Paper Presentation at
The International Society of Ethnobiology, 1st Asian Congress of Ethnobiology
Hosted by Shei-pa National Park Headquarters, Providence University and the International Society of Ethnobiology

October 21-28, 2009
Taiwan

Application of ethnobiological methods to assess community resource use patterns in the Crocker Range Park in Sabah, Malaysian Borneo

James TH Wong[1], AL Agama[1], A Murphy[1], G Martin[1], J Nais[2], M Lakim[2] & Y Miki[2]

Introduction

With rapid global development and the mounting challenges to safeguarding biocultural diversity, the multidisciplinary field of ethnobiology offers a holistic approach to understanding, and coping with, the changes around us (Stepp, 2005). In particular, the growing momentum to engage directly with indigenous peoples, not just as parabiologists, but as experts in their own right, has demonstrated just how powerful the combination of applied ethnobiology and participatory action research techniques can be (Danielsen *et al.*, 2005; Pimbert & Pretty, 1995; Vermeulen & Sheil, 2007). Involving indigenous peoples and local communities as equal partners in conservation research and action has, in part, contributed towards the increasing recognition of how the tapestry of traditional ways of life contains valid and workable solutions to global issues such as biodiversity loss, climate change and food security (Borrini-Feyerabend *et al.*, 2004a; Lasimbang, 2004b; Maffi, 2007a).

In this paper we will briefly discuss how this process has been unfolding in the Malaysian state of Sabah, located at the northern tip of Borneo. We focus on recent developments in park management policy, where efforts are underway to integrate community livelihood needs with the biodiversity conservation priorities of protected areas (Agama *et al.*, 2005). No longer confined to fortress conservation approaches, decision-makers and practitioners the world over are looking for new ways to collaborate with indigenous and local communities in the management of protected areas (Maffi, 2007b, Borrini-Feyerabend *et al.*, 2004b). This paper draws upon our work with park managers and indigenous communities to document and monitor community resource use patterns in the Buayan-Kionop area of the Crocker Range[3]. Using a "training of trainers" approach, we have been implementing various ethnobiological and participatory action research techniques such as freelisting, pilesorting, weighted-ranking, livelihood surveys, participatory video and

[1] Global Diversity Foundation
[2] Sabah Parks
[3] The work described in this paper has been supported by three Darwin Initiative projects (2004-2012), jointly carried out by Global Diversity Foundation, Sabah Parks, Partners of Community Organisations, and the indigenous people of Buayan-Kionop in the Crocker Range.

community mapping (Agama *et al.*, 2006). In this paper, we will focus on the role participatory mapping has played in strengthening the community's capacity to meaningfully engage in participatory resource monitoring (also Chambers, 2006). In particular, we have found that participatory 3-dimensional modeling, an innovative offshoot of community mapping, is an effective and enabling platform for community involvement in joint resource monitoring, capacity building and collaborative management.

The research site

Buayan-Kionop refers to an area in the remote reaches of the upper Papar River valley, amidst the rugged terrain of the Crocker Range in Sabah. Buayan-Kionop is inhabited by about 450 indigenous Dusun people who have lived here for generations, depending on the surrounding natural resources and landscapes for survival. Until today, Buayan-Kionop has minimal infrastructure; there is no road access, and the nearest town is about four-hours' journey on foot. The Buayan-Kionop Dusun are subsistence swidden farmers, relying principally on hill rice, hunted animals and freshwater fish, as well as gathering of forest products for their daily needs. Over generations in these ancestral lands, they continue to transform the surrounding anthropogenic landscapes into a living cultural landscape that sustains a diversity of plants and animals, which in turn, provide them with the food, medicines and materials they need (Miki *et al.*, 2006).

The Buayan-Kionop people reside in a string of several small hamlets dispersed along the Papar River. These villages are located at the rim of the boundary to the Crocker Range Park (CRP), a fully protected State park that was gazetted in 1984. The exception is the village of Kionop, which is located deep inside the CRP and is one of the settlements of origin for people who now live outside of the park. As Sabah's largest terrestrial park (roughly 140,000 ha), the CRP is valued for its high biodiversity, water catchments and other environmental services, and is managed by Sabah Parks, the state statutory body responsible for park management in Sabah (Sabah Parks, 2006). The lowland and montane forests of the CRP contain an impressive representation of the Malesian flora, including over 10% of the estimated 20,000 to 25,000 vascular plant species in Borneo. The Crocker Range has long been recognised as a primary centre for plant diversity and endemism, and is included in the WWF Global 200 high priority ecoregions (Davis *et al.*, 1995).

Historically, the CRP was originally designated as a Forest Reserve in 1969, before being converted to a State Park in 1984 for the conservation of natural resources and ecosystems in the area (Sabah Parks, 2006). Procedures for gazetting a Forest Reserve require that an official announcement be made to declare the intention to gazette an area as a Forest Reserve, and provide opportunity for objections to be submitted and duly considered. Lasimbang (undated: 3) points out that "the posting of the notice and public inquiry is highly significant because once a Forest Reserve was established, the communities in the area would either restrain from applying for Native Titles or their land applications would immediately be rejected by the land office. When the Forest Reserve is subsequently converted into parks, no such

enquiries are carried out and communities lose out on claims to their traditional territories" (also Lasimbang, 2004a). Unfortunately, the Buayan-Kionop community was never consulted, and as a result, a vast part of their ancestral lands were incorporated first into the Crocker Range Forest Reserve, and subsequently into the CRP. Parks in Sabah are governed under the Sabah Parks Enactment (1984) that prohibits any human encroachment and resource gathering activities. Disenfranchised from their ancestral lands and without access to the resources inside the CRP, the people of Buayan-Kionop would not have been able to meet subsistence needs or generate the income to support their families. Although, Sabah Parks has continued to practice a soft policy of allowing limited community resource use inside the park, this situation has been a source of heated conflict between the community and park personnel for decades (George, 2005; PACOS Trust, 2004).

To resolve this conflict, the 2006 Crocker Range Park Management Plan proposed to establish Community Use Zones (CUZs) to strike a balance between the conservation priorities of the park and the livelihood needs of the local communities who depend on lands within the park for survival (Sabah Parks, 2006). Although a CUZ would not grant land tenure to communities, it would legally enable the local communities to continue subsistence agricultural and resource gathering activities within the demarcated boundaries of a CUZ inside the park, and under the supervision of Sabah Parks. The Buayan-Kionop area has been identified as a CUZ candidate, and negotiations are underway between Sabah Parks and community representatives to determine the exact location and size of the Buayan-Kionop CUZ. Although critics have fiercely attacked the lack of recognition accorded to land tenure issues, Sabah Parks has maintained that CUZs, as they are currently defined, are an initial step towards building long-term partnerships with the communities living inside and around parks, as part of developing adaptive protected area management strategies that balance conservation and community livelihoods (Ahtoi, 2004; Nais, 2004; also Borrini-Feyerabend *et al.*, 2004b).

As part of this commitment to develop a relationship with the Buayan-Kionop community, Sabah Parks partnered with the Global Diversity Foundation (GDF) in a series of Darwin Initiative projects to build capacity in documenting and conducting participatory monitoring of community resource use patterns in Buayan-Kionop (Agama *et al.*, 2006). Using a blend of ethnobiological and participatory action research techniques, we have been working with a team of indigenous community researchers to investigate the key resources and landscapes important for subsistence livelihoods in Buayan-Kionop (see also Danielsen *et al.*, 2005). Following good feedback and strong support from Sabah Parks and the communities of Buayan-Kionop, we subsequently established an integrated resource monitoring team comprising Buayan-Kionop community researchers and field staff from Sabah Parks and PACOS Trust, an indigenous NGO in Sabah who is also partnered in these projects. This team has been conducting participatory monitoring of subsistence activities, including hunting, fishing, agriculture and collection of forest products. Data generated from these monitoring activities will help to formulate the Buayan-Kionop CUZ Management Plan. Over the coming years, we are further developing

this approach to support the nomination of the Crocker Range Biosphere Reserve with input from the indigenous communities of the upper Papar River valley.

Going beyond participatory GIS mapping

Participatory mapping, otherwise referred to as community mapping, is a commonly used participatory action research technique to visually display the link between local peoples and the land or seascapes (Corbet, 2009). This includes the community's perceptions and classifications of surrounding land or seascapes, locations of important resources, and sites of cultural significance. These participatory maps have been widely used by communities and external facilitators to enable effective land use planning and communication within communities, foster dialogue between communities and external agencies, and to exert community authority over ancestral territories, lands and resources (Chambers, 2006; Rambaldi, 2005). In Malaysia, participatory mapping emerged in 1992 at a workshop in Sarawak, when discussions highlighted how community-made maps could be a powerful tool to advocate for indigenous peoples' land and resource rights (Lasimbang, 2004a).

Needing an inclusive platform to consolidate our efforts to document land and resource use patterns in Buayan-Kionop, we initiated a community mapping process in 2005. We started with a series of community workshops where community members worked together to discuss and map the locations of important features such as rivers and tributaries, village locations and customary boundaries, individual house locations, agricultural fields, hunting areas, places where important plants can be found, and places of historical and cultural significance. Over many months, these continued discussions arrived at community consensus and a finalised sketch map of Buayan-Kionop was produced. Using GPS devices, we then trained the community researchers to work with other community members to ground-truth the information displayed on the sketch map. This led to an ongoing process of collecting georeferenced data of the Buayan-Kionop area, encompassing areas both inside and outside of the CRP. We then uploaded this information to produce GIS maps of community resource use patterns in Buayan-Kionop. The resulting maps are used as a reference point for the community and Sabah Parks in negotiating the terms for defining and demarcating the Buayan-Kionop CUZ.

However, we soon found that each of the mapping processes used had its weaknesses (see also Chambers, 2006). Sketch maps are normally not recognised by government agencies because of a lack of accurate scale and georeferenced information (Lasimbang, 2004a; Rambaldi & Callosa-Tarr, 2002). At the same time, GIS maps are spatially very accurate but the level of community participation in this process is constrained by the degree of computer skills, time, money, software and hardware required. We found that the more advanced the technology, the less the participation from community members, particularly from the elderly and women (see also Danielsen *et al.*, 2005). Furthermore, we quickly discovered that many community members found GIS maps hard to understand and faced difficulties in relating 2-dimensional maps to the actual landscapes represented.

Participatory 3-D Modeling as a tool for participatory monitoring

Wanting to encourage meaningful community participation, we experimented with a mapping method called participatory 3-dimensional modeling (P3DM). This method integrates sketch mapping and GIS mapping to produce a stand-alone relief model, using low-tech methods and interactive participatory workgroup sessions (Corbet, 2009; Rambaldi & Callosa-Tarr, 2002). P3DM has been used in Africa and parts of Southeast Asia as a tool for conflict resolution and collaborative management between government and local communities, and is increasingly gaining recognition as a powerful tool in the field of participatory research because of its simplicity, flexibility and accessibility.

In Buayan-Kionop, we capitalised on our earlier participatory mapping and GIS processes to subsequently embark on a P3DM process. We found that P3DM was ideal because of its simple and dynamic approach, enabling fuller community input by facilitating open participation and knowledge-sharing from all demographic sectors of the community, including the elderly and illiterate. Unlike participatory GIS mapping, the P3DM approach is a platform for inclusivity, a strength which is inherent to the model-making process itself (also Rambaldi & Callosa-Tarr, 2002).

In a series of community-based workgroup sessions over a period of six months, our integrated resource monitoring team worked with community members to build the model. We started by tracing the contours of a topographic map onto corrugated cardboard, cutting the contours out in separate layers, and gluing contour layers sequentially one on top of the other, thus creating a three dimensional representation of the topographic map. Once assembled, we glued paper towels across the entire surface of the model to produce what is called a "blank model". As soon as the blank model was ready, we found that community members were eager to start discussing the landscapes represented on the model. After some discussion, community members chose which features should be displayed on the model and what colour should be used to represent each feature. A selection of paint colours was used to indicate areas (e.g. forest types according to the Dusun classification system, agricultural fields and hunting sites), coloured yarn to indicate lines (e.g. rivers and tributaries, boundaries), and coloured pins to indicate specific points on the landscape (e.g. individual houses, burial sites, waterfalls). They also labelled each area with local toponyms in the Dusun language. Finally, a legend was created to reference the meanings of each feature for future users.

As we continue to work with the model, we find that the P3DM approach is, by default, an ongoing process. The model is never "complete" because it continues to be updated as land and resource use changes occur, and new knowledge can be added at any time. Because the model is built to scale, it is possible to merge the indigenous spatial knowledge displayed on the model with georeferenced GIS maps. Each time new information is added, the current layout is recorded by taking digital photographs of the model, which can be stored as hardcopy, digitally, or uploaded into GIS maps, and compared to monitor changes over time. An important next step therefore, is to ensure that the community retains the desire to improve and manage the model, since they are responsible for updating the model with new information. We are currently discussing the usefulness of establishing a community P3DM team which would be tasked with the updating and maintenance of the model. In this regard, the team can be guided by a community protocol to ensure the model is used as a base for future research and planning in the area, and as a tool for negotiations with Sabah Parks about the formulation of the Buayan-Kionop CUZ.

Essentially, the model should remain a community-based and community-owned venue to consolidate data collected through various participatory monitoring methods and from traditional knowledge reservoirs. In terms of sharing their knowledge, the local community should remain in control of how they wish to display their knowledge on the model. Data displayed on the model can be discussed extensively at the village level, before it is presented to government agencies. This ongoing collaboration between park personnel and the local community in joint

training and resource monitoring activities, in turn, creates a platform for mutual learning in exploring a common understanding about managing the Buayan-Kionop area.

Returning to the issue of inclusivity, we found that because the model was manufactured at the village level, the model-making process attracted the attention of many community members. Each stage in the model-making process involved simple, low-tech actions, from tracing, cutting, gluing to painting, which made this an activity where everyone could participate, regardless of age, gender or educational background. In this way, a community process produced a completed model that was, by virtue of effort, common property. We also found that an immediately accessible 3D replica of their ancestral lands was an irresistible springboard for elderly community members to share their knowledge on resource areas and cultural landscapes. With regular updating, the model can be used to illustrate changes in land use patterns, social migrations and species pools in the area, making this a dynamic and attractive method for long-term participatory monitoring.

Conclusion

P3DM has great potential as a community-controlled tool for collaborative planning and management of integrated protected areas. In Buayan-Kionop, it has enabled the community to gain confidence as equal collaborators in the research and monitoring of their ancestral lands. It is a process that has enhanced overall community capacity and knowledge about conservation research action, and provided encouragement for community-driven research. In the near future, we will focus on having community-to-community exchanges throughout the upper Papar River valley so that the Buayan-Kionop community can share their experiences with other communities. In doing so, we aim to promote P3DM as powerful tool for grassroots capacity building and community participation in collaborative protected area management.

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