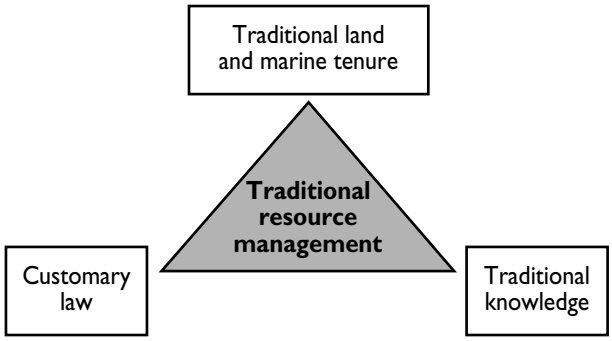
Brendan Tobin[18]

Traditional resource management is increasingly recognised as a key tool for sustainable management of natural resources. This is particularly the case with fragile marine ecosystems, where time honoured practices have ensured that over-harvesting or environmental damage is controlled in the interests of long-term community survival. The three pillars of traditional resource management illustrated below are: traditional land and marine tenure (which defines the area of protection); traditional knowledge (which defines why and how resources are to be protected); and customary law (which ensures the application of traditional knowledge for the benefit of conservation). National legal systems are typically superimposed over customary laws, frequently undermining chiefly power and traditional decision making practices. As interest in reviving traditional natural resource management practices increases so too does interest in reviewing the role of customary law and practice, and its application to new resource management issues such as access to genetic resources and traditional knowledge.

International governance of access to genetic resources and benefit-sharing (ABS) is primarily regulated by the Convention on Biological Diversity (CBD). The CBD recognises sovereign rights over genetic resources. This is frequently misinterpreted as granting ownership rights to states over genetic resources. Parties to CBD commit to facilitating access to and adopting legal, administrative and or policy measures that address fair and equitable benefit sharing and technology transfer (TT), including by the public sector and of biotechnologies arising from the use of genetic resources. Indigenous and local communities are to be consulted regarding use of TK and intellectual property rights are to support and not run counter the CBD's objectives. More than 50 countries have adopted or are working on ABS laws, policies and contracts; developed countries have tended to focus more on policy initiatives than legislation processes, but even here actions are fairly limited. No evidence has been shown of action by developed countries to adopt specific legislation on technology transfer. During

16. See Tobin B. and Swiderska K. Speaking in tongues: Indigenous participation in the development of a sui generis regime to protect traditional knowledge in Peru, IIED, London, 2001, available online at http://www.iied.org
17. See Tobin B. Redefining perspectives in the search for protection of traditional knowledge: A case study from Peru, RECIEL 10(1) 2001, ISSN 0962 8797
18. Institute of Advanced Studies, United Nations University, Yokohama, Japan. Email: tobin@ias.unu.edu

Conference of Parties (COP) VI meeting of the CBD, there was an attempt to bring balance to the ABS governance through the Bonn Guidelines on access to genetic resources and benefit-sharing (http://www.biodiv.org/programmes/socio-eco/benefit/bonn.asp). It is hoped that implementation of the Bonn Guidelines on ABS will lead to an increase in action by those countries exploiting resources[19] to develop relevant ABS law and policy compatible with equity for supplying countries.



Towards an international ABS regime

The World Summit on Sustainable Development (WSSD) in 2002 called for negotiation of an international regime on benefit sharing relating to genetic resources within the framework of the CBD, bearing in mind the Bonn Guidelines. One of the key questions by this process has been whether these measures be legally binding or voluntary? This is a debate that polarises countries, but unnecessarily so. The existing international regime of ABS governance includes "hard law" (legally binding law) such as: the CBD itself; trade-related aspects of intellectual property rights (TRIPS); the World Intellectual Property Organization (WIPO) Treaties; the International Treaty on Plant Genetic Resources for Food and Agriculture; phytosanitary standards; regional and national ABS and IPR laws; and customary law and practice of indigenous peoples where recognised by national and/or international law. It also includes soft law such as: the Bonn Guidelines; regional ABS Policies; and national biodiversity strategies and action plans (NBSAPS). It is thus evident that any new regime will have both binding and non-binding elements.

Despite a period of 10 years to adopt measures to implement the CBD, there has until recently been only limited action by developed countries to adopt measures to comply with obligations such as technology transfer and benefit sharing. There is also a perception that IPR regimes are becoming ever more pervasive and threatening to the objectives of the CBD. This has led to questions regarding the utility of the voluntary Bonn Guidelines as a tool to bring about equitable governance of ABS. It is noteworthy that in response to pressures for negotiation of an international regime, there has been a significant move by developed countries stress implementation of user measures, and of ABS capacity building programmes.

The terms of reference for negotiation of an international regime on ABS adopted at CBD COP VII do not specify any objectives. Negotiators may wish to include objectives from both the CBD and WSSD, including those that: seek to ensure fair and equitable benefit sharing; secure transfer of technologies; facilitate access, strengthen traditional knowledge and innovation systems and protection of rights over TK; and alleviate poverty.

Development of ABS and TK regimes will need to be dealt with in parallel. Customary law plays an important role for protection of TK and regulating access to genetic resources within a local community or indigenous peoples' jurisdiction, but its power to regulate use outside this jurisdiction is normally quite limited. Customary law may in some instances conflict with human rights. There is a need for greater analysis of opportunities and challenges to the development of mechanisms to bridge the gaps between national and international law and policy and customary law and practice, in order to develop culturally sensitive and functional ABS and TK regimes.

Lessons learned and recommendations

Equity was developed as an extra judicial remedy to overcome the injustice caused by strict application of the law. An international body of equity for ABS should be developed through consideration of multiple sources of law and equity, including customary law and practice.

19. For discussion of user measures see Barber C., Johnston S. and Tobin B. 2003. UNU-IAS Report: User measures: Options for developing measures in user countries to implement the access and benefit-sharing provisions of the Convention on Biological Diversity – 2nd Edition. UNU-IAS, Tokyo, available online at http://www.ias.unu.edu

Case Study 14

Oceans of opportunity: Seeking new commercial and sustainable uses of Australia's marine biodiversity

Elizabeth Evans-Illidge[20]

Biodiscovery, intellectual property rights and access and benefit sharing issues within AIMS

The Australian Institute of Marine Science (AIMS), established in 1970 by the AIMS Act, carries out, facilitates and applies research and development relating to marine science and technology in Australia. Its mission is to generate and transfer knowledge to support the sustainable use and protection of the marine environment.

The biodiscovery process starts with sample acquisition and leads to product development. It is used in numerous fields, including pharmaceuticals, agrichemicals, sunscreens, seafood toxin testing, antifoulants, bioremediation, environmental monitoring and industrial enzymes. Australia's huge marine biodiversity, and 16 million km^2 of ocean, offer infinite opportunities to discover new bioactive chemicals.

The acquisition of samples is followed by chemical analysis and initial development of extracts and chemical variations, using funds contributed by pharmaceutical companies. Patents can be put on discovery methods, lead structures and supply methods, during the early stage of "development"; this is prior to the more advanced stages of development that involve medical or agricultural trials.

Although necessary for products, intellectual property (IP), is a controversial aspect of early biodiscovery as it is often difficult to determine whether the intended application of the novel compound was "discovered" by the indigenous community at the site. IP discussions can have negative effects on research by reducing publication rates and undermining curiosity science. There can be major mistakes in designating if publication proceeds before protection, which can lead to "disastrous" shared ownership with a total loss of priority for both the indigenous peoples and the discovering laboratory because the information is on the public record. Similarly, contracts can have the drawback of tying a product to an exclusive partner or hindering other research within that field. Thus, there is a need to develop a transparent IP policy and procedures to "optimise the social, environmental and economic benefits arising from IP" for the indigenous communities; and to revise contractual arrangements so as to allow some independence and gain access to internal and independent expert advice.

In response to the lack of process and legislative basis and the ambiguity on beneficiaries and benefits in the field of benefit sharing, AIMS has developed a Policy and Procedure on access and benefit sharing (ABS) for biodiscovery. The Queensland Government/AIMS Biotechnology Benefit Agreement provides AIMS with ownership of the samples, allowing for transfer to third parties and providing legal certainty; Queensland receives documentation on biodiversity, specimens in museums, capacity building and jobs, new opportunities for Queensland industry and 1.5% of the monetary profit.

Domestic and international instruments to protect biodiscovery

Various domestic and international guidelines and instruments protecting biodiscovery are now available. The recent CBD Bonn Guidelines, the Queensland Biodiscovery Bill, the Nature Conservation Act and the Commonwealth Environment Protection and Biodiversity Conservation Act and regulations (pending) are but a few.

In Australia, the Interim Marine and Coastal Regionalisation for Australia established an ecosystem regionalisation system to facilitate the selection of MPAs based on limited data. A framework to take more detailed information and ground truthing (e.g. bioprospecting inventories) has been implemented in this prospect.

Lessons learned and recommendations

"Oceans of opportunity" are now open for AIMS. The Institute is now a co-investor with industries, has obtained sound advice for contracts and IP licensing, and maximises its participation in lead discoveries, with added focus on biodiversity knowledge and supply. Conservation outcomes are maximised and low technology has opened new opportunities for sustainable use.

20. Australian Institute of Marine Science, PMB 3, Townsville MC Townsville 4810, Queensland, Australia.
Email: e.evansillidge@aims.gov.au

DISCUSSION

These case studies contain several recurrent principles, which may prove to be very useful for governments and decision-makers wanting to improve their collaboration with customary owners throughout the Pacific region. However, each should be adapted to the particular cultural, economic and historic situation of each country.

Principle 1: Harmonising customary and governmental decisions

The rules and regulations of customary communities and government authorities should be harmonised, so as to avoid legal pluralism and promote exchange and consultation between delegations (Case Study 8). Therefore, customary authorities should be empowered so as to be fully incorporated into enforcement processes, through a devolution of power and enforcement capacity to the local authority level or even to individual villages. This will encourage the participation of chiefs and other users in decision making (Case Study 10). Ideally, traditional chiefs should be included in legislatures and state government bodies, but the ownership of the negotiation and design of the regulatory system should be at the local level, wherever possible.

The success of bylaws in Samoa (Case Study 4) demonstrates that effective implementation of laws in villages requires the engagement of traditional decision-makers. Traditional chiefs should also be encouraged to speak up and assert their rights in meetings of delegates from both national and customary authorities.

Cooperation between national and customary authorities should take place in various areas, including: science; management of marine resources; education; and dispute resolution.

Principle 2: Linking scientific and traditional knowledge

Traditional knowledge and scientific knowledge can complement each other, and in the process expand the knowledge base on the status of marine resources. This knowledge is necessary for ensuring sustainable management of marine resources, both for traditional owners and government authorities. Traditional knowledge can be used by the scientific community as an indicator, while science should provide simplified explanations of results for indigenous communities for adaptive management and learning. Government agencies and NGOs can provide initial technical expertise and assistance, and then evaluate the effectiveness of resource management by communities (Case Studies 6 and 9).

Principle 3: Co-management of marine resources for sustainable development

Marine resources can be more effectively managed if communities and governments combine their knowledge and forces to ensure sustainable conservation. Co-management can be achieved via a complex adaptive process, involving communities and government agencies, built upon strengths and overcoming weaknesses of both customary and governmental bodies. For instance, fisheries officers and traditional knowledge holders can work together to grant permits, and develop reserves and management plans as is the case in New Zealand (Case Study 7). Communities should also be involved in monitoring programmes. However, a better understanding of customary management in socioeconomic terms is necessary to ensure successful co-management.

Alternatively, support can come from the government, while enforcement can be achieved by communities, as shown in the case study from Palau (Case Study 2). Tabus, buffer zones, banning of destructive measures, etc., should then be decided by traditional chiefs, according to their traditional knowledge; for instance, seasonal closures for certain fish species can be decided in accordance with traditional knowledge of spawning periods (Case Studies 2 and 10).

Principle 4: Dispute resolution: applying the "principle of subsidiarity"

Indigenous conflicts are frequently and traditionally resolved by village court systems and punished according to local customs. Enforcement, penalties and conflict resolution mechanisms over coastal resources should therefore be administered by customary authorities.

However, problems can occur is the offender is an "outsider" (i.e. someone from another community, or a foreigner) who cannot be punished under local customary law, as illustrated in the case studies from Samoa and the Solomon Islands (Case Studies 4 and 5). In such a case, village rules should be given legal support by higher levels of government.

Dispute resolution in Melanesian countries could follow the so-called "principle of subsidiarity" used in the European Union law, whereby subsidiarity is defined as the principle that decisions and responsibilities should lie as low down in the system as possible. This means that disputes should be resolved at the most appropriate level for each individual case (village courts if the offender is a local; the formal province or national court system if the offender is an outsider).

Principle 5: Education and awareness for better use of indigenous rights

One of the main reasons for the decline of traditional knowledge is the lack of interest by the young, who consider that their traditional heritage is outdated. The incorporation of traditional knowledge into national education is thus vital for indigenous communities (Case Study 1). This knowledge should be taught in primary and high schools, as an important part of the educational curriculum. Courses can be adapted locally to specific indigenous knowledge and practices and elders used for instruction.

But indigenous communities would also gain from being informed of western knowledge, particularly marine biology and marine policy. Capacity building in these two areas is particularly needed to ensure sustainable use of resources and development of self-sufficient communities. Cross-disciplinary training can thus be used to translate scientific knowledge into policy, using traditional means (Case Study 11).

Finally, there is a need for awareness raising amongst indigenous communities on existing legal or governance structures that can be used to protect their rights (Case Studies 10 and 13).

Principle 6: An international regime for access and benefit sharing (ABS) and the protection of traditional knowledge

Traditional knowledge is often abused by outsiders who appropriate this knowledge to make profit outside the country of origin. This is known as "biopiracy" and "bioprospecting". Currently most Pacific developing countries lack ABS measures, because they lack the capacity or the political will to become involved in rather complex legal resolution procedures. As this is an international issue, the most appropriate resolution it is to establish a strong international regime for ABS and the protection of traditional knowledge. This would contain both binding and non-binding elements (hard and soft law; Case Studies 12 and 13). An international body of equity should be established for ABS, including a prior informed consent condition to ensure a legal certainty in the TK regime.

Principle 7: Respecting indigenous philosophy

All national and international laws should respect the philosophy and holistic nature of indigenous cultures. Decisions were usually made within communities on an "integrated management basis". Therefore, national and international laws should be developed in close cooperation with indigenous people, as was the Loyalty Islands Environment Charter (Case Study 3).

The harmonisation of customary and government authorities and laws is conditional upon the recognition of all the sectors (intellectual property, research and development, biodiversity, access and benefit sharing, etc.) under one single theme; with all stakeholders included in the drafting of laws. A major problem of national laws in Pacific countries has developed due to their *sectorality*, with specific government departments and agencies responsible for individual sectors (e.g. separate departments of Fisheries, Forestry, Development and Conservation). Traditional knowledge and laws are more holistic (Case Study 1), and recognise complex interactions and interconnections of entities; the western approach tends to divide concepts and entities into rigid sectors.

Conclusions

The survival of traditional knowledge is vital to ensure sustainable conservation of resources in Melanesia. Action to protect this knowledge, both at national and international levels, is urgently needed throughout the Pacific, and action needs to be taken *now* to prevent the erosion and, eventually, the loss of this precious knowledge base. But this should be approached with caution; not all aspects of traditional knowledge are sustainable, and similarly neither are all the western principles. Therefore, it is recommended that customary and government institutions attempt to work together for the wise use of the best aspects of traditional knowledge, combined with the best aspects of western knowledge in resource management and the drafting of regulations. The process itself will act as a catalyst for a sustainable management of resources in Melanesia.

Acknowledgements

The authors are particularly grateful for support from The Christensen Fund for the workshop on *Traditional Knowledge and Coastal Resource Conservation for Countries and States of the Melanesian Spearhead Group*. Co-sponsors were IMPAC, The World Bank, International Oceans Institute – Australia (IOI), CRC Reef Research Center, the Institute of Advanced Studies of the United Nations University (UNU), South Pacific Regional Environment Programme (SPREP), and the World Conservation Union (IUCN). Funding was provided through the Christensen Fund, Australian Local Government Association (ALGA), the Queensland Government State Development and the World Bank, with UNU/IAS assisting by funding their representatives.

Are our mailing lists correct?

To ensure that we operate efficiently, it is important that all mailing information is correct. This will avoid duplication in printing and postage, and save paper.

If your mailing details are not correct or if you would like to be (or know of someone else who would like to be) included on the *Traditional Marine Resource Management and Knowledge Information Bulletin* mailing list, or if you do not need the printed copies anymore because you are using the online version of the bulletin (http://www.spc.int/coastfish) please fill in the following form and return it to the SPC Fisheries Information Section (see address on cover page) or send us an email (cfpinfo@spc.int).

Traditional Marine Resource Management and Knowledge Information Bulletin mailing list details:

First Name: .....
Last Name: .....
Complete Address: .....
.....
Tel/Fax: .....
E-mail: .....

- ☐ **Please change my details as above**
- ☐ **Please include me on your mailing list**
- ☐ **I currently receive duplicate copies, please rectify this**
- ☐ **I currently receive one copy, but would like to receive __ copies**
- ☐ **I do not need the printed copies anymore, but let me know when new publications are made available on SPC website**

Original text: English

Secretariat of the Pacific Community, Marine Resources Division, Information Section
BP D5, 98848 Noumea Cedex, New Caledonia
Telephone: +687 262000; Fax: +687 263818; cfpinfo@spc.int; http://www.spc.int/coastfish