

Root Seeking and Remote Sensing with the Bunun in the Mountains of Taiwan

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ABSTRACT

Many Indigenous groups in Taiwan, including the Bunun, inhabited remote mountainous regions. Beginning in the 1930s, all mountain settlements were relocated to lower-lying areas by the colonial authorities. These groups lost the territories where they used to hunt, practice slash-and-burn agriculture, and carry out other social and cultural practices. Having being separated from their ancestral lands for decades, their knowledge of their former settlements and traditional ways of life is gradually disappearing. In recent years, there is a tendency among the younger generation of Indigenous people to organize and participate in roots-seeking expeditions. As their knowledge about the former settlements is limited, they seek help from the elderly—and archaeologists. Since 2014, I have collaborated with Bunun communities, recording their ancestors' lands in the Lakulaku River Basin by joining archaeological surveys on roots-seeking trips. During these surveys, I had to learn Bunun values and gain knowledge of the Lakulaku River Basin via the bodily experience of moving through and being in the landscape with its traditional inhabitants. By applying remote-sensing technologies such as airborne lidar in our surveys, our team managed to identify and record settlements that were unfamiliar to the Bunun.

Keywords: Taiwan, Indigenous archaeology, landscape, airborne lidar, Bunun group, remote-sensing, former Indigenous archaeology

Muchos grupos indígenas de Taiwán, incluidos los Bunun, habitaban regiones montañosas remotas. A partir de la década de 1930, las autoridades coloniales trasladaron todos los asentamientos de montaña a zonas más bajas. Estos grupos perdieron los territorios donde solían cazar, practicar la agricultura de tala y quema y otras prácticas sociales y culturales. Habiendo estado separados de sus tierras ancestrales durante décadas, el conocimiento de sus antiguos asentamientos y formas de vida tradicionales se está perdiendo gradualmente. En los últimos años, existe una tendencia entre las generaciones más jóvenes de indígenas a organizar y participar en expediciones de búsqueda de raíces. Para algunas comunidades, estos viajes a las tierras ancestrales también tienen un propósito político: recuperar territorios tradicionales perdidos hace mucho tiempo. Como su conocimiento sobre los antiguos asentamientos es limitado, buscan ayuda de los ancianos y arqueólogos. Desde 2014, he colaborado con las comunidades Bunun registrando las tierras de sus antepasados en la cuenca del río Lakulaku al unir el estudio arqueológico con los viajes de búsqueda de raíces. Durante estas encuestas, tuve que aprender los valores de Bunun y obtener conocimiento de la cuenca del río Lakulaku, a través de la experiencia corporal de moverme y estar en el paisaje con sus habitantes tradicionales. Mediante la aplicación de tecnologías de detección remota como el lidar aerotransportado en nuestras encuestas, nuestro equipo logró identificar y registrar asentamientos que no eran familiares para los Bunun.

Palabras clave: Taiwán, arqueología indígena, paisaje, lidar aerotransportado, Bunun, teledetección, arqueología indígena antigua

Developed in North America as a reaction to the worldwide Indigenous movements of the 1980s, Indigenous archaeology is defined as “archaeology done with, for and by indigenous people” (Nicholas and Andrews 1997:3). Realizing the colonial legacy of the discipline and that its methods and theories are reliant on Western knowledge system and methodologies, Indigenous archaeology is considered a decolonizing practice that seeks to understand history and heritage by incorporating archaeology and the Indigenous knowledge, value, and epistemologies through a collaborative approach (Atalay 2006; Nicholas and Andrews 1997; Silliman 2008; Smith 2021; Smith and Wobst 2005; Watkins 2000; Watkins and Nicholas 2014). Community-based research that

addresses the importance of archaeologists and the descendant groups collaborating in the design, process, and interpretation of archaeological investigation is applied to make sure that the interpretation of Indigenous heritages is multivocal (Atalay 2008). Inevitably, conducting archaeological investigations in Indigenous territories would more or less affect the local communities and even cause some sort of destruction to their heritages. Consequently, practitioners of Indigenous archaeology often seek to minimize the impact of archaeological investigation (Lightfoot 2008). In these cases, technologies that are considered non-invasive, such as remote sensing, have been used to serve the needs of archaeologists and communities to understand and

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preserve Indigenous heritages (e.g., Gonzalez 2016; Lightfoot 2006; Nelson 2021; Sanger and Barnett 2021; Wadsworth et al. 2021). Indigenous archaeology has been enriched in practice by archaeologists working in regions around the world (Watkins and Nicholas 2014), and when referred to as Indigenous archaeologies, celebrates its multiplicity across regions and subjects (Atalay 2008). Recently, collaborative and Indigenous archaeology has been advocated and practiced in East and Southeast Asia (e.g., Acabado 2020; Acabado and Martin 2020; Acabado et al. 2017; Ang et al. 2020; Heng et al. 2020; Stark 2020; Watkins 2014).

In Taiwan, most archaeological studies focus on the history of Austronesian populations since their arrival. In the late 1980s, as the number of CRM projects grew abruptly, archaeologists began to notice the impact of excavation on Indigenous communities and suggested that the academic community respect the local customs when conducting archaeological investigations (Chen 1990). Yet, even now, few studies have discussed the relationships between archaeological practice and the Indigenous descendants of these Austronesian populations in Taiwan (Muyard 2016). Only recently have more archaeological studies been done in collaboration with Indigenous communities (Cheng 2020; Chiang 2019).

This article introduces the Indigenous archaeological project focusing on former Indigenous settlements in the Lakulaku River Basin that is now considered Bunun country. The abandoned Bunun settlements there are mostly located in remote, rugged spots that can only be reached on foot. Moreover, the exact locations of many settlements remain unclear, even to descendants. I use the following case study as an example of how archaeology can help stakeholder communities record their traditional territory. I will also share how archaeologists developed a set of practices for conducting archaeological study in Bunun traditional territory, including the integration of archaeological methods with traditional Bunun knowledge and the application of technologies such as GIS, GPS, and remote sensing. Such collaboration between archaeologists and the local community has elevated our understanding of Bunun heritages and their value.

THE INDIGENOUS TRADITIONAL TERRITORIES IN THE INNER MOUNTAINS OF TAIWAN

Prior to the arrival of the Dutch in the early seventeenth century, the island of Taiwan was occupied by Austronesian-speaking populations. Multiple lines of evidence show that they migrated to Taiwan from coastal areas of southeastern China around 4000 BC. These early arrivals, known as the Tapenkeng culture, were the progenitors of Neolithic Taiwan. The Neolithic cultures of Taiwan became the cultural and linguistic foundations of Taiwan's current Indigenous population (Chang 1969; Li 2013; Tsang 2000). Today, there are 16 nationally recognized Indigenous groups in Taiwan, numbering about 577,000 in total, or 2.45% of the island's population. Understanding the evolution and history of these Indigenous groups since the Neolithic period has been the core purpose of Taiwan archaeology.

Since the early seventeenth century AD, Taiwan has been controlled or partially controlled by various outside powers,

including the Dutch in southern Taiwan (1624–1662), the Spanish in northern Taiwan (1626–1642), the regime of the Ming loyalist Koxinga and his descendants (1662–1683), the Qing Empire (1683–1895), the Empire of Japan (1895–1945), and the Republic of China (1945 to the present). There was also steady migration to Taiwan from the early seventeenth century to the mid-twentieth century, mostly from nearby coastal regions of China, punctuated in and around 1949 by the arrival of the Republic of China state apparatus and its dependents. The Chinese population in Taiwan grew rapidly during the Qing rule. Chinese expansion often came at the expense of the Indigenous groups living in the western plains and in the northern part of the island. Some people lost their lands to the Chinese outright; others became “Sinicized,” losing their cultures and languages, in part through intermarriage with Chinese settlers (Chou 2015:68–111; Hung et al. 2010:129–132). Indigenous people living in the mountains and along the coastal plains of the eastern island were relatively undisturbed by the outsiders until the arrival of the Empire of Japan. As a result of the First Sino-Japanese War, Taiwan was ceded to Japan in 1895. One important purpose of Japan's colonization of Taiwan was to exploit the mineral and timber resources of the mountain regions. Given that most of these areas were occupied by Indigenous peoples, the Japanese colonial government had to control the locals to access the underlying natural resources. The term “Savage Governance,” first used in official Japanese documents in 1902 (Lin 2017:3), referred to a set of policies designed to control “Savage Country” and its inhabitants—the “savages”—during the Japanese colonial period. Savage Country in the Japanese period was composed of Indigenous territories on the east coast of Taiwan, the island of Botel Tobago off the east coast, and the mountainous core of Taiwan (Fujii 2001:1–14; Ishimaru 2008:2–99; Lin 2017:29–72). As colonial power penetrated deeper into the mountains through the construction of military trails and police outposts, Japanese enterprises began to exploit the resources at the heart of the Indigenous territories. Then, in the 1930s and early 1940s, thousands of Indigenous people were relocated from the inner mountains to lower altitudes, by both incentive and force. This mass relocation of the Indigenous groups helped the Japanese gain full control over Savage Country. The Indigenous territories in the inner mountains were then nationalized, which permanently changed the landscape of the mountains of Taiwan (Fujii 2001:129–154; Lin 2017:29–72).

When the Republic of China took over Taiwan from the Empire of Japan in 1945, it followed the Japanese policy. It nationalized traditional Indigenous territory and established national parks in some regions. The laws made it more difficult for Indigenous people to get closer to their homelands. In the 1980s, Taiwan experienced a political transformation. A huge number of social movements, including Indigenous rights movements, were born during this time. In 1988, 1989, and 1993, there was a series of three “Give Back My Lands” protests carried out by the Indigenous people. The first two protests focused on the right to better utilize the Indigenous Reserved Lands, whereas the third one aimed to reclaim traditional territories beyond the Indigenous Reserved Lands. The state did respond to these demands. In 2000, President Chen Shui-bian announced a “New Partnership between the Indigenous Peoples and the Government of Taiwan.” One of the elements of this new partnership was to reinstate the Indigenous peoples' traditional territories. As part of this effort, between 2002 and 2007, the Council of Indigenous Peoples

launched a series of surveys of the traditional territories of the Indigenous groups in Taiwan. However, there has been little progress since then (Kuan 2014).

Due to their relocation and the subsequent changes in land use in the Inner Mountains, modern-day Indigenous communities rarely have the chance to visit their ancestral lands, their settlements in the mountains are collapsed, and their memories are fading. The archaeological study of former settlements (*jiùshè*), focusing on abandoned Indigenous settlements, emerged in the early 1980s in this context. More former settlement studies have been done in the last decade, because awareness of their traditional territories has been growing among Indigenous people. Yet, the research on the recent history of Indigenous groups is still only a fraction of Taiwan archaeology. Most of the studies have been done at sites accessible by car and have focused on settlement layouts and stone structures.

CASE STUDY: STUDY OF THE BUNUN FORMER SETTLEMENT IN THE LAKULAKU RIVER BASIN

The Geological and Historical Background of the Lakulaku River Basin

The Lakulaku River Basin covers an area of approximately 400 km². It is currently administered as part of Zhuoxi Township, Hualian

County. In terms of topography, the Lakulaku River Basin is surrounded by mountains higher than 3,000 m on its western, northern, and southern sides. The Central Range lies to the west, the Mount Mabolasi (3,785 m) massif to the north, and the Mount Xinkang (3,331 m) massif to the south. In the east, the basin connects to the Hualien-Taitung Rift Valley (Figure 1).

Most of the Lakulaku River Basin is rugged and challenging to inhabit. It snows in the winter at higher altitudes, such as along the ridgelines of the Central Range. At lower altitudes, such as in the river valleys, the dense semitropical forest is almost impassable (Figure 2). Yet, the area lies within what is now considered Bunun country. According to oral history, a part of the Bunun population arrived in the early eighteenth century from west of the Central Range, seeking new lands for hunting and slash-and-burn agriculture. These movements were not cohesive; different clans moved at different times and in different directions. In general, some Bunun expanded into the upper reaches of the Lakulaku River Basin, then spread further to the east and south, eventually spreading past it. The Bunun eventually established 14 tribes in the region, consisting of 126 households and 1,434 individuals (Huang 2006:9–38; Mabuchi 2014 [1953]:125–155; Palalavi 2006:81–187; Yeh 2002:33–153).

The Bunun remained undisturbed in the Lakulaku River Basin until the arrival of Northeast Asian colonizers in the late nineteenth century. Agents of the Qing Empire entered the area in 1875. They constructed the 2 m wide Middle Trail, which crosscut the northern Lakulaku River Basin. The Japanese Empire, in turn,

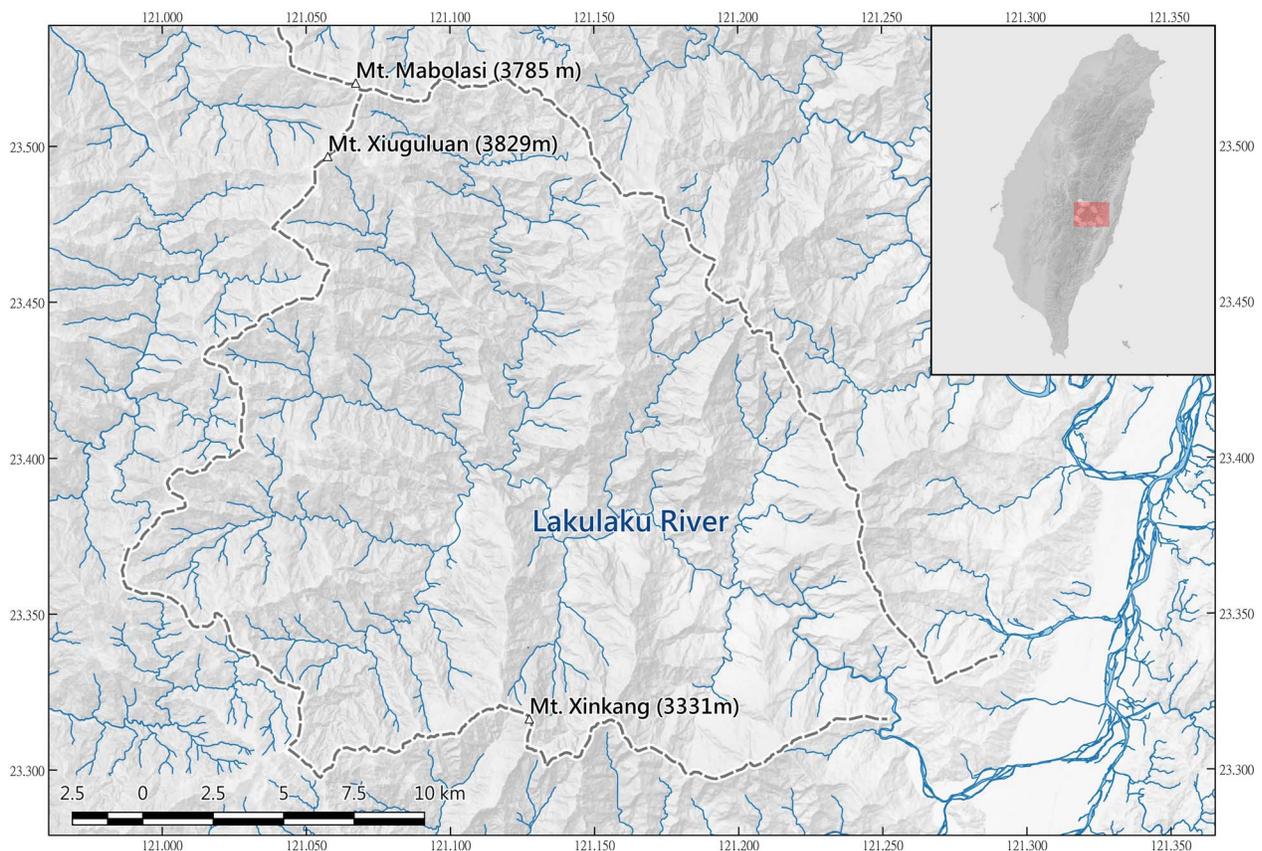


Figure 1. Map of the Lakulaku River Basin.



Figure 2. Mountain environment of the Lakulaku River Basin. (Photo taken by author.)

completed the Pattonkan Transmontane Trail in 1921. It ran south of the Lakulaku River, and police outposts were built along the trail to control the local Bunun population. Military victory emboldened the Japanese to relocate the Bunun to lower-lying areas in 1935 (Huang and Lin 2001; Lin 2005; Yang and Wang 1987, 1989). This relocation greatly changed the landscape of the Lakulaku River Basin, and the area has remained without permanent inhabitants, with only occasional visits by hikers and tourists. It is now part of Yushan National Park. In the process, the Bunun lost the territories where they used to hunt, practice slash-and-burn agriculture, and carry out other social and cultural practices. They were left with only some lands in the foothills on which to reside and practice sedentary cultivation.

Archaeology Enabled the Bunun Community to Record Their Traditional Territory

As illustrated, in the last 300 years, several groups of people have settled or competed in this mountainous region. Today, all of these groups have left, but their trails, stone-slab houses, shelters, field systems, and police outposts remain. Several surveys of Qing and Japanese trails were conducted as a result of the establishment of Yushan National Park in the late 1980s (Chen 1984; Yang and Wang 1987, 1989). In 1987, the Qing Middle Trail was designated as a “national monument,” the highest designation awarded to historic sites in Taiwan. The Japanese Pattonkan Transmontane Trail was restored as the national park’s hiking trail in 2006 and renamed “Batongguan Historic Trail.” The trail has remained the best-maintained footpath to reach to the heart of the Lakulaku River Basin since the relocation of Bunun in 1935.

The section of trail from Nan’an to Walami is one of the most popular tourist attractions of the national park and, along the route, maps and signs provide interpretation for tourists. Some signs had been posted to introduce the history of the trail and the Lakulaku River Basin. Prior to 2017, these signs highlighted the region’s colonial history by introducing the Japanese military trail and outposts. The Bunun population that had dominated the region for hundreds of years was rarely mentioned. This is one example of how Indigenous voices have been marginalized in Taiwan’s colonial history. Indigenous narratives, including those of the Bunun, constitute only a small portion of Taiwan’s national educational curriculum. Not until 2020 did elementary education in Zhuoxi Township include a series of Bunun culture-focused courses.

A Yushan National Park-funded survey on Bunun former settlements in the Lakulaku River Basin was conducted by architects from Chung Yuan Christian University, focusing mainly on the structure and forms of stone-slate house remnants in 1999 (Huang and Lin 1999). However, until recently, there had been no government-funded research of the former settlements in the Lakulaku River Basin, and no Bunun heritage sites there had been designated by authorities.

Between 2014 and 2021, serving as field director, I helped the Institute of History and Philology, Academia Sinica design and conduct a series of archaeological surveys and research studies on former Bunun settlements in the Lakulaku River Basin. We collaborated with descendants to locate and record the settlements, supplementing community knowledge with documentary records and modern technologies (see Chen and Cheng 2014; Cheng 2020). The research can be categorized as the archaeological

study of former settlements mentioned earlier, a subdiscipline of Taiwan archaeology that involves the investigation of the Indigenous settlements and the collapsing stone-slab buildings abandoned at the end of Japanese rule.

Prior to our investigation, this kind of study focused on settlements located in the less remote areas that were accessible by car. The former settlements of Paiwan and Rukai groups were the most studied. These tribes were composed of dozens to hundreds of households, and the settlement could be divided into several sections. Therefore, the researchers often took a settlement pattern approach to examine the distribution of the stone-slab buildings, exploring the relationship between a settlement's layout and the social organization of the tribe.

Conversely, the Bunun settlements in the Lakulaku River Basin are located in remote spots that can only be reached on foot. The Bunun often lived more sparsely than the Paiwan and the Rukai, needing larger land areas for hunting and slash-and-burn agriculture (Huang 2006:16–17). Each tribe was mainly composed of the members of one clan. To study the Bunun settlements, as well as to serve the descendants in terms of locating and recording their homeland, a new approach to studying Indigenous settlements was required.

Archaeological Surveys Incorporating Bunun Traditional Knowledge and Values

I started my doctoral dissertation research in 2013, focusing on the Japanese Pattonkan Transmontane Trail and the police outposts in the Lakulaku River Basin that were abandoned in the 1940s. In the surveys, I sometimes hired Bunun locals to serve as guides, and they were always in the minority of the research team. Once, I went on a 10-day trail maintenance expedition with Bunun park rangers to learn how the Japanese military trail is being utilized today. That crew was mostly made up of Bunun, and hiking with them allowed me to learn the Bunun ways to survive in the mountains. After learning that I was an archaeologist, they also took me to see some of their former settlements. We developed a strong friendship on the trip, and I subsequently received many invitations to attend the Bunun family and tribal events. Consequently, when I had the opportunity to launch a former Indigenous settlements archaeological project in 2014 through Academia Sinica, I approached people I knew—the Istasipal family—and proposed a survey of their ancestors' home in the Kasin tribe along the lower Lakulaku River. At that time, the descendants were unsure of the house's precise location.

One criticism that Indigenous leaders have leveled at Taiwanese archaeologists is the failure to respect Indigenous values (Muyard 2016:237–239). Academia Sinica's research in the Lakulaku River Basin approached archaeology as "done with, for and by indigenous people" (Nicholas and Andrews 1997:3) with the goal that it should intersect "with indigenous values, knowledge, practices, ethics, and sensibilities, and through collaborative and community-originated or -directed projects, and related critical perspectives" (Nicholas 2008:1600).

We sought to incorporate stakeholders' understanding of their world in the interpretation of archaeological data. After a series of discussions between the archaeologists and the descendants, we decided to join archaeological survey work to the family's

"roots-seeking" (*xúngēn*) expeditions, led by Istasipal's elder, Haisul, who was also a park ranger. Roots seeking, a common activity for some of the Indigenous groups of Taiwan, is to travel back to one's ancestral lands. For some communities, these trips to the ancestral lands are also loaded with political purpose: to reclaim long-lost traditional territories. Nevertheless, roots-seeking trips are an important part of Taiwan's Indigenous cultural revitalization.

Modern-day Bunun communities rarely have the chance to visit their ancestors' lands. Over the course of decades, their wilderness skills and knowledge have been eroding. Many Bunun communities do not even know the location of their former settlements. For the Bunun in Zhuoxi Township, roots seeking is the rare opportunity to revisit the settlements they had to abandon in 1935. The expeditions can be organized by an authority, such as a township office, or they can be run privately by a family or community. Such expeditions often take days, and some take more than a week.

When interpreting former Indigenous settlements, many Taiwan archaeologists rely on recently recorded oral tribal histories (e.g., Chen 1995; Chung 2013; Wu 2003). Nevertheless, in this study, the roots-seeking expeditions with the Bunun elders in the mountains provided me with a unique perspective to observe and document Bunun traditional knowledge about their landscape. I realized that the trips for the Bunun were not just to perform rituals in front of the old stone-slab houses previously owned by their family. Some traditional knowledge can only be learned when traveling in the mountains. This is when the elders seize the chance to teach the younger generation about the landscape. They tell stories about the resource-rich and important places in the area. They teach the young ones how to navigate the mountains the Bunun way—through their ability to recognize landscape features.

When camp has been set up, the young people learn how to survive in the mountains the way their ancestors did—that is, by practicing camp duties. After dinner, everyone sits by the fire, and the elders tell stories about the landscape they passed through during the day (Figure 3) so that its meaning can be considered in the present day and possibly in the past as well. Bunun movement through the landscape—with its attendant lore and practices—is an important medium for passing on traditional knowledge about Bunun country, and it is fundamental to the culture.

Our survey and roots-seeking expedition in the Kasin tribe area located several stone-slab houses in multiple locations. One of them was identified as the Istasipal's former house before the relocation (Figure 4). The "discovery" of the Istasipal's family house resulted in its restoration in 2018, which was supported by a government-funded project that I will explain later. Nevertheless, during the expedition, the archaeologists applied up-to-date technologies to help the Bunun record their homeland. This included GPS and GIS to map the Bunun heritage sites in the Kasin tribe area and photogrammetry to record three-dimensional (3D) data of the abandoned Bunun houses (Figure 5). The 3D models of the Bunun houses discovered in the surveys were accessible to community members. This included the elderly, who grew up in the Istasipal's family house but were too old to hike in the mountains. By incorporating roots seeking into archaeological survey, archaeologists are then present not just to record archaeological features but also to learn Bunun values and gain knowledge of the Lakulaku River Basin, through the bodily



Figure 3. The elders tell stories about the landscape by the fire. (Photo taken by author.)

experience of moving through and being in the landscape with its traditional inhabitants.

Modern Technologies in Former Settlement Archaeology

Taiwan's Ministry of Culture launched the Historic Site Regeneration Project launched in 2017. This nationwide program aims to blend cultural heritage preservation with people's memory and life

experiences. The Lakulaku River Basin's Bunun cultural heritage was selected as one of the sites in Hualien County. Given that archaeological research was part of the regeneration project, the county government and the archaeologists held a series of meetings in Zhuoxi Township. Some Bunun expressed the concern that archaeological digs would destroy the graves of ancestors who were buried under former houses. Nonetheless, with the agreement to minimize the impact of archaeological investigation and to include descendant communities in the project, between 2017



Figure 4. Members of the Istasipal family clearing vegetation on the surface of the abandoned house. (Photo taken by author.)



Figure 5. 3D model of a Bunun house, generated by photogrammetry.

and 2020, a series of government-funded archaeological surveys and roots-seeking expeditions was conducted collaboratively with the Kasin, Qasivanan, Asang Daingaz, and Masisan tribes by the Institute of History and Philology and the Center for GIS at Academia Sinica with Bunun communities. With more funding, the research team was able to implement more complicated surveys with modern technologies in order to study the Bunun traditional territory.

From the 2014 survey, we learned that the Bunun and their traditional knowledge strongly related to the landscape in profound

ways, given that many of the places are named after landscape features, abundant local vegetation, abundant local animals, and other resources. The survey applied a landscape approach that focuses on the relationship between the people and their lands. In the Kasin area, which is less remote than other tribes,¹ a systematic survey of a 4 km² area focused on more than the Bunun houses and included other landscape elements, such as trails, field systems, and shelters (Figure 6). As suggested by our collaborators, the Istasipal family, the Kasin survey also focused on the area's fauna and flora, and other resources were essential components of the Bunun's traditional landscape. Through synthesis



Figure 6. Cihon Istasipal recording a Bunun structure during the systematic survey in the Kasin area. (Photo taken by author.)

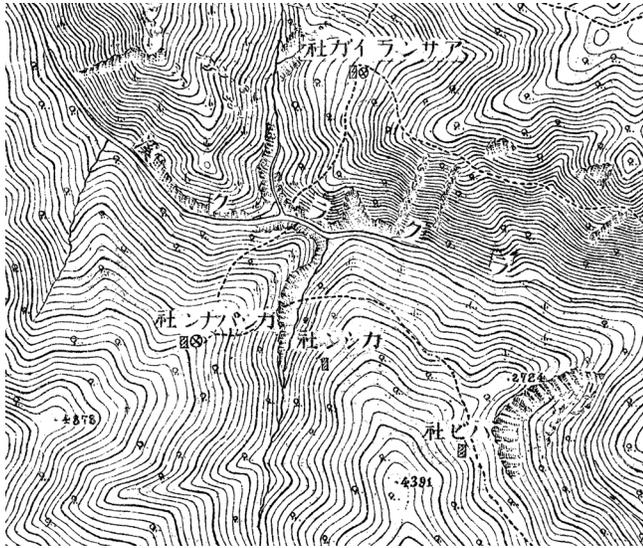


Figure 7. The Qasivanan tribe as recorded on the old Japanese map, “Topographic Map of Savage Country—Tahun Tribe.”

of survey results, oral traditions, and archaeological and archival evidence, the research team gathered the best available information about Bunun resource use and adaptations to the environment. We used this information to infer the relationship between Bunun dwellings, cropland, and hunting grounds—and as a backdrop to understanding how Bunun of the past perceived this landscape. The result of our systematic survey was presented in the village in the forms of a presentation and short film. ESRI’s ArcGIS StoryMaps of the Kasin survey was produced so that the descendants could access our research through computers and phones.

Different survey strategies with emphasis on remote-sensing technology were applied for the more remote tribes, such as the Qasivanan, Asang Daingaz, and Masisan tribes. For example,

the survey at the Qasivanan area in 2018 and 2019 was done in collaboration with the Naqaisulan family. At the time, given that their elders had already passed away, the community did not remember anything about their old houses, not even their location. After a series of discussions, we developed a set of methods incorporating both oral tradition and modern technology. The descendants studied the oral tradition and narrowed down the possible location of their homes. The archaeologists analyzed the information provided by old Japanese maps. The 1:50,000 scale “Topographic Map of Savage Country—Tahun tribe” surveyed in 1911 was digitized, georeferenced using QGIS, and it provided the information about the locations of the Bunun tribes in the Lakulaku River Basin, including for the Qasivanan tribe (Figure 7). The archaeologists then compared the digitalized map to the data generated from airborne lidar (light detection and ranging) for the possible locations of the Bunun tribe and pinpointed the survey area.

Airborne lidar had been used by the archaeologists in Taiwan to determine the extent of a well-studied Paiwan tribe—the Wun-lou settlement—providing former settlement archaeology with a significant efficiency boost (Kuo et al. 2017). Yet, this was the first time this technology has been applied to locate Indigenous settlements in the remote mountains. In 2009, typhoon Morakot caused a great deal of damage in the mountains of Taiwan. To monitor the changes of topography caused by the subsequent landslides, the government launched a three-year project using airborne lidar to generate 1 m resolution digital surface models (DSMs) and digital elevation models (DEMs) covering the entire mountainous regions of Taiwan. This high-resolution lidar data has been made available to government agencies and organizations, including Academia Sinica.

We used QGIS to generate a slope map for the high-resolution DEM. Slope analysis identifies the steepness at each cell of a raster surface. The steeper the terrain, the higher the slope value; the flatter the terrain, the lower the slope value. We colored the steepest spots in the light gray, and the flattest parts dark gray (Figure 8a). Given that the foundations of the Bunun stone-slab houses were carved into the terrain, the half-collapsed houses can

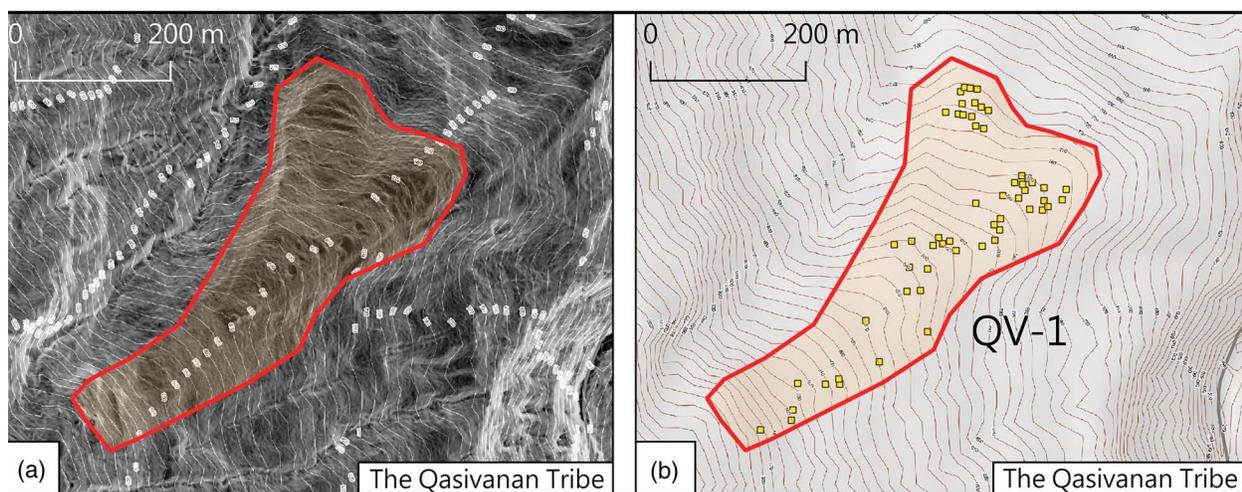


Figure 8. (a) Qasivanan area’s slope map, and (b) distribution of Bunun houses in the Qasivanan area.



Figure 9. “Recording Our Own Home” workshop participants recording the Asang Daingaz tribe area. (Photo taken by author.)

be identified in the slope map despite the thick vegetation cover, which gives the archaeologist a basis on which to plan fieldwork. The survey team therefore successfully located and recorded the settlement at Qasivanan area (Figure 8b). Archaeologists and Indigenous stakeholders had jointly developed a method that could be widely applied to the study of forgotten Bunun settlements.

Because there is a growing demand among Indigenous communities in Taiwan to record their own former settlements, it is often beneficial for these kinds of archaeological projects to take the form of workshops or field schools. As shown in many case studies (see Silliman, ed. 2008), workshops or field schools with both archaeologists and Indigenous community members in attendance not only benefit the latter by providing them with technical



Figure 10. Archaeologists and the Bunun camping in the mountains. (Photo taken by author.)



Video 1. Bunun workshop participants singing when finishing the survey/roots-seeking expedition in the Asang Daingaz tribe area.

and technological assistance but also immerse the former in Indigenous traditional knowledge (Lightfoot 2008; Silliman 2008). In 2020, Academia Sinica organized a series of lessons and a workshop named “Recording Our Own Home,” with an archaeological field trip hitched to a roots-seeking expedition (Figure 9). The destination of the expedition was the Asang Daingaz tribe area. One goal of the event was to provide some technological support for the Bunun who want to record their settlements. The Bunun participants varied in gender, age, and level of mountaineering skill. There were elders who led the roots-seeking team and young adults currently enrolled at university in the cities. The lessons and workshop introduced field techniques such as GIS, GPS, airborne lidar, and photogrammetry, as well as resources for conducting literature research.² More importantly, the archaeologists and community participants had a chance to learn each other’s skill sets during that expedition, because we traveled, camped, cooked, and did archaeological work together (Figure 10). Discussions that took place during the lessons and workshops, and especially during the expedition, were included in our report, and these eventually helped create a body of multivocal archaeological research (Video 1). Today, many participants of the workshop have been playing important roles in the Bunun cultural revitalization projects in Zhuoxi Township and elsewhere. Moreover, along with being published by the archaeologist (Cheng 2021, 2022), the results of our joint research have been utilized by the Bunun community in a variety of ways, including a documentary film entitled *The Tribe That the Sun Shines on Last* (*tài yángzui hòuzhào yàodejiā*), articles published in local newsletters, and books written by our Bunun collaborator (Takisvilainan 2019; Takisvilainan and Lin 2021).

CONCLUSION

The Bunun in the Lakulaku River Basin, like many other Indigenous populations in Taiwan, had once dominated the mountain regions. Yet, the lands on which they used to hunt, practice slash-and-burn agriculture, and carry out their social and cultural practices have been nationalized by colonial policy. Because of their relocation, the Bunun lost their land, as well as their wilderness skills and knowledge of the landscape. Consequently, they could not recall locations with any certainty. Furthermore, with the establishment of



Figure 11. The Istasipal house after its restoration. (Photo taken by author.)

Yushan National Park, it is difficult for the Bunun to gain access their homelands.

The Indigenous history about the colonial period and the issue of rights to traditional territory have not yet been fully discussed by the Taiwanese society. Archaeology, in this context, has served Bunun communities to reclaim their voice in the history of the Lakulaku River Basin. Since 2014, new approaches and archaeological methods have been applied to help archaeologists and Bunun stakeholder communities conduct field research in remote, rugged spots that can only be reached on foot. By combining survey with roots-seeking expeditions, archaeologists have managed to learn Bunun traditional knowledge so that they and the Bunun could design field research and interpret archaeological data accordingly. In addition, the application of technologies, especially airborne lidar, certainly allowed the research team to locate unknown Bunun sites.

It was argued that remote sensing data obtained through a community-based project should be managed by—or at the very least, made available to—Indigenous communities (Sanger and Barnett 2021). Unfortunately, as previously stated, the high-resolution lidar data provided by the government is considered confidential and is only made available to government agencies and organizations such as Academia Sinica. Although lidar data may not be accessible to the Bunun people, archaeologists have been providing the communities with the maps they need.

The collaborations between archaeologists and the Bunun communities not only advanced our understanding about the Lakulaku River Basin’s history but also elevated the value of Bunun heritage



Figure 12. The Koma site. (Photo taken by author.)

in the region. For example, funded by the Historic Site Regeneration Project, the stone-slab house we had surveyed in 2014 was repaired in 2018 by the Istasipal family, with the help of scholars from the Center of Austronesian Culture, National Taitung University (Figure 11). Since its restoration, numerous Bunun cultural events have been held at the house. Many Indigenous and non-Indigenous students visit the Istasipal house each year to learn about Bunun history and culture from our collaborators. In 2020, the house and its surrounding area, Mia-asang kasing, were designated as a “cultural landscape” by the Hualien government. In 2022, the Koma site (Figure 12), which was found in the 2017 systematic survey, was designated as an “archaeological site” by the Hualien government. Following their designation as cultural properties, the government has provided funding for their maintenance, which is carried out by the local Bunun community. To date, hundreds of former Indigenous settlements in the remote mountains are still understudied, but the approaches and methods developed in Bunun country will certainly provide applicable strategies for Indigenous former settlement studies in other parts of Taiwan’s mountain regions. However, as a government-funded project, our investigation in the Lakulaku River Basin had to be led by an academic institution, and the research was inevitably constrained within a specific time frame, although collaborations between archaeologists and Indigenous communities frequently necessitate a period of reflection for both parties (Lightfoot 2008). The “Recording Our Own Home” workshop did provide an opportunity for both to communicate with each other through discussions, lessons, and fieldwork. As a result of my previous good relationship with the Bunun community, when the Bunun people and I discussed research plans, fieldwork methods, and data interpretation, they tended to agree with my opinions. Because of this, I believe a more community-based or

descendant-led research project is required. Even though our work in the Lakulaku River Basin is still in its early stages, it has advanced Indigenous archaeological practice in Taiwan.

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Data Availability Statement

The lidar data used in this research was collected by the Central Geological Survey, Republic of China. The author received permission to use the data through Academia Sinica between 2017 and 2021. The data is designated as confidential due to its sensitive nature and therefore not available to the general public.

Competing Interests

The authors declare that he has no competing interests related to this research work. All aspects of the study, including data

collection, analysis, interpretation, and manuscript preparation, were conducted with impartiality and without any financial, personal, or professional conflicts that could influence the outcomes or the integrity of the research presented herein.

NOTES

1. It requires two hours of hiking from the trailhead to reach the Kasin area.
2. "Recording Our Own Home" included lessons such as the application of technologies and traditional knowledge in archaeological research, a discussion session about the airborne lidar-generated digital elevation model in the Asang Daingaz area, a discussion session for the interpretation of Asang Daingaz survey results, an introduction to the study of household registration during the Japanese period, and an introduction to literature study, presentation of survey data, and the application of StoryMaps. It also included a two-day workshop on the practice of root-seeking/archaeological survey and a six-day field survey in the Asang Daingaz tribe area.

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