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F. Merlin Franco
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Case Studies in Biocultural Diversity from Southeast Asia

Traditional Ecological Calendars, Folk Medicine and Folk Names

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Foreword

During the past seventy years, substantial research has been undertaken on the diverse ecologies of Southeast Asia revealing the complexities of the local and traditional knowledge of ecosystems and the historical contexts in which this knowledge has been generated, sustained, transformed, and, unfortunately in some cases lost. In my view there were three classic studies in the first half of the 1950s, all three directed to swidden or shifting cultivation in Southeast Asia, by Harold Conklin on the Hanunóo of Mindoro (1954), Charles Frake on the Sindangan Subanun of the Zamboanga Peninsula, Mindanao (1955 and see 1962), and J. D. (Derek) Freeman on the Iban of Sarawak (1955a, b). Around the same time, Julian Steward's general theoretical work on culture change appeared (1955).

Another classic volume that appeared a little less than a decade later was Clifford Geertz's detailed account of the irrigated rice terraces (*sawah*) of the Javanese and his comparison of these with the properties of swidden fields (*ladang*) in the Outer Islands of Indonesia (1963). In addition, Thomas Fraser undertook an early study of the fishing ecology of the Pattani Malays of Southern Thailand (1960), and Raymond Firth's research on fishermen in the Malay states of Kelantan and northern Terengganu was published in a second revised edition in 1966 [1946]. By this time the field of cultural ecology or ethnoecology was firmly established. Other key studies followed on from there in the 1970s and into the 1980s, too numerous to mention, though the hunting-gathering and horticultural ecology of the Nuaulu of Seram by Roy Ellen became essential reading (1978), as did James Fox's accounts of the sugar palm-based economies of Roti, Savu and Ndao in the Lesser Sundas, to Clifford Sather's examination of the small-scale fishing economies of the Bajau Laut of South-Eastern Sabah (1977). Dove's later studies on the subsistence strategies of the Kalimantan Kantu' (1985), in certain respects, exceeded some of the earlier research on shifting cultivation. Much of this work has not simply been concerned to reveal and understand the ways in which the environment is used but also how it has been perceived, thought about and classified (King and Wilder 2006: 231–261).

In some of these earlier studies of human-environment interactions in this wide range of habitats, the concepts of human ecology, cultural ecology, cultural cognition, and ethnobiological classification were coined and developed. Among others, it was Geertz who helped address these complexities in his crucial statement that an ecological approach can 'achieve a more exact specification of the relations between selected human activities, biological transactions, and physical processes by including them within a single analytical system, an *ecosystem*' (1963: 3). What Geertz and other researchers were attempting to do, though there was often a lack of agreement on what precisely defined an ecological approach, was to overcome the problem of treating culture and environment or humankind and nature as two separate, independent, artificial, arbitrary, and deterministic domains. Ellen too argued that the core of the approach was the dynamic interactions, interdependencies, and transactions between the natural environment, resource use and production, cultural values and practices, and socio-economic organisation. An ecosystem is processual; it is a site of energy interchange, in which, as Ellen argued convincingly, its constituent elements are interrelated in terms of 'flows of matter and energy…and flows of information' (1978: 1). However, one major issue in dispute has been how to draw boundaries around ecosystems and include wider influences and effects in the context of modernisation, globalisation, and commercial trade and exchange. Another matter for debate is the functionality and stability of resource use, even with the deployment of traditional knowledge. There is also the suggestion that Christine Padoch made in her study of Iban agriculture in long-settled areas of Sarawak that rather than attaining a system of balance and equilibrium, ecosystems have probably been characterised more by 'constant change and disequilibrium' (1982: 2).

The present volume carries forward earlier analyses but importantly focuses on 'traditional ecological calendars', 'folk medicine', and 'folk names' in the context of the vital importance of maintaining biological, cultural, and linguistic diversity. It does this by addressing a range of cases and issues in relation to Southeast Asia: Brunei Darussalam, Indonesia, Malaysia, the Philippines, and the culturally connected area of North-East India. The several chapters demonstrate the ways in which the various forms of knowledge of the environment and its categorisations are important in such areas as landscape and resource management and conservation. They also demonstrate that environmental knowledge and the practical skills which accompany it are not necessarily widely shared. There are those, as in the case of certain members of the fishing communities in the Central Visayas, who are more accomplished and have more specific knowledge of sites, of the strong and complex sea currents, changing tides, monsoonal winds, and calendrical cycles, and, in consequence, have become more successful and their livelihoods more viable than others.

Among the Mao Naga of North-East India, calendar keepers are especially important in their knowledge of star clusters and other celestial bodies, horizon sun watching, and other seasonal factors in the organisation of the agricultural cycle and

resource management. Similarly, among the Sundanese, traditional ecological calendars played an essential role in determining the appropriate timing for the necessary stages in wet rice-farming and in such areas as water management and pest control. In both these cases—among the Mao Naga as a result of acculturation and religious change, and among the Sundanese, the effects of the Green Revolution and agricultural modernisation—there is a danger of losing this knowledge.

In the case of the Kedayan of Brunei Darussalam, the interrelationship between the ecological calendar and folk medicine is explored in that the calendar indicates the appropriate times for harvesting medicinal herbs and administering them, and the seasonal occurrence of illnesses. This would suggest that folk medicine (besides the classification of useful medicinal plants) and spiritual-based approaches might continue to offer certain therapies in addition to modern drug-based remedies. The continued use of medicinal plants is also demonstrated in the research undertaken on vendors in the streets and markets of Baguio City in the Philippines. These plants remain popular because of their availability, ease of preparation, low cost, and their effectiveness in treating certain ailments.

These findings on traditional medicines lend support to the significant research sponsored through the World Wide Fund for Nature (WWF) in Indonesia in the 1980s (see, for example, Avé and Satyawan Sunito 1990; Leaman, Yusuf, and Sangat-Roemantyo 1991) and the historic Chiang Mai Declaration of 1988 'Saving Lives by Saving Plants'. This was followed by the collaboration between the World Health Organization (WHO), the WWF, and the International Union for Conservation of Nature and Natural Resources (IUCN) in their *Guidelines on the Conservation of Medicinal Plants* (WHO, IUCN, and WWF 1993), subsequently further revised in 2003.

The addition of two pieces of research on folk plant names among the Urang Kanekes of Banten and fish names among the Vaie of Sarawak demonstrate how important these are in encoding traditional knowledge in relation to ecology, morphology, experience, quality, and utility. With linguistic and cultural change, once names are lost then a body of local knowledge disappears as well. The chapters respond to the question of how indigenous communities order and categorise their knowledge of the environment, its past processes and characteristics, and its present condition. It also continues in the tradition of Harold Conklin from the 1950s who presented the classifications of the Hanunóo on food and land use, climate, soils, terrain, vegetation, and plants, arguing that swidden agriculture has to be understood in its cultural context and as 'a way of life' (1957: 29–138). Folk classifications of the kind that are referred to here are crucial for analysing and understanding ecological interactions.

In summary, there is much to learn from this book as it sends important messages to those who care about the sustainability of our environment, the maintenance of its biocultural diversity, or at least the maintenance of what remains of it because much has changed, and the impacts of culture-carrying human beings on nature. In the 1920s the pioneering American geographer Carl Sauer formulated his notion of a

'cultural landscape' as being 'acted on and modified by a cultural group' which was thinking about, making, modifying and using the landscape (1925: 19–53). Perhaps today we would not phrase his concept exactly in these terms. Cultural ecology or ethnoecology has encouraged us to face and attempt to understand the complexities of human-environment relations. Yet the role of culture in all that we do in, on, and with the environment remains vitally important, as Sauer was arguing around a century ago.

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Chapter 1
Case Studies in Biocultural Diversity from Southeast Asia—Traditional Ecological Calendars, Folk Medicine and Folk Names

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Abstract Biocultural diversity refers to the dynamic interrelationship between the Earth's biological, cultural, and linguistic diversity. The concept draws strength from the fact that biodiversity-rich regions of the world are also rich in cultural and linguistic diversities. This volume adds to scholarship in biocultural diversity with case studies from geographical Southeast Asia. The chapters presented in the volume, based on research in Brunei Darussalam, Indonesia, Malaysia, the Philippines, and Northeast India demonstrate i) how traditional ecological calendars and calendar keepers serve as repositories of knowledge on landscapes and their resources, ii) the importance of folk medicine for healthcare in contemporary Southeast Asia, and iii) how folk names of flora and fauna serve as condensed forms of traditional knowledge on biodiversity. While highlighting the importance of customary ways of knowing and categorizing the environment in areas such as resource management, conservation, and healthcare, the chapters also demonstrate that traditional environmental knowledge and the practical skills which accompany it are not necessarily widely shared and are under constant threat. As Southeast Asia marches forward in pursuit of economic growth, it would also have to ensure that its biocultural diversity stays alive, nurturing local communities for generations to come.

Biocultural diversity refers to the dynamic interrelationship between the Earth's biological, cultural and linguistic diversity (Maffi 2007). Proponents of the concept espouse an 'inextricable' link between these three forms of diversity, drawing on insights mostly from anthropology, ethnobiology, ethnoecology and human ecology

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(Maffi 2005, 2007; Posey 1999). Biocultural diversity draws strength from the fact that biodiversity-rich regions of the world are also rich in cultural and linguistic diversities (Gorenflo et al. 2012). This co-occurrence indicates strong interlinkages between human communities and their environment. Indeed, communities adapt to and shape their environments and the kinds of biodiversity that can thrive in them through their cultural practices and traditional knowledge (Cocks 2010; Usher 2000). Consequently, biodiversity-rich regions such as Amazonia and Borneo once romanticised as pristine are now recognised as culturally influenced landscapes (Barker et al. 2017; Heckenberger et al. 2007; Levis et al. 2017; Roosevelt 2013; Wartmann and Purves 2018).

A key component of biocultural diversity is traditional knowledge. Traditional knowledge is the 'knowledge and know-how accumulated across generations, and renewed by each new generation, which guide human societies in their innumerable interactions with their surrounding environment' (Nakashima et al. 2012: 27). According to Houde (2007), traditional knowledge on the environment is hexa dimensional: (i) it helps in the identification, classification and naming of the environment and its resources, (ii) facilitates landscape management, (iii) provides an ethical framework linking beliefs with actions, (iv) offers an understanding on the past and present state of the environment, (v) shapes cultural identity, and (vi) provides cosmological underpinnings for human–nature interactions. Traditional knowledge is interlinked with languages that act as the carriers of both traditional knowledge and cultural values (Maffi et al. 1999; Unasho 2013). Therefore, the loss of languages escalates the loss of traditional knowledge, leading to the breakdown of human-nature ties at the landscape level.

Since its origin in the 1990s, biocultural diversity has accumulated considerable scholarship on the interrelationship between biological, cultural and linguistic diversity (Hidayati et al. 2015; Maffi 2007). According to Maffi (2005), studies in biocultural diversity have four major foci (Maffi 2005): (i) Relationship between language, traditional knowledge, and the environment, (ii) Common threats to biological, cultural, and linguistic diversities, (iii) Conservation and revitalization of biocultural diversity and (iv) Biocultural diversity and human rights. The generation, maintenance and/or loss of traditional knowledge and its contribution to human well-being is a theme prominently featuring in biocultural diversity studies (Maffi 2005). This volume seeks to add to this body of knowledge using case studies from geographical Southeast Asia (see Enfield and Comrie 2015; Michaud et al. 2016). The crux of the book is about traditional ecological calendars, folk medicine and folk names. The case studies presented in the volume, based on research in Brunei Darussalam, Indonesia, Malaysia, the Philippines and North East India demonstrate (i) how traditional ecological calendars and calendar keepers serve as repositories of knowledge on landscapes and their resources, (ii) the importance of folk medicine for healthcare in contemporary Southeast Asia and (iii) how folk names of flora and fauna serve as condensed forms of traditional knowledge on biodiversity.

A core strength of biocultural diversity is its ability to bridge nature and culture (see Bridgewater and Rotherham 2019). The concept forces us to challenge nature-culture dualisms that have been conspicuous in the biological and social sciences

(Descola 1996; Haila 1999). For the biologists, the origin of the concept of biodiversity (or biological diversity) as 'variety and variability among living organisms and the ecological complexes in which they occur' (Office of Technology Assessment 1987: 3; also see Delong 1996; Swingland 2001) could have offered a paradigm shift by providing peoples and cultures a more prominent role in discourses on nature. It instead strengthened the nature-culture dichotomy by choosing to focus on species conservation. The definition of biodiversity has evolved since then to include cultural diversity (Heywood 1995). Yet, the nature-culture dichotomy remains entrenched in much of the biological sciences.

In the social sciences, too, the nature-culture dualism has been prominent. In the late nineteenth century, environmental determinist arguments proliferated in geographical and ethnographic studies (Moran and Brondízio 2013: 4). The focus was on how the physical environment or habitat shape human conduct. The trend of referencing broad environmental conditions, for example, different climatic zones, in explanations of cultural differences continued into the twentieth century (Huntington 1945). Critical responses to such speculative theories soon followed (Boas 1896, 1963). Among a growing number of anthropologists, historical and cultural forces gained traction in explanations of cultural forms and patterns (Freilich 1967: 29). Kroeber (1947), among others, challenged environmental determinist reasoning and questioned the validity of the 'culture area' concept. He pointed out that people who live in similar environments can have very different cultures, while people who live in different environments can have similar cultural attributes. Cultural diffusion and exchange can significantly alter the adaptation strategies of specific communities. While nature sets limits on what is possible, cultural factors play a key role in determining the course of history.[1] This argument came to be known as possibilism and is often considered as an antithesis to environmental determinism (Sauer 1925; Stallins 2012). Proponents of environmental possibilism see humans as active agents creating places and cultures and, to a certain extent, their environments (Anderson 2015; Geddes 1912; Hartshorne 1960).

In the mid-twentieth century, American cultural ecologist Julian Steward brought the debate forward by zooming in on the interaction between demography, ecology and technology (Steward 1955). He argued that the core of a people's culture is intimately linked to its dominant mode of production (hunter-gatherers, horticulturalists, pastoralists and intensive agriculturalists). He also pointed out that the capacity of humans to adapt to changing environments is in part historically inherited. However, Steward's approach is unable to account for the fact that people who live under roughly the same ecological conditions develop very differently (Eriksen 2001: 195).

Although they are often considered as contradicting concepts, Lewthwaite (1966: 16) sees environmental determinism and possibilism as complementary concepts 'at opposite poles in the long continuum of man-environment relationships'. In between these two poles lies environmental probabilism (Lewthwaite 1966). Environmental probabilism acknowledges the interaction between nature and humanity

[1] According to Kroeber (1947: 401), 'political-religious-lettered culture can alter drastically and independently of subsistence culture'.

as a complex and continuously evolving reciprocal one (Brooke 2016). Biocultural diversity[2] favors such a view, by highlighting the co-constitutive process of human–environment interaction (Maffi 2007). Unravelling the links between traditional knowledge, language, cultural values, beliefs, practices and the environment requires an understanding of the human culture-nature relationship at local levels (Maffi 2007).

Much contemporary scholarship on biocultural diversity builds on insights from human ecology. Human ecology is an interdisciplinary field that includes biology, Earth science, human geography, sociology and anthropology. Anthropologists and geographers have conducted comprehensive studies of how communities in Southeast Asia interact with the diverse environments that exist in the region (King and Wilder 2003: 231–261). There is much literature on topics such as hunting and gathering (Endicott 1984), horticulture (Ellen 1978), shifting or swidden cultivation (Conklin 1957; Dove 1985; Freeman 1955), irrigated rice agriculture (Geertz 1963) and small-scale or artisanal fishing (Firth 1966; Nimmo 1972; Sather 1997). Some scholars emphasise more on the technological-material and economic dimensions of human–environment interactions, while others focus more on perceptions, worldviews, values and systems of classification. In what is variously called 'ethnoecology' (Brosius et al. 1986), 'ethnobiology' (Ellen 1993) or 'folk biology' (Taylor 1990), much focus has been on how indigenous, traditional or local communities classify, organise and use their knowledge of the environment. Among such classification-oriented studies, Harold Conklin's (1957) book on Hanunóo swidden agriculture on the Philippine island of Mindoro is exemplary. He gives a detailed and systematic account of native systems of classification of land use, climate, soils, terrain, vegetation, plants and food. Based on these findings, Conklin argues that, for the Hanunóo, swidden cultivation is more than a livelihood; it is a set of practices deeply embedded in most aspects of their lives.

The studies discussed above demonstrate the artificiality of eliminating nature from efforts to understand social organisation and cultural classification. 'What appear to be "natural" phenomena or "cultural" artefacts are the very result of human-environmental interaction' (King and Wilder 2003: 233). There is, however, a strong rural bias in much of the literature. There is also limited systematic focus on calendric knowledge. Moving away from the stereotypical image of biocultural diversity as a paradigm relevant mainly to indigenous, rural or traditional societies, the book showcases the relevance of traditional ecological calendars and traditional knowledge in urban and peri-urban settings as well. To succeed in our effort to expand the concept of biocultural diversity beyond 'indigenous' or 'rural' realms, we recognise that essentialist definitions of 'culture' are problematic (Ingold 2002). Instead of seeing culture as a widely shared and clearly bounded system of values and beliefs, we adopt a relational and dynamic view of culture, one where different cultural orientations and

[2] Biocultural diversity is notably different from biocultural anthropology (Franco 2022). The origin of biocultural anthropology can be traced to the 1960s and focuses on the influence of biological and cultural factors on human biology and well-being (McElroy 1990). In biocultural anthropology, the term 'biocultural' largely implies the influence of the environment on human biology (Wiley and Cullin 2016).

experiences shape how people re-articulate traditional knowledge and interact with their environments (Cocks 2006; Cocks and Wiersum 2014). Such a focus allows us to examine how certain ecocultural practices and knowledges (Franco 2022), are lost, persist, thrive or obtain new significance under altered conditions. However, we acknowledge that, in a rapidly transforming world, it is the alarming loss of languages and species that require immediate attention (Bridgewater and Rotherham 2019).

Both languages and species evolve in similar ways (Loh and Harmon 2014), and often, factors and processes driving the evolution of languages and biological diversity, or their losses, are the same. Globalisation, acculturation, resource exploitation, plantation agriculture, urbanisation and formal education are factors that affect both languages and biological diversity. Thus, biological and cultural diversities are influenced by similar 'coevolution processes, common threats, and geographic overlap' (Gavin et al. 2015). Acknowledging the intricate relationship between species, languages and culture can improve strategies that aim to simultaneously conserve them (Gavin et al. 2015; Posey and Overal 1990). Studies in biocultural diversity are much useful in this context as they have produced new insights on the language-culture-landscape nexus (Fagúndez and Izco 2016; Gorenflo et al. 2012; Wartmann and Purves 2018). However, they have largely overlooked the importance of traditional ecological calendars as instruments that facilitate human interaction with nature (Franco 2015). Thus, a major aim of this volume is to highlight the role of traditional ecological calendars and calendar keepers as repositories of traditional knowledge.

1.1 Traditional Ecological Calendars

Traditional ecological calendars are ecocultural frameworks that link cycles of the sun, moon and stars with the phenology of plants and animals in landscapes (Bakar and Franco 2022). As such, they guide and facilitate individual and collective actions over temporal and spatial scales (Armatas et al. 2016; Cochran et al. 2016; Franco 2015; Furasawa and Siburian 2019; McKemey et al. 2020; Mondragon 2004; Mughal 2014; Munn 1992; Prober et al. 2011). Often embedded deeply in local spiritual beliefs, calendric rituals demarcate temporal intervals and trigger human actions (Franco 2015; Rappaport 1992; Silva Sinha 2019). Studies on calendars have adopted a typology that is based on the indicators used, or general purpose of the respective calendars. As a result, calendars are classified into agricultural calendars, astronomical calendars, sky calendars, lunar calendars, solar calendars, luni-solar calendars, phenological calendars, etc. (Ammarell 1988; Armatas et al. 2016; Daldjoeni 1984; Gislen and Eade 2019; Stevenson and Millar 2013). Such approaches fragment calendric studies while also ignoring local understandings of ecology. For local communities, the sun, stars, moon, local indicators such as calendric plants and animals, and mythical elements are all mutually interacting components of local ecology. For instance, in the landscape inhabited by the Kodi community of Indonesia, the position of the sun and stars influence human actions over the landscape, leading to

various land use patterns (Fowler 2016). For the Javanese peasants, seasonal rhythms are capable of influencing human health (Daldjoeni 1984). For many local communities, these relationships are not analogies, but causative ecological phenomena. Therefore, we refer to calendars that are landscape specific in origin and practice as 'traditional ecological calendars'.

Chapters 2, 3, and 4 of this volume deal with traditional ecological calendars. In Chap. 2, Knudsen (2022) explains why temporal knowledge is vitally important for small-scale fishers who fish in a strong-current environment in the Central Visayas region of the Philippines. In Chap. 3, Lokho et al. (2022) bring out the importance of the calendar keepers and the traditional institution of calendar keeping. Iskandar and Iskandar (2022) in Chap. 4 provide an elaborate account of the traditional Sundanese calendar and its contemporary relevance.

At the southern mouth of the Tañon Strait, the body of water that separates the islands of Cebu and Negros in the Philippines, strong and complex sea currents make small-scale fishing difficult. In Chap. 2, based on fieldwork among fishing communities near Dumaguete City who fish in this challenging environment, Knudsen shows the importance of calendric knowledge for successful fishing. Knowledge of the link between changes in fish behaviour, tides, currents, the lunar cycle and monsoon winds are particularly important. Building on Evans-Pritchard's concept of 'ecological time' (Evans-Pritchard 1939, 1940), he shows that fishers' 'ecological clocks' are not entirely synchronised. In this peri-urban coastal setting, fishers' skills and knowledges, as well their access to boats and gears, vary greatly. Hence, their ideal time to go fishing is not the same. Nonetheless, the basic principles of the traditional ecological calendar continue to structure much fishing activity. Moreover, with a considerable decline in fisheries resources in recent decades, rather than becoming redundant, Knudsen shows that the temporal dimensions of the fishers' knowledge complex have in some ways become more important. While many fishers have observed a large decline in their fish catches and income, fishers with advanced skills and fine-grained knowledge of the coastal and marine environment continue to make fishing a viable livelihood. Yet knowledges and skills are not sufficient to secure success in fishing. To more fully explain why some fishers continue to do well while others barely cover the cost of fishing and are squeezed out, the last part of Knudsen's chapter looks at the politics of resource regulation (Fabinyi et al. 2010). With the implementation of a so-called 'community-based coastal resource management' system, small-scale migrant fishers have increasingly become blamed for illegal fishing. The skilful fishers who are members of well-established, long-term settled families fare much better, being able to use their knowledge of the marine environment to legitimate their own fishing practices.

Using a case study with the Mao Naga community of Northeast India, in Chap. 3, Lokho et al. (2022) argue that calendar keepers are unsung heroes responsible for the maintenance of ecological calendars and traditional knowledge related to landscape management. In the past, many communities, especially those of the northern hemisphere, had dedicated calendar keepers who kept track of the various phases of the sun and the moon to calculate time (Gell 1992; Rice 2009). Similar to the calendar keepers of the Hopi tribe of America who practised 'horizon moon watching' (Zeilik

1986), the Mao Naga calendar keepers practised horizon sun watching to determine seasons. The calendar keepers undertake the important task of contextualising data from celestial bodies, by correlating it with local seasonal indicators. This locale specificity is a noteworthy feature of traditional ecological calendars (Armatas et al. 2016; Liu et al. 2011) that differentiates them from civil calendars.

Calendar keepers have been understood by various names such as keepers of calendars, calendrical experts, skywatchers, sun watchers, moon watchers, day keepers and calendric priests (Gell 1992; Marshack 1985; Rice 2009; Zeilik 1986). A beekeeper keeps track of activities related to hive growth and health, and foresees events that determine the well-being and productivity of the bee colony (Brown 2013). A calendar keeper, in similar ways, is responsible for keeping track of days, the position of the sun, moon and stars, processing observations on local seasonal indicators, and coordinating community actions over temporal and spatial scales. In order to ensure deliverables, calendar keepers cite 'supernatural sanctions' which eventually enable them to rise in social status and assume power and control in the community (Rice 2009). Rice's (2009) account of the Mayan calendar keepers gives a lucid understanding of the role of Mayan calendar keepers and the power they wielded in the society. As the beliefs of the community change, the role of calendar keepers, and the nature of calendar keeping and associated artefacts also change. They could either be adapted into new religious orders as seen in the case of masks of Sumatra worn by shamans during pre-harvest rituals that got adapted to fit Islamic customs and festivals (Thomas 2015), or lost altogether. As Gell (1992: 304) points out using the example of Mursi calendar of Ethiopia, calendars receive data from all members of the community. However, it is the calendar keeper who processes the data and disburses it to the public. Gell observes that the calendar keepers have to assume authority and power in order to ensure that the dispersed calendrical information is clear and accepted without contesting claims. The chapter from Lokho et al. (2022), in this light, also demonstrates the power tussles associated with the institution of calendar keeping and how contesting calendars that bypass the authority of calendar keepers lead to confusion and knowledge erosion.

Humans have influenced much of the world's landscapes and biodiversity through cultural practices such as agriculture, foraging, hunting, and burning (Guillet et al. 1983; Heckenberger et al. 2007; McKemey et al. 2020; Reid and Ellis 1995). Agriculture converts natural landscapes into cultural mosaic landscapes consisting of various land use patterns. Today, agriculture is the major process driving land use pattern and landscape management (Bogaert et al. 2014; Kanianska 2016; Siahaya et al. 2016). Farmers manage these ecocultural landscapes through production practices, both individually, as well as collectively using their traditional ecological calendar (Erickson 1992; Franco 2015; Primdahl et al. 2013). Local agricultural practices, the associated agrobiodiversity and traditional knowledge are also deeply rooted in local beliefs (Khattri 2003; Pfeiffer et al. 2006). In the rice-based cultures of Southeast Asia, many rice cultivars are cultivated exclusively for their significance in local cultural practices, including rituals (Pfeiffer et al. 2006). When the religious values change, the motivation for cultivating these cultivars is also lost, leading to the loss of agrobiodiversity (Negi and Maikhuri 2013; Shen et al. 2010). The chapters from

Lokho et al. (2022) and Iskandar and Iskandar (2022) demonstrate how changes in local beliefs and socio-cultural practices affect traditional ecological calendars and drive loss of calendric knowledge and practices.

In the Mao Naga experience, change in traditional beliefs due to the embracing of Christianity has led to the erosion of calendric knowledge (Lokho et al. 2022). Like the Mao Naga, the Sundanese community of Rancakalong of West Java, Indonesia used to practise an agricultural model that followed their traditional ecological calendar called *pranata mangsa* (Iskandar and Iskandar 2022). The *pranata mangsa* made use of star clusters and local seasonal indicators, to facilitate climate and locale specific agriculture. Local rice varieties bred to suit local climatic and edaphic conditions ensured food security for the community. However, the farmers have largely given up their traditional agricultural practices due to the embracing of the Green Revolution (Iskandar and Iskandar 2022). Daldjoeni (1984) acknowledged the relevance of *pranata mangsa* in regulating rural life and facilitating two crops per year. However, he also identified the calendar as a hindrance to the economic progress of the community. Twenty-five years after Dadljoeni's prediction, the Sundanese have deviated from agricultural and landscape management practices prescribed by the *pranata mangsa*. The *pranata mangsa* and the associated rituals and festivals have been rendered irrelevant, and are on the verge of being lost forever along with the associated rice cultivars. Fields are continuously irrigated and cropped throughout the year with rice monoculture. This makes conditions conducive for the perpetual thriving of pests. Farmers even cultivate the fields during periods of water scarcity, hoping in vain that irrigation would solve their water problems. Consequently, crop loss due to pest outbreaks and droughts have become common. In the absence of *pranata mangsa*, collective cultural actions of the community that were once regulated by it have also become irrelevant. Hybridising the calendric knowledge from *pranata mangsa* with formal scientific knowledge would propagate ecologically sound agriculture that is also suitable to the local environmental conditions and culture.

Like most components of biocultural diversity, calendars do not exist in a vacuum, but rather overlap with multiple aspects of traditional knowledge. Chapter 5 from Bakar et al. (2022) focuses on the synergies between folk medicine and traditional ecological calendar. Using a case study with the Kedayan community inhabiting a peri-urban locality of Brunei Darussalam, the authors show that a community's traditional ecological calendar influences healing practices. Change of seasons, the flowering of certain species of plants, tidal cycles and certain timings of the day influence the occurrence and curing of diseases. The calendar also prescribes specific timings for the harvest of medicinal plants and administration of medicine. Timings perceived as favourable and unfavourable are capable of increasing or decreasing the potency of folk medicine. Using the Kedayan example, the authors thus show how the ecological calendar can influence human health.

1.2 Folk Medicine

Folk medicine and related practices continue to thrive in many societies (Kirmayer 2004). Like any knowledge-based cultural phenomena, folk medicine and traditional healing practices are open and adaptive, continuously evolving in response to emerging diseases and health disorders (Press 1978). Unlike formal biomedicine, folk medicines give importance to both spiritual and physical well-being (Anggerainy et al. 2017; Kamsani et al. 2020). Folk medicines vary significantly from the dominant medical traditions of nation-states that are codified in nature and bestowed with official recognition and support (Press 1978). Thus, they are at risk of being branded as superstitious practices (Li 2017). Yet, all folk medicines have their own philosophical foundations; the concept of four humours is one of the common premises both in traditional codified medicines as well as folk medicines. According to Hippocrates' humoral theory of health, the human health depends on four humoral fluids, viz., yellow bile, black bile, blood and phlegm (Balzer and Eleftheriadis 1991; Smith 2002). From the Greeks, the concept was transmitted to the mediaeval Islamic world (Leonti and Verpoorte 2017). The humoral concept is believed to have influenced local medicines throughout the world; local understandings of humoral properties of medicinal plants facilitate their selection into local medicines (Geck et al. 2017). In Malaya, the Malays developed a humoral concept that was an amalgam of existing folk notions of humours, and humoral concepts borrowed from the Chinese, Ayurvedic and mediaeval Islam (Laderman 1987). The Kedayan folk medicine discussed by Bakar et al. (2022) in Chap. 5 attributes manifestation of illness to both natural and supernatural causes. Ailments caused by natural causes are addressed using a humoral concept, and those caused by supernatural factors by spiritual therapies. Medicinal plants are employed as agents to restore the equilibrium of humours. This unique ability to address both natural and spiritual causes of ailments differentiates the Kedayan folk medicine from the formal biomedicine popular in Brunei Darussalam.

Medicinal plants serve as the major therapeutic agents in folk medicines (Reid et al. 2018). Folk medicinal practices contribute to the identity of local and indigenous communities (Kirmayer 2004; Li 2017). Migrants in urban environment seek their folk medicine to mitigate pressures of acculturation (Press 1978). Thus, contrary to popular belief, folk medicine can be popular in urban environments too. For instance, in French Guiana, urban French Guianese youth continue to rely on traditional medicinal plant and practices to meet their healthcare needs (Tareau et al. 2017). In Chap. 6, Barcelo et al. (2022) provide an understanding of the traditional medicinal plants sold by 42 local vendors in the Baguio City of the Philippines. These vendors sell 59 medicinal plant species to treat more than 50 health conditions. Their findings show that folk medicine and medicinal plants have a significant role to play in urban health care. This is concurrent with studies conducted in other urban settings, especially urban environments that have managed to retain their cultural diversity (Ceuterick et al. 2011; Monteiro et al. 2011; Njoroge 2012; Ocvirk et al. 2013; Tareau et al. 2017; Verma et al. 2007). Urban medicinal plant vendors are known to enhance

access to medicinal plants for the residents. In the Eastern Cape province of South Africa, researchers found that 166 medicinal plant species amounting to 525 tonnes were traded per year by the vendors (Dold and Cocks 2002). Folk medicine in urban settings shows a high prevalence of culturally important medicinal plant species and high dependency on dried and processed plant materials. Social networking is also crucial in urban environments for the exchange of medicinal plant materials (Ceuterick et al. 2011). Therefore, given their continuing contribution to urban health care (Cocks and Dold 2006), folk medicine and medicinal plants should be included in policies addressing urban health care.

1.3 Folk Names

The formal binomial system of naming plants and animals is meant to unambiguously identify relevant taxa (Rao 2004). Folk nomenclatures on the other hand are linguistic reflections of people's conceptualisation of the environment (Berlin 1992; Stringer 2017). In folk nomenclature, salient characteristics of the taxa including morphological, ecological and behavioural features are encoded in names (Mourão et al. 2006). Berlin (1992: 27) considers this phenomenon of 'adaptive significance' in making flora and fauna names easy for the respective communities to remember and utilise. Zariquiey (2014: 251) considers strategies used by communities to name their flora and fauna of 'linguistic and cognitive' interest. However, the knowledge on salient characteristics of taxa is acquired, validated, maintained and transmitted in ways characteristic of the culture. Such knowledge, therefore, forms a significant component of the traditional knowledge of the community. The volume of traditional knowledge encoded by folk names could go beyond denoting a single taxon, or describing its salient characteristics (see Franco 2021). Evans (1997) while introducing sign metonymies, demonstrated that folk metonymic names could encode traditional knowledge on multiple taxa and the complex causal relationships between them as perceived by the respective culture. Berlin indeed recognises the capability of folk names to encode traditional knowledge on multiple entities (Berlin 1992, 2006). Principle 5 of ethnobiological nomenclature addresses this as:

> Names for plants and animals commonly allude metaphorically to some typical morphological, behavioral, ecological, or qualitative characteristic feature of their referents. (Berlin 1992: 31)

However, Berlin's principle only addresses metaphoric names generated through senses of analogy or resemblance, and not metonyms that represent causal relationships between multiple taxa. Semantic analyses of folk names carried out post Evans (1997) have deepened our understanding of both metonyms and metaphors (Cutfield 2016; Turpin 2013; Zariquiey 2014). While both metaphors and metonyms contain traditional knowledge on multiple taxa/entities, the traditional knowledge in metonyms are relatively complex as well as more susceptible to loss.

Consider the example of *aralakki*, meaning castor bird (*Columba indica*) from Solega language of India (Agnihotri and Si 2012). The name readily disburses the traditional knowledge that the emerald dove feeds on the castor plant (*Ricinus communis* L.). However, it also encodes the mythical belief that the bird fetches the castor seeds to the god who requires its oil for his hair. One could predict two fallouts from loss of traditional knowledge/language proficiency of the speaker, or the failure on the researcher's part to document it:

(i) the name would be reduced to a homonym, or
(ii) it could be mistaken for a metaphor where a speaker could invent a resemblance between the castor plant and a salient characteristic of the emerald dove.

Cutfield (2016), Evans (1997), Turpin (2013), and Zariquiey (2014) approach folk names from the linguistic perspective, subjecting them to rigorous semantic analysis. Ethnobiologists studying folk names have otherwise taken a rather direct approach, analysing the traditional knowledge readily disbursed by folk names (Franco and Narasimhan 2009, 2012; Kakudidi 2004; Mourão et al. 2006). In Chaps. 7 and 8, Hidayati et al. employ a combination of both these approaches. Hidayati et al. (2022a) analyse the traditional knowledge encoded by the food plant names of Kanekes community of Banten, Indonesia, while Hidayati et al. (2022b) analyse the folk fish names of Vaie community of Bintulu, Sarawak in Malaysian Borneo. Through these chapters, the authors show that folk names of flora and fauna are broadly classifiable into barefaced and cryptic on the basis of the apparency of traditional knowledge. Besides metaphors and metonyms, Hidayati et al. (2022a) also reveal the prevalence of portmanteaus, an important group of cryptic names. Metaphors and metonyms could be either names denoting genera (primary lexemes), or species (secondary lexemes). According to Berlin's principle of nomenclature (Berlin 1992: 27), secondary plant and animal folk names are more complex than primary ones. The occurrence of monolexemic metonymic names, such as *binglu* denoting a taxon (*Mangifera caesia*) as well as a disease (Hidayati et al. 2022a), adds complexity from the traditional knowledge perspective to the linguistically simple primary lexemes.

Hidayati et al. (2022a, b) provide an approach that helps us understand the nature of traditional knowledge encoded in folk names of flora and fauna. As discussed before, our ability to decode the traditional knowledge encoded in folk names depends on the language and traditional knowledge proficiency of the speaker. The ability of folk names to reflect the language and traditional knowledge proficiency of the speaker makes them excellent indicators of language and traditional knowledge vitality (Franco et al. 2015). The presence of a rich corpus of names encoding traditional knowledge is also indicative of the ecological knowledge held by the respective communities (Wilder et al. 2016). It has been established that traditional knowledge held by local communities on ecologically important, yet understudied species could be of immense value in enhancing our understanding of their ecology, distribution and population status (Beaudreau et al. 2011; Bernstein et al. 1997; Franco and Minggu 2019; Lima et al. 2017; Silvano et al. 2006). A major debate on the purpose and basis of folk classifications has been if they were meant to be of utilitarian value to the community, or outcomes of intellectual pursuit (Berlin 1992;

Hunn 1982; Levi-Strauss 1966). The chapters from Hidayati et al. (2022a, b) do not deal in detail with the Kanekes and Vaie folk taxonomies. However, the prevalence of cryptic names such as metaphors and metonyms encoding complex traditional knowledge on multiple taxa/entities stand testimony to the intellect of the respective communities.

Hidayati et al. (2022a) also record the prevalence of introducer metonymy where crop varieties are named after people who introduced them, or the localities where they originated. Such names serve as folk mechanisms to recognise the intellectual property associated with the germplasm (Mekbib 2007). More than half a century of research from anthropologists, ethnobiologists and linguists working with folk classifications have deepened our understanding of the ways local communities classify and name their flora and fauna (Berlin et al. 1966, 1973; Conklin 1954). Yet, there is far more to be done in according them the respect and sanctity they deserve. Researchers are caught in a perpetual race to standardise folk names for plants and animals, so as to avoid the confusion caused by multiple folk names used to denote the same taxon (Armstrong and Villet 2019; Ehmke et al. 2018; Eisenmann and Poor 1946; Phaka 2020; Phaka et al. 2019; Masski and Ait Hammou 2016). The mandate to provide unambiguous methods of classifying and naming flora and fauna, however, is best served by the formal systems of classifications (Rao 2004). Folk names of flora and fauna are meant to help the respective communities to recognise their biota, and transmit knowledge related to them. Despite their immense usefulness to formal science, they are not meant to cater to the needs of formal science. We should therefore consider the foremost principle of biocultural diversity—the need to appreciate diversities of life, knowledge and culture (Maffi 2007; Stringer 2017). Our quest for standardisation of folk names is not different from calls for standardisation of languages and dialects (Ansre 1971), which catalyse loss of language diversity. Standardisation calls also undermine the intellect of the respective communities, and the linguistic processes that give birth to them. We propose that folk names of flora and fauna by virtue of the traditional knowledge encoded in them should be treated as a part of the cultural heritage, and as intellectual property of the respective communities. This recognition would also pave way for incorporating folk names into formal binomials when reporting species that are new to formal science, but already known to local communities (see Gillman and Wright 2020; Franco 2021).

This volume consists of a compilation of case studies that highlight the interrelationship between languages, traditional knowledge and biodiversity. It showcases traditional ecological calendars as integral components of biocultural diversity, while also highlighting the importance of calendar keepers as custodians of calendric knowledge. The book enhances our understanding of how acculturation drives changes in local beliefs and socio-cultural practices that in turn affects traditional ecological calendars and drives the loss of calendric knowledge and practices. Traditional ecological calendars are being replaced with codified calendars all over the world, leading to the loss of precious traditional knowledge contained in them. In this scenario, calendar keepers emerge as key figures for developing future strategies on revitalising traditional ecological calendars. Adopting a relational and dynamic view of culture, the chapters show how people re-articulate traditional knowledge

and interact with their environments. The section on folk medicine demonstrates the relevance of folk medicine to contemporary urban and peri-urban communities. The book also establishes that folk names of flora and fauna are part of our cultural heritage as they encode vital traditional knowledge. Traditional ecological calendars, folk medicine and folk names are all integral components of biocultural diversity, that are being lost at a fast pace. As Southeast Asia marches forward in pursuit of economic growth, it would also have to ensure that its biocultural diversity stays alive at the landscape level, nurturing local communities for generations to come.

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Chapter 2
Changing Tides: Temporal Dimensions of Low-Cost, High-Skill Fisheries in the Central Visayas, Philippines

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Abstract At the southern mouth of the Tañon Strait—the body of water that separates the islands of Cebu and Negros in the Visayas region of the Philippines—small-scale fishing has always been challenging. Strong and complex sea currents make it difficult for fishers to utilise certain fishing gears. With a significant decline in the resource base and new regulations of the fisheries in recent decades, only fishers with advanced skills and fine-grained place-specific and calendric knowledge of the marine environment are able to catch enough fish, and the right kind of fish, to secure a decent return. Drawing on insights from cultural ecology, the chapter examines the skills and knowledges that fishers draw on to catch fish in this challenging environment. It gives particular attention to the temporal dimensions of the biocultural knowledge complex, showing how fishers' knowledge of the links between sea currents, the lunar cycle and monsoon winds play into their decisions about where, when and how to fish. In addition to its direct livelihood significance, calendric knowledge also serves as a resource in the formation of identity as *mananagat* (fisherman) and authority and status within the fishing community. To further explain why some fishers are able to use their knowledge to make fishing a viable and legitimate livelihood and others are not, the last part of the chapter uses insights from political ecology to address issues of power and dynamics of exclusion in the fisheries.

Keywords Small-scale fishing · Calendric knowledge · Cultural ecology · Resource decline · Coastal resource management · Political ecology · Tañon Strait · Philippines

2.1 Introduction

The Tañon Strait, the body of water that separates the islands of Cebu and Negros in the Visayas region of the Philippines, is approximately 160 kms long and, for such a narrow body of water, very deep, reaching depths of around 500 m (Baez et al. 2015).

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The Strait is at its narrowest in the south. With intricate geological and topographic features, a mix of coral patches, sand and rock, and depths varying between 30 and 140 m halfway between the two islands, the southern mouth of the Strait is a place of exceptionally strong and complex sea currents. When the currents are strong, many fishers find it difficult to navigate small outrigger canoes and utilise certain fishing gears. Drawing on insights from cultural ecology, the chapter examines the skills and knowledges that fishers draw on to catch fish in this challenging environment.

Cultural ecology is the study of human–environment interaction. Focus is on human uses of and adaptations to the natural environment, and how people perceive, classify and know that environment (King and Wilder 2003: 231). Adaptation is here understood as an active and innovative process. People learn and adapt by putting their knowledge to use (Mangahas 2001). How a community or a particular group of fishers adapts to its environment must also be understood in light of its interactions with other communities within a wider socio-economic and political context (Barth 1956; Hviding and Bayliss-Smith 2000).

In tropical regions of Southeast Asia and the Pacific, ecologists and anthropologists have conducted detailed studies of the resource use patterns, material culture and knowledge systems of small-scale fishers (Firth 1966; Hviding 1996, 2005; Johannes 1981; Mangahas 2004). To tap into the often-diverse ecological niches of tropical coastal environments, fishers utilise many different fishing methods and have detailed place-specific knowledge (Hviding 2006; Yano 1994: 44). Skilful small-scale fishers know much about the terrain at the bottom of the ocean and use the triangulation method to locate coral patches, channels, crags, shoals and submerged rocks (Randall 1977). Through naming practices and story-telling, they further develop and systematise their insights and knowledge of fishing grounds. Many artisanal fishers also know how to build, repair, modify and improve boats and gears (Hart 1956), and they develop considerable bodily knowledge, strength and stamina to efficiently paddle, sail and operate these. In addition, the competent fishers have detailed knowledge of fish behaviour (Johannes 1981). Such knowledge is often species-specific. They know much about where and when different kinds of fish and other aquatic species group together, spawn, what they feed on and how they feed (Johannes and Hviding 2000). As fishing conditions are better during particular months, moon phases and tidal stages, knowledge of timing and seasonal factors are crucial (Espina 2008; Firth 1966; Hviding 2005; Randall 1977; Zayas 1994).

Although many studies discuss various temporal dimensions of fishing, the topic of time is rarely made the primary focus of research. Issues relating to time tend to be subsumed under other topics (material culture, ecology and indigenous systems of classification, poverty and resource decline, coastal resource management, etc.). The approach of this chapter is different in that it takes the problem of time, tides and currents as the main topic of investigation. How do small-scale fishers in the Municipality of Sibulan (see Fig. 2.1) make decisions about where and when to fish, and why is it so important for them to be able to predict, with considerable accuracy, changes in the direction and strength of sea currents? The chapter looks at daily, weekly, monthly and seasonal aspects of the small-scale fisheries. It shows how fishers' knowledge of the links between sea currents, the lunar cycle and monsoon

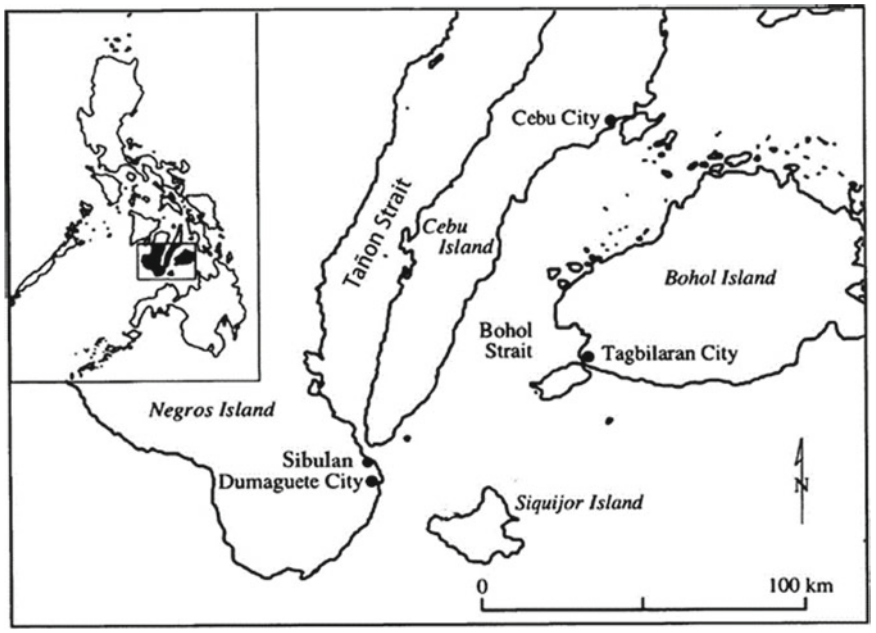

Fig. 2.1 Location of the research site. Map modified from the original in Shio Segi (2013: 338), with permission of author

winds play a significant role in structuring their fishing activities, giving the fisheries a distinctive 'rhythmic form' (Mughal 2014; Munn 1992).

This argument has to be developed with some caution, however. Due to considerable diversity in species composition and gear use in many tropical coastal zones (Bailey and Pomeroy 1996; Hviding 2006), fishers' 'ecological clocks'[1] are not entirely synchronised. A fisher's preferred time to fish depends on many factors, including his skills, knowledge and commitment to fishing as a livelihood. It also depends on the fisher's access to boats and gears, the abundance (or otherwise) of aquatic resources, market access and price, and the availability of employment or income-earning activities outside of fishing. In peri-urban Sibulan, there are significant differences among small-scale fishers in terms of their knowledge, status and access to fishing gears (Knudsen 2016). Many are part-time fishers. Some only fish when they have no other jobs. With a considerable decline in the resource base and new regulations of the fisheries in recent decades, the timing aspect of the small-scale fisheries has altered in some new ways. Opportunities for seasonal migrant fishing, for example, has more or less closed down. Nonetheless, the key principles of the temporal knowledge system continue to structure much fishing activity,

[1] The concept of 'ecological time' hails back to E. E. Evans-Pritchard's study of 'Nuer time reckoning' (1939). Being cattle herders, the life of the Nuer is significantly structured around the 'cattle clock' (Evans-Pritchard 1939: 101; Gell 1992: 17).

and for the dedicated small-scale fishers, knowledge of sea currents and tides has arguably become more—not less—important as fish stocks have declined, enabling the skilful local fishers a decent return on fishing with low-cost gears. In addition to its direct livelihood significance, calendric knowledge serves as a resource in the formation of identity as *mananagat* (fisherman) and authority and status within the fishing community. Yet skills and knowledge alone are not enough to secure access and status.

To develop a fuller understanding of who succeeds and who fails to make small-scale fishing a viable and legitimate livelihood in Sibulan, the last part of the chapter draws on insight from political ecology. In the 1970s, cultural ecology still tended to use basic ecology principles to examine the adaptive capacities of human societies (Bryant 1992; Bryant and Parnwell 1996). Political ecology emerged in response to these approaches, putting more emphasis on power, social inequality and history in shaping human–environment interaction. Focus shifted to 'the political dynamics surrounding material and discursive struggles over the environment' (Bryant 1998: 89). Goldman and Turner (2011: 1) argue that 'knowing nature is a complex, multiple, and highly political process'. In efforts to legitimate certain resource use practices and discredit others, whose claims to knowledge stick, and whose knowledge is ignored? While not ignoring class-related differences in economic resources, I show how social and cultural capital, in the form of social networks, settler status and livelihood background, help explain whose knowledge gains traction in efforts to regulate and redefine appropriate resource use among small-scale fishers in Sibulan.

The paper is organised as follows. First, I introduce the study and research methods. Next, I examine fishers' knowledge of daily, weekly and monthly changes in tides and currents, and how they utilise this knowledge in their fishing activities. I then look at how fishers categorise seasons and adjust their fishing practices over the year. Lastly, I show how resource decline and new regulations affect the timing aspects of the small-scale fisheries, and explain why some fishers continue to do well while others barely cover the cost of fishing and are squeezed out.

2.2 Background to the Study and Methods

Between 2005 and 2008, as part of my Ph.D. research in social anthropology, I conducted 18 months of ethnographic fieldwork among fishing families in the Municipality of Sibulan (Knudsen 2009). Since then, I have returned to Sibulan regularly, nearly every year, for shorter periods of fieldwork. Long-term fieldwork has allowed me to develop good trust relationships with several family groups living along the shoreline. I am well-versed in Cebuano, the main language of the Central Visayas. In addition to participant observation and casual conversations, I have collected data through semi-structured interviews, focus group discussions and quantitative surveys.

In 2005/2006, 131 households were included in a survey of livelihoods. Nearly half of the households had one or more members who were involved in small-scale fishing.

The vast majority of the boats were small non-motorised outriggers (*baroto*) (79%). A daily record of the catch of twenty-four fishers was collected, most of them for more than six months and eight for more than a year. I recorded the species caught, the amount in kilogram (kg), location of the catch, how much of the catch was consumed and sold, and the price of fish sold. On later field trips, I collected additional data on fish catch and income, accompanied fishers on their fishing trips and observed changes in their fishing practices. I have covered topics such as coastal resource management (Fabinyi et al. 2010), conflict over land (Knudsen 2012), social organisation and political leadership (Knudsen 2013) and fishing and poverty (Knudsen 2016).

During fieldwork in 2019, my focus was on timing issues and temporal knowledge in the fisheries. Eleven of the fifteen key informants who participated in this part of my study were dedicated 'full-timers' who had fishing as their main source of livelihood.[2] Four were former 'full-timers' who had retired or were semi-retired. All had considerable knowledge of the marine environment and were locally recognised as skilled in fishing (*kahanas sa panagat*). Three of them, George, Leoncio and Ed, were particularly helpful in sharing their knowledge of sea currents and tides. In 2019, despite being in their late 60s, they were still active fishers. George was a highly skilled hook-and-line fisher who could fish under any condition. Leoncio's expertise was in deep-sea trap fishing. Ed was a local authority on schooling pelagic fish and how to catch them with net and hook-and-line techniques in strong currents. I will return to these local experts in various sections throughout the chapter.

2.3 Knowledge of Sea Currents and Tides: Daily, Weekly and Monthly Rhythms

2.3.1 Talab-on *and* Hologton

Sibulan fishers use the movement of the sun and the moon to predict the direction and strength of sea currents. They also link changes in the strength and direction of sea currents to changes in wind patterns. *Talab-on* refers to the current going north, when the tide is coming in. *Hologton* is the current going south, when the tide is going out. There are two high tides and two low tides in a lunar day,[3] one more pronounced than the other. The bigger the difference between the tides, the stronger the *talab-on* and *hologton* currents are. Leading up to the peak flood (*ta-ub*) and ebb (*hunas*) tides, more water is squeezed through the narrow mouth of the strait, creating the strong current phenomenon.

[2] For definition and discussion of 'full-time', 'part-time' and other categories of small-scale fishers, see Knudsen (2016).

[3] A lunar day is 24 h and 50 min. Four times per lunar day, every 6 h and 12.5 min, the tidal current changes direction.

Just after the *talab-on* current ends and before the *hologton* current begins, a period of 'no current' (*walay sulog*) tends to occur, called *padantol*. The period just after the *hologton* current ends and before the *talab-on* current picks up in strength is called *hinagite*. The length of the *padantol* and *hinagite* periods depends largely on the moon phase. In the days following half-moon (*mudtong bulan*), a period Sibulan fishers call *lakad*,[4] the difference between low tide and high tide is at a minimum (neap tides). During the three to four days after half-moon, the *walay sulog* periods last up to thirty or forty minutes. During the periods of full moon (*tibook*) and new moon (*patay ang bulan* ('death of the moon'), the difference between high tide and low tide is at a maximum and the periods of 'no current' are much shorter and sometimes non-existent.[5] At these times, the *talab-on* and *hologton* currents are very strong (*kusog kaayo ang sulog*). Sometimes there is an overlap in the *talab-on* and *hologton* currents, typically coinciding with spring tides. This is when '*talab-on* and *hologton* are fighting' (George, the skilful hook-and-line fisher), and a 'whirlpool' effect (eddy), called *lilo*, is created. At these times, the water circles around with massive force in the middle of the mouth of the strait.[6] If a low-pressure system coincides with new moon or full moon, the currents tend to be even stronger, and severe coastal flooding may happen.

According to the Sibulan fishers, there is a link between changing wind strength and tides. Just before the peak high tide of the lunar day, there is often no or very little wind. When the high tide reaches its maximum and the low tide begins, there is typically a period of stronger wind. The wind also tends to be stronger when the peak low tide ends and the flood tide begins.

There are also other currents linked to the *talab-on* and *hologton* currents. *Ulwag* is a current going out from the beach. It takes place both during *talab-on* and *hologton*. *Dumagsa* is a current going towards the beach and happens both during *talab-on* and *hologton*. *Waso*[7] refers to the phenomenon where the upper level of the water moves *talab-on* and the deeper level moves *hologton*. The *waso* phenomenon can be enhanced or triggered by strong winds, when the top layer of water is pushed in the opposite direction of the underlying current.

[4] Among some Cebuano-speaking fishers elsewhere in the Visayas, *ang mga lakad sa bulan* means 'moon phases' (Espina 2008). For the Sibulan fishers included in this study, the *lakad*-concept refers to the days following half-moon (*mudtong bulan*).

[5] During full and new moon, the Sun and the Moon are aligned with Earth, creating gravitational pull on the Earth's water in the same direction. Due to friction between the water and the land masses at the bottom of the ocean, the biggest difference between the tides are about two days after full moon and new moon. For the same reason, the neap tides happen a day or two after the First and Third Quarter.

[6] The town at the southern tip of Cebu Island, Liloan ('the place of *lilo*'), has more or less daily occurrences of *lilo*.

[7] *Binal-an* is another term for *waso* currents.

2.3.2 Moihap ug pito ka adlaw

The fishers have developed a calendric system to keep track of the main features of these changes in the currents. They call it the 'seven-day count' (*moihap ug pito ka adlaw*):

- 7 days after new moon => half-moon => first quarter *lakad* => weak currents the following three to four days
- 7 days after half-moon => full moon => strong currents
- 7 days after full moon => half-moon => last quarter *lakad* => weak currents the following three to four days
- 7 days after half-moon => new moon => strong currents.

The more detailed version of the 7-day count, as explained to me by Leoncio and his brothers, all highly skilled trap fishers, is as follows:

Starting from the first day after new moon:

(1) *Entrada* or *paingon sa subang*[8] (first day of the rising [moon])
(2) *Ika duha sa subang* (second day of the rising)
(3) *Ika tulo sa subang* (third day of the rising)
(4) *Ika upat sa subang* (fourth day of the rising)
(5) *Ika lima sa subang* (fifth day of the rising)
(6) *Ika unom sa subang* (sixth day of the rising)
(7) *Ika pito sa subang* (seventh day of the rising) => *mudtong bulan* => first quarter

(1) *Entrada sa lakad* or *primero lakad* (entry or first day of *lakad*)
(2) *Ika duha sa lakad* (second day of *lakad*)
(3) *Ika tulo sa lakad* (third day of *lakad*)
(4) *Ika upat sa lakad* (fourth day of *lakad*)
(5) *Ika lima sa lakad* (fifth day of *lakad*)
(6) *Ika unom sa lakad* (sixth day of *lakad*)
(7) *Ika pito sa lakad* (seventh day of *lakad*) => *tibook ang bulan* (full moon)

(1) *Entrada sa hilom* (entry or first day of the fading [or disappearing moon]
(2) *Ika dua sa hilom* (second day of the fading)
(3) *Ika tulo sa hilom* (third day of the fading)
(4) *Ika upat sa hilom* (fourth day of the fading)
(5) *Ika lima sa hilom* (fifth day of the fading)
(6) *Ika unom sa hilom* (sixth day of the fading)
(7) *Ika pito sa hilom* (seventh day of the fading) => *mudtong bulan* (halved moon) => last quarter

(1) *Entrada sa lakad/primero lakad* (first day of *lakad/* primary *lakad*)

[8] *Entrada* is Spanish for entrance/entry. *Subang* means 'rise' or the gradual beginning, coming forth or growth. *Paingon* means 'toward'. Another expression used is: *paingon sa itom ang bulan* ('towards the black moon').

(2) *Ika duha sa lakad* (second day of *lakad*)
(3) *Ika tulo sa lakad* (third day of *lakad*)
(4) *Ika upat sa lakad* (fourth day of *lakad*)
(5) *Ika lima sa lakad* (fifth day of *lakad*)
(6) *Ika unom sa lakad* (sixth day of *lakad)*
(7) *Ika pito sa lakad* (seventh day of *lakad*) => *patay ang bulan* ('dead moon')

With Spanish colonial and missionary presence on the east coast of Negros Island going back to the 1570s, it is not surprising that fishermen use several Spanish words in their account of the lunar cycle. Their narrative of the 'rising' and 'death' of the moon mirrors the story of the birth and death of Christ.

2.4 Timing of Rituals

Among the key informants I worked with, the sea is not a neutral space. The sea is filled with diverse lifeforms and spirit beings. To ensure safety and success at sea, they conducted small rituals.[9] The timing of these rituals was very much structured by the fishers' knowledge of tides and currents. To appease the sea spirits, some fishers conducted a ritual called *halad sa dagat* ('send to sea'). It consisted of a small raft on which they put rice, tobacco and some other items. The ritual was usually conducted at high tide on a Friday just before *lakad*. Another way to seek good luck (*swerte* or *chamba*) is to fill a coconut shell with a special kind of grass and flowers from the procession parade of Jesus Christ. The grass and flowers are burnt to produce smoke and, in inauguration rituals, the coconut shell is carried around a new boat or important fishing gear. Again, the timing of the ritual tends to coincide with the lunar cycle, performed just before fishing conditions with the gear is 'ideal'. When I asked Ryan, one of Leoncio's sons, why he performed this ritual, he said: 'I follow the tradition of my papa and the people before'. There is continuity here, a transmission of knowledge of how to be successful, safe and comfortable at sea, and a value attached to such continuity which forms the basis for their identification as *mananagat* (fisherman). Moreover, in the process of sharing calendric knowledge and conducting rituals, fishers forged stronger ties between the generations, with senior and more experienced fishers acting as calendar keepers.

[9] Many rituals are held individually or by a small group of fishers, partly because they do not want to draw critical attention from non-believers, or those who think the rituals go against Christian doctrine.

2.5 How Tides Shape the Rhythm of Fishing

A knowledgeable fisherman using a non-motorised outrigger knows how to utilise the daily changes in the currents and winds to his own advantage. He rides the current—*magpaanod sa sulog*—to the fishing ground, arriving just when the current weakens and it is time to drop the line to catch bottom-dwelling fish. This is when *isda sa bato* ('fish in the rocks') come out of their shelters to feed. When the current changes direction and picks up in strength, the fisherman rides the current back home again, limiting the need for laborious paddling.

When currents are strong, bottom-dwelling and several reef-associated fish are harder to catch for two reasons. Firstly, the fish tend to hide in corals or behind rocks. Secondly, with strong and complex currents, the task of getting a fish trap or a set of hooks tied to a nylon line to the desired place—their *tulongdon* ('secret fishing place')—in deep water is nearly impossible. Today, partly due to overfishing and degradation of nearshore fishing grounds, the skilled small-scale fishers' 'secret fishing places' (*ang mga tulongdon*) are almost entirely located in deeper waters, in hard-to-access places.

The majority of the fishers in Sibulan are part-timers who utilise non-motorised boats (Knudsen 2016). During full and new moon phases, fewer fishers are out at sea. Instead of fishing, when the shoreline (*baybayon*) is exposed during the big low tides, many go gleaning (*manginhas*) for molluscs, crustaceans and other marine products. Men, women and children partake in gleaning activities. Some use smaller nets near the shore, splashing water to scare fish into the net. Many of the Sibulan fishers who continue to fish with non-motorised outriggers at these times target smaller coral reef and bottom-dwelling fish with hook-and-line gear near Dumaguete City, in areas sheltered from the strong currents. *Pamasiyon* is the most commonly used hand-line technique in this kind of fishing. It consists of a nylon line with 7–15 small hooks baited with shrimp. Considered easy to learn, it is the favoured technique among less-skilled hook-and-line fishers. While it is easy to catch fish with the technique, the nearshore reefs on which the technique is mostly used are heavily overexploited. Hence, the fish caught with the technique tend to be small in size, and the combined catch seldom more than a kilogram per fishing trip.

The well-rounded, skilful hook-and-line fishers have more options. Many of them master more than ten different hook-and-line techniques and are able to fish in many different environments. They target fish in all depths of the sea: 'fish in the rocks' (*isda sa bato*); 'fish in the middle' (*isda sa tunga-tunga*) and 'fish in the surface' (*isda sa kapaw*). Some skilled hook-and-line fishers utilise the strong currents created during full and new moon to target fast-moving fish near the surface of the sea, including trevally (*mamsa*), Spanish mackerel (*tangigi*), flying fish (*salasa*) and flat needle fish (*balo*).

I will briefly describe some of the techniques the fishers use to catch fish in strong current with non-motorised boats. *Pangbalo*, to catch *balo*, consists of two hooks tied together and baited with a round scad or small mackerel. The fisher rides the current and lets the baitfish drift off from the boat, at depths of 1–2 m below the surface.

Habyog, another full and new moon technique from a non-motorised boat, consists of one hook (US nr. 5) with sliced round scad or mackerel as bait. The fisher anchors the boat in a strong current and lets the baited hook drift away from the boat, 2–4 m below the surface. The target fish is big-eye bream (*katambak*). *Lasdak* is a multiple hook-and-line technique to catch round scad, herring, Indian mackerel, redtail scad and other small schooling pelagic fish during daytime. The small schooling pelagic fish are valued food fish locally. As they are also used as baitfish in big hook-and-line fishing, the skilful fisher must master *lasdak*. It is practised at any time of the month when these fish are available, also during new and full moon periods. It consists of a few hundred small hooks tied to a nylon line. Sometimes with the help of their wives or daughters, the fishers tie a piece of 'rentex' (strings of silky cloth) in different colours on each hook. *Pamirit*, a technique to catch *perit* (frigate tuna), is similar to *lasdak*, but the hooks are slightly larger and fewer in numbers, and instead of 'rentex', the hooks are covered with a plastic hose in green, blue or white colour. Green imitates Japanese mackerel, locally called *hasa-hasa* and *anduhaw* (depending on its size), blue imitates a sardine locally called *malalangsi*, and white imitates an anchovy locally called *bolinao*. Less experienced fishers, or those who do not know how to accurately predict the strengths and changing directions of currents, tend to feel uncomfortable fishing far from the coast in a small non-motorised outrigger when the currents are strong.

Those who have access to motorised outriggers and have knowledge of suitable techniques for chasing tuna in strong current tend to use two techniques: *salabay* and *habal-habal*. *Pang tulingan nga salabay*, to catch a tuna species called *tulingan*, consists of hooks with coloured plastic strips tied to a line that is dragged on the surface between two motorised boats. An improvisation on the *salabay* technique is the *pangtulingan nga habal-habal*, a one-fisher-one-boat operation with a drag at the end of the line. Chasing tuna in strong currents requires considerable fuel consumption. To keep the cost of fishing down, fishers conduct this kind of fishing when somewhat larger schools of pelagic fish pass through the strait.

During the days of *lakad*, activity levels at sea are much higher. Fishers utilise a range of hook-and-line, trap, spear and net fishing gear. Many fishers venture further north and into the middle of the mouth of the strait. More experienced fishers cross the strait to reach fishing grounds near the southern tip of Cebu Island. Some use small sails on their boats. For them, knowledge of currents and wind patterns are crucial.

Some knowledge-intensive fishing methods are practised only during the *padantol* and *hinagite* periods of *lakad*, including trap fishing in deep water. Some fishing families in Sibulan have long traditions of trap fishing (*bobo*). As fish catch started declining in the 1970s and 1980s, Leoncio and his brothers developed traps suitable for fishing in deeper waters. The traps are set out at depths between 45 and 70 m. They catch species such as grouper, long-faced emperor, surgeon fish, sweet lip and parrot fish. Four or five fishermen go together in a large non-motorised dugout canoe (*bangka*) to pull up, empty and set out the traps. This kind of trap fishing only occurs during the *hinagite* and *padantol* periods of the first three or four days of *lakad*. When currents are strong, the traps are too heavy to pull up. It is also near impossible

to control where the traps end up when the fishers lower them back in the water. When currents are strong, the traps easily get stuck in or ripped by rocks or corals. At night, and on days with strong wind and big waves, they are unable to do this kind of fishing. With such a limited window of opportunity (a maximum of 30 or 40 min once or twice per day for six to eight days per month), the trap fishers are very busy at work when the timing is right and conditions are good.

Another high-skill *lakad* technique is called *taktakon.* This is a hook-and-line technique for catching high-value, good-sized fish such as groupers, jacks, snappers and long-faced emperors. It consists of 5–20 hooks tied to a drift line. The drift line is tied to a thicker nylon line attached to a heavy sinker. The hooks on the drift line are baited with sliced pieces of fresh squid, herring or mackerel. The drift line is located a couple of metres above the sinker, close to the bottom of the sea. On the surface, the thicker line is attached to a floater. The fishers' 'secret fishing places' for this technique are located mostly in the middle of the strait, two or three kilometres from the coast, at depths between 80 and 130 m. George and some of the other highly skilled fishers who target 'fish in the rocks' with the *taktakon* technique showed me how they learn about bottom conditions and locate good fishing grounds. In places that are too deep for studying bottom conditions by diving or looking into the sea, the fishers measure the depth and 'feels' the bottom conditions with a line attached to a sinker. They also observe movements in surface currents and, when the sea is quiet, look for air-bubbles to locate coral patches. As with the deep-sea fish traps, the difficulty of this technique is getting the sinker and drift line to the right place. When currents are weak, the fisher is able to locate the sinker and baited hooks in the right place at the right time, when the target fish feed. When the currents are strong, during the days following full and new moon, *taktakon* fishing is rarely practised.

To sum up this section: small-scale fishing in Sibulan is significantly shaped by changes in tides and currents, and by the knowledge fishers have of these. The 'seven-day count' and other temporal dimensions of the knowledge system structure much fishing activity. Moreover, the analysis reveals a differentiated rhythmic pattern, reflecting diverse ecological conditions and significant differences among fishers in terms of their skills, knowledge and access to boats and gears.

2.6 Seasonal Variations

2.6.1 Amihan, Salatan *and* Habagat

Fishers divide the year into three seasons: *ting amihan*, *ting salatan* and *ting habagat*. The prefix '*ting*' means 'season'. The main wind direction moves clockwise over the year and varies in strength. *Ting amihan* is characterised by strong, persistent cool and dry wind from northeast. The season of *amihan* begins late October or first half of November (see Fig. 2.2). It is sometimes referred to as the 'cold season' (*ting bugnao*) and the 'season of waves' (*ting balalod*).

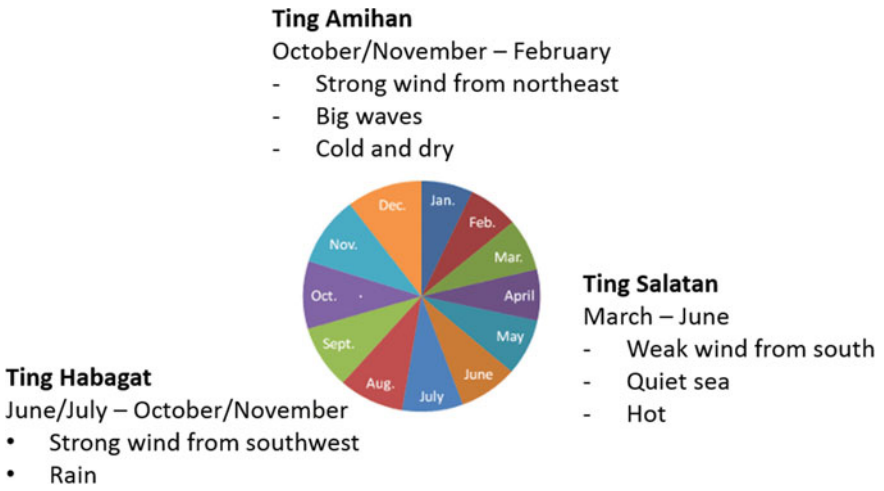

Fig. 2.2 Seasons in a year

In the months of December and January, the *amihan* wind tends to be at its strongest.[10] With strong north-easterly wind, the top layer of the sea moves south even when the underlying current goes north (*talab-on*), creating *waso* currents. While the Island of Cebu provides some shelter against *amihan*-created waves and currents, on days when *amihan* is strong and turns a bit more easterly (*timog*), the waves in Sibulan tend to be large. Big waves make fishing with a small outrigger canoe difficult. The number of fishers who go out fishing declines. Many fishers use the strong-wind *amihan* period to repair boats, traps and other fishing gear. They also do other kinds of jobs, fixing houses and doing paid work locally or in Dumaguete City. Only the most dedicated small-scale fishers continue to fish 'full-time' during *amihan*.

The *amihan* season is followed by *ting salatan*, typically starting in March. *Ting salatan* is characterised by a gentle breeze from the south[11] and a 'quiet' (*linaw*) sea. This is the start of the peak season for many fishers in Sibulan. Figures 2.3 and 2.4 show the average catch per fishing trip and number of fishing trip per month over a 14-month period in 2005/2006. Although catch levels were generally low, the seasonality of fishing remained pronounced. In December, the fishers included in the study went fishing, on average, ten times. They caught an average of 1.5 kg per fishing trip (per fisherman). The average catch levels increased to around 3 kg per fishing trip in March, April and May, during *ting salatan*. Fishers went fishing most days during these months.

Ting habagat refers to the southwest monsoon season, usually starting mid-to-late June and lasting until September or early October. It is characterised by

[10] The strength of the *amihan* winds varies from year to year. The 2019 *amihan* season was gentle, with weaker than normal north-easterly winds.

[11] *Salatan* means 'south'.

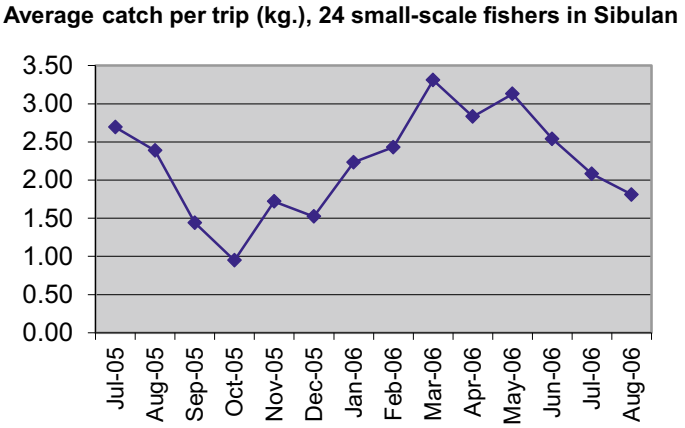

Fig. 2.3 Seasonal variations in catch (kg per fishing trip)

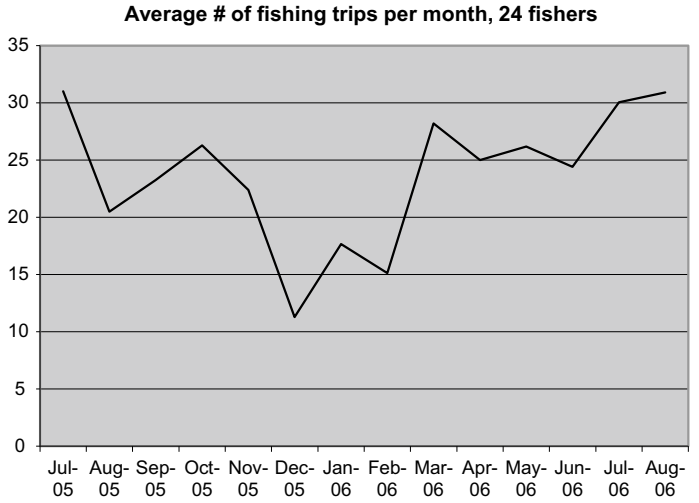

Fig. 2.4 Number of fishing trips per month

frequent heavy rain showers and gusty winds from southwest and west. As Mt. Talinis (1,903 m.) on Negros serves as a windshield, the small-scale fishers in Sibulan are not strongly affected by the *habagat* winds.

While monsoon seasons affect fishing practices, spawning cycles and migratory patterns of fish do not fit neatly within the monsoon categories. Different species of sardines, anchovies, herring, mackerel, tuna, snappers, groupers and other fish are abundant or good to catch at different times of the year, and also at different times of the lunar cycle. There are also significant variations in the availability of particular species of fish from one year to another. It goes beyond the scope of this chapter to

detail the knowledge fishers have of such complex dynamics. Some broader trends will have to suffice.

The mackerel and tuna season generally starts during *amihan*. Many species of sardines, mackerels and herrings spawn (*yag-yag*) between October and December. The following months are often good for catching these. Fishers continue catching mackerels and herrings until August or September. Barracuda, jack, Spanish mackerel and tuna feed on mackerel and herring. Barracuda fishing is usually good from May to September. Fishers have four different names for barracuda depending on their size (*tabanko*, *bulatok*, *rompi* and *pangalwin*). The larger barracuda (*rompi* and *pangalwin*) are mostly caught in August and September. Fishing with beach seine net (*sahid*)[12] to catch small sardines and anchovies, which is one of Ed's areas of expertise, reaches a peak between June and September, but is also practised at other times of the year, as different species follow different cycles. A sardine fish called *malalangsi* spawn in October, November or December, and are usually good to catch a month or two later. A smaller kind of *malalangsi* tend to spawn a month later. The catch level of two anchovies species locally called *bolinao* and *tulakhang* tend to peak in the transition period between *habagat* and *amihan* (September/October). During *ting salatan*, conditions are good for fishing *isda sa bato* ('fish in the rocks'), such as *lapu-lapu* (grouper), *maya-maya* (snapper) and *mol-mol* (parrot fish). One group of fishers reported that some of the more lucrative bottom-dwelling fish species tend to be 'fat' (*tambok*) in July or August and spawn (*yag-yag*) in September or October. Just before spawning, when the fish is full of roe (*bihod*), they 'feel full in their stomachs and are not eating much'. Other fishers noticed a more varied pattern of spawning among the same species, however, varying with the temperature in the water. There was much more agreement on the spawning period of mangrove crabs (*kagan*), which is expected to take place in October, during new moon.

2.6.2 Seasonal Migrant Fishing

Scholars have documented how seasonal migrant fishing has resulted in the production of vast inter-island social networks within and beyond the Visayas (Mangahas 2001; Seki 2000, 2004; Zayas 1994). In the past, migratory fishing during *ting amihan* was common among Sibulan fishers. Starting in the 1960s, George and his group of skilled hook-and-line fishers went on trips to Cabangahan, Siaton, located on the southwest coast of Negros Island, a place sheltered from the strong wind and big waves. Being 'migrants' (*langyaw*) in Cabangahan, they re-activated kinship ties and formed new friendship relations to get permission to build temporary shelters near the beach. They exchanged their knowledge of fishing with local fishers, the 'original people of the place' (*lumad*). When the *habagat* season began, with strong winds from the southwest, Sibulan fishers acted as hosts to fishermen from Cabangahan and other

[12] The best time of the day for *sahid* fishing is after low tide. It is illegal to use fine-mesh *sahid* nets.

places. During the 1970s and 1980s, the fishers switched easily between *langyaw* and *lumad* status. The relationship between 'locals' and 'migrants' was largely seen as mutually beneficial. For young, single men, courtship and the prospect of marriage were a part of the excitement associated with these fishing trips.

During *ting salatan*, the season of little wind, roughly between March and June, this same group of Sibulan fishers roamed around the islands of the Central Visayas and beyond, using motorised outriggers. In the 1970s, some of the men went to smaller islands off the northwest coast of Mindanao, the main island in the Southern Philippines. They used a larger motorised outrigger (*pamboat* or pump boat) with a 16 horse powered engine. A fish trader in Dipolog City owned the boat. Half the catch was for the owner and half for the fishers (*tunga-tunga*). In the early 1980s, several of these fishers owned their own motorised boats, usually equipped with a 10 horse powered engine. During *ting salatan*, they went on overnight and two-day trips to the islands of Cebu and Siquijor and five-day trips to Apo Island, off the east coast of southern Negros. They were in part driven out by the declining fish catch at home, but also by new opportunities for profitable fishing elsewhere. They expanded the area of fishing and used more expensive boats and gears, exploiting the period of little wind.

2.7 Migrants No More: Dynamics of Exclusion

2.7.1 Declining Fish Catch and New Regulations

In the late 1980s and early 1990s, this kind of long-distance seasonal migrant fishing became increasingly difficult for the Sibulan fishers. A substantial drop in fisheries resources across the Visayas made long-distance small-scale fishing trips less profitable. As in many other regions of the Philippines, the rising demand for seafood, introduction of more capital-intensive fishing gears, rapid increase in the number of fishers, destruction of mangrove forests to establish aquaculture ponds and a poorly regulated commercial fishing sector, with rampant illegal intrusion of commercial fishing vessels into 'municipal waters',[13] contributed to the decline (Anticamara and Go 2016; BFAR 2004; Butcher 2004; Green et al. 2003).

An equally, if not more, important factor in closing down opportunities for small-scale migratory fishing was the implementation of new regulations. These regulatory efforts intensified in the 1990s. Throughout the country, government agencies and their partners (including USAID, EU, research institutions and NGOs) invested money and effort into Community-Based Coastal Resource Management (CB-CRM) projects (Alcala 2001). The main bulk of funds and resources allocated for resource management was invested in the regulation of the small-scale fisheries sector. These

[13] According to Republic Act 8550, known as the 'Philippine Fisheries Code of 1998', 'municipal waters' is reserved for small-scale fishers (or 'Municipal fisherfolk'). Municipal fishers use boats of 3 gross tons or less. Municipal waters stretch 15 km into the sea from the shoreline.

projects had a rather narrow territorial institutional setup and focus, with each municipality having responsibility for its own 'municipal waters'. Coral reef protection received much attention. In 1999, the municipal government of Sibulan established two 6-hectare non-take Marine Protected Areas over nearshore reefs. Several fishers from long-established families, the 'original people of the place' (*lumad*), were involved in CB-CRM. They formed government-accredited fishermen's associations. Some became sea wardens (*bantay dagat*) and received monthly honoraria for their policing efforts. Fishers with 'migrant' status and very poor households with weak social networks in the place were not involved in CB-CRM (Fabinyi et al. 2010).

One effect of the new regulations was rising exclusionary pressures on small-scale migrant fishers. Fishers belonging to *lumad* families increasingly subscribed to the idea of 'protecting fish for local fishers'. Fishers with migrant and newcomer status were more often apprehended or blamed for illegal fishing. From around 2006 onwards, highly skilled Sama-speaking ('*Badjao*'[14]) fishers, who have long been fishing and dwelling in Sibulan during *ting habagat*, were no longer welcome. In the past, local fishers in Sibulan were keen to tap into Sama knowledge of marine environments, fishing and navigation. In 2007, I observed two Sama fishers and their families being blamed for illegal poison fishing and forced away from Sibulan. Some of their fishing gears were confiscated and they were not allowed to dock their boats and sleep on the beach.

In stark contrast to the Sama ('*Badjao*'), some local Sibulan fishers have been able to make certain fishing practices legal despite a national ban, such as beach seining (*sahid*). After strong lobbying from skilled fishers belonging to Ed's large family group, beach seining became permitted seasonally in restricted areas. In addition to having solid *lumad* settler status, this family was politically well connected. With much better knowledge of seasonal factors, bottom conditions and fish behaviour than municipal officials pushing to implement national laws, Ed argued successfully that fishermen should be allowed to use *sahid* nets seasonally in designated areas, in locations where there is no damage to seagrass beds and corals. In the sea just in front of his house, where Ed has always used the net, the bottom is sandy. This is also an area where many Sibulan fishers dock their boats. Being a member of a large local family group, and having strong support from neighbours and other people who regularly joined to pull in his large *sahid* net, Ed was well-placed to lobby support. A municipal councillor was also important in lobbying for Ed, being his relative and receiving voter-support from Ed, his family and many of his friends.

As shown with the examples of Sama-*Badjao* and Ed, the ability of small-scale fishers to use their environmental knowledge in shaping resource regulation clearly varies. At the same time, there are limitations to the power small-scale fishers like Ed are able to mobilise through local social networks. Illegal commercial fishing within municipal waters is an issue that has largely been ignored in resource management, despite prevalent critique from small-scale fishers. In 2006, I observed frequent illegal

[14] The Sama ('*Badjau*') is one of the most widely dispersed ethnolinguistic groups indigenous to insular Southeast Asia (Sather 1997: 2). '*Badjao*' is an exonym with largely negative connotations in much of the Philippines. The language is also referred to as Sinama (Zayas 2014).

commercial purse seine fishing, locally known as *kubkob*, in the southern part of the Tañon Strait. These boats were particularly active at night during new moon periods. During the *habagat* season, from June to September, the number of boats and the intensity of fishing increased. Yet, for the entire year of 2006, not a single *kubkob* was apprehended for illegal fishing in Sibulan. Owners of commercial fishing boats are part of the local and regional elite, including governors and congressmen, and the operators of these boats, despite its illegality, have been able to continue to fish inside municipal waters. Many fishermen in Sibulan are in direct competition with *kubkobs*, competing for small pelagic species such as mackerels, round scads and small tunas.[15] One fisher said: 'It's useless even to complain. They [referring to the mayor, the head of police and the head of the municipal *bantay dagat* association] are all corrupt'. Another fisher presented a similar critique:

> Commercial fishing is a really big problem. They fish once only, and it's all gone. We cannot do anything. And the *bantay dagat* cannot run after them, and besides there are only a few of them [*bantay dagats*]…One *kubkob* can catch 100 coolers in one night of fishing [40-50 kg of fish per cooler]…We cannot do anything about this. Only the national government can do something…The municipality cannot be trusted anymore. If you are mayor or head of police you can say: 'give me 15,000 per *kubkob*'. That's what we are thinking. They are in power while we are just small-time fishers. We can only complain.

2.7.2 Further Decline in Fisheries Resources and Differential Effects

Although the new territorially-based resource management scheme has protected a few local reefs, it has not led to improved fisheries. Catch levels have continued to decline. In 2006, fishers who remembered back to the 1960s and 1970s reported a decline of roughly 80% over the last forty years. In the early 1970s, a hook-and-line fishing trip would normally result in a catch of 10–15 kg. In 2005/2006, over a 14-month period, the average catch of the 24 fishers who took part in my survey was 2.23 kg per fishing trip. The average catch per trip of 8 fishers surveyed in 2012 was 1.6 kg.

With a significant drop in fisheries resources and a booming construction and service sector economy in nearby Dumaguete City, there has been a significant drop in the number of fishers in recent years. Between 2005 and 2019, I estimate a 24% decline in the number of small-scale fishers in the field site (from 174 to 132). In addition to 'migrant' fishers having been squeezed out, many local fishers have also dropped out of the fisheries in this period, mainly less-skilled 'part-timers' using a few hook-and-line techniques.

For the highly skilled local fishers, the decline in catch levels and income has been less significant. The average figures presented above shield significant differences in catch levels and income among the fishers. Some of the skilled 'full-timers' own and

[15] Of the fishermen included in my research, slightly more than 50% of their catch were small pelagic species, the same fish caught by the *kubkobs*.

use many different types of fishing gears. By knowing when and where to fish for different kinds of species, and having the skills, boats and gear to target these, they are able to catch larger and better-quality fish than the less-skilled fishers, while at the same time keeping the cost of fishing low. From January to June 2019, with the help of two record-keepers, I conducted a survey of four highly skilled hook-and-line fishers in their mid-to-late 20s. Their average catch per trip was 3.74 kg. The average selling price of the fish was 162.20 Philippine pesos. With an average of 28.5 fishing trips per month, the average monthly market value of each fisher's catch was 17,289 pesos (or US$ 331).[16] Their income from fishing was more than twice the income of people working full-time for minimum wage in the formal sector of the economy, including security guards, construction workers and store attendants in shopping malls (PhP 330 per day/PhP 7,920 per month).[17] Even after expenses, their return on fishing was well above the official poverty threshold for the Central Visayas (PhP 10,580 for a family of five) (Philippine Statistical Authority 2018).[18]

Two of these young fishers were grandsons of Ed, a local authority on when and how to catch pelagic fish in the narrow mouth of the Strait. Instead of becoming obsolete, his vast knowledge of the links between tides, currents and fish behaviour has been transmitted to a new generation of small-scale fishers. These fishers, in turn, constantly seek to refine and expand on their knowledges and skills, trying out new fishing techniques and adapting to altered conditions. The temporal aspect of this evolving biocultural knowledge complex is set to remain important also in the future, albeit for a smaller number of fishers.

2.8 Conclusion

The southern mouth of the Tañon Strait is a place of very strong and complex sea currents. The small-scale fishers of Sibulan have developed considerable knowledge to exploit fisheries resources in this challenging body of water. The temporal dimensions of the knowledge complex are particularly important. Successful fishers in Sibulan know how to predict, with great accuracy, the strength and direction of sea currents. The sea currents follow diverse paths and have different strengths depending

[16] Calculated with 1 US$ = 52.22 Philippine Pesos.

[17] These fishers all had some other sources of income as well, and other members of their families contributed to their household's budget.

[18] Three of the four fishers owned two boats each, one non-motorised and one motorised. The fourth fisher owned a small non-motorised boat only. A non-motorised outrigger (*baroto*) cost around PhP 1,800 (US$ 34.50). A small motorised boat with a 5.5 horse powered engine cost approximately PhP 30,000 (US$ 574.50). These boats and engines are good for more than ten years of fishing. Those using a mix of motorised and non-motorised boats spent on average P110 per fishing trip. For the fisherman who used a small non-motorised boat, the expenses of fishing were around P40 per fishing trip. Included in the calculation of expenses are hooks, lines and other fishing gear, ice, baitfish and gasoline, as well as epoxy, glue and other materials used in the making and maintenance of boats and gear.

on the features of the terrain, weather phenomena and the position of the moon and sun. Their calendric and place-specific knowledge overlaps with their knowledge of currents and fish behaviour. Fishing activities fluctuate within the month, linked to the lunar cycle, and across the monsoon seasons. While the tides, currents and winds shape the rhythm of fishing, the ideal time to fish are not the same for all small-scale fishers. They use different kinds of boats and gears and exploit different ecological niches, and their knowledges and skills vary, resulting in a differentiated rhythmic pattern.

As fisheries resources have declined, the knowledge barrier in the small-scale fisheries has increased. Nearshore reefs are heavily overexploited and fishing as a livelihood has become increasingly difficult for many. The number of people who fish for a living has declined in recent years. Many of those who have completely dropped out of fishing tend to earn more money from construction work and other land-based jobs than from fishing. Others remain highly dedicated fishers, and some of them regularly catch significantly more fish per fishing trip than other fishers.

In response to declining catch levels, the highly skilled fishers who participated in this study, mostly men who were born in Sibulan and whose fathers and grandfathers were fishers, began refining their knowledge of local fishing grounds. With long-distance migrant fishing becoming economically and politically difficult, they turned their focus on how to access fish in hard-to-reach places with low-cost hook-and-line techniques and small outrigger canoes. They also improved their fish traps to enable fishing in deeper water. Some continued to use beach seine nets seasonally, in suitable places. A key aspect of this adaptation process entailed developing more detailed knowledge of the temporal aspects of the fisheries, such as the direction and strength of sea currents in particular places. Senior, highly experienced fishers, including George, Leoncio and Ed, have played a key role in this process, sharing their calendric knowledge with younger fishers within their respective family groups and neighbourhoods, forging stronger ties between the generations. The significance of such knowledge thus goes beyond its immediate livelihood aspect; it serves as a resource for forming an identity as *mananagat* (fisher) and authority and status within the fishing community.

While considerable knowledge and advanced skills are necessary for securing a good return on fishing, under current conditions other factors also come into play. Highly skilled Sama (‘*badjao*’) fishers have been forced out of the place. With a rather narrowly conceived territorial system of resource regulation proliferating in the last decades of the twentieth century, migrant and ethnic minority fishers became increasingly blamed for illegal fishing and are no longer welcome to fish in Sibulan. The fishers who continue to have some level of success in Sibulan tend to have solid status as ‘locals’ and belong to well-connected family groups. Their socio-political and cultural capital help them in their effort to legitimate their own resource use practices.

Whether it is possible to integrate small-scale fishers’ temporal knowledge into resource regulation to ensure more socially inclusive and environmentally sustainable outcomes remains to be explored. Meanwhile, coastal resource management should focus much more on how to limit commercial fishing, such as purse seine and trawl

fisheries. Fishers in Sibulan compete directly with purse seine boats for small pelagic fish. The politics of such regulation must be brought into the open. Large-scale commercial fishing in the Tañon Strait has been banned for several decades. More recently, regional and national government agencies have imposed seasonal bans on commercial fishing of schooling pelagic fish. Yet state-sanctioned laws regulating the fisheries are often undermined by various social forces. Governors, congressmen and other politically influential people own commercial fishing fleets in many parts of the Philippines, including the Central Visayas. Their boats continue to intrude illegally into municipal waters. The small-scale fishers feel powerless 'changing the tides' in this long-standing resource conflict.

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Chapter 3
Calendar Keepers: The Unsung Heroes in Indigenous Landscape Management

Kreni Lokho, F. Merlin Franco, and D. Narasimhan

Abstract Indigenous communities use their calendric knowledge to carry out landscape management activities. Using the example of the Mao Naga community of Northeast India, we demonstrate that keepers of such calendars are facilitators of landscape management activities of the community. The Mao Naga community chief once served as the chief calendar keeper from whom calendric information flowed to village-level calendar keepers. The chief calendar keeper processed information on the skyscape and local seasonal indicators and disseminated it to the village-level calendar keepers, and other community members. The calendar keepers determined the dates for sacred holidays called *genna*, and festivals which in turn determined landscape management activities that include agriculture, hunting and fire management. The village-level calendar keepers combined calendric information received from the chief calendar keeper with their own observation of skyscape and local seasonal indicators. The observation of local seasonal indicators by the village-level calendar keepers enabled them to keep the ecological calendar dynamic, flexible and relevant to the landscape. The Mao Council has introduced a printed traditional calendar which makes it easier for determining lunar months and festival days. But it lacks information on sacred holidays and local seasonal indicators. We recommend that the printed traditional calendar be developed further to include information on sacred holidays and local seasonal indicators. The improvised printed ecological calendar should then be administered by the calendar keepers.

Keywords Traditional ecological calendars · Phenology · Traditional knowledge · Seasonal knowledge · Climate change

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3.1 Introduction

In landscapes managed by indigenous communities, collective and individual actions related to landscape management are facilitated by traditional ecological calendars (Franco 2015). These calendars link people's knowledge of skyscape with that of the landscape, and social practices (Ammarell 1988). Observations made by local communities on changing weather patterns due to climate change, and its influence on terrestrial biomes are as reliable as formal weather forecasting systems (Savo et al. 2016). Since traditional ecological calendars of local communities are repositories of such knowledge, they can help in understanding the impacts of climate change and adapt to it at local levels (Armatas et al. 2016). Owing to the complex calculations required for calendar keeping, communities with robust calendars such as the Maya and Nahuatl of classic Mesoamerica were also known to have dedicated calendar keepers (Rice 2007). Calendar keepers are curators of the community's calendar. They gather information on the skyscape (sun, stars and moon), and local seasonal indicators (calendric plants and animals) to make calendric calculations (Gell 1992). Thus, they are key individuals holding immense traditional knowledge (TK) related to the traditional ecological calendar of the community. Unlike indigenous languages and healing practices, traditional ecological calendars and calendar keepers have received very little attention from the academic community. This chapter examines the role of the traditional ecological calendar of the Mao Naga people of Northeast India in facilitating landscape management. The objectives are threefold: (i) to document the Mao Naga traditional ecological calendar, (ii) to understand its role in landscape management and (iii) to highlight the role of calendar keepers in maintaining the Mao Naga ecological calendar, and making effective use of it in landscape management.

Northeast (NE) India comprises eight states: Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. Northeast India is a part of geographical Southeast Asia, unlike the rest of India that is in South Asia. The region is popular for its rich biocultural diversity. Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura are part of the Indo-Burma biodiversity hotspot, while Assam and the upper region bordering Arunachal Pradesh falls under the Himalayan hotspot (Mittermeier et al. 2004). Of the 450 ethnic communities in India, a whopping 225 have roots in NE India. The region also harbours 400 languages and dialects (Chatterjee et al. 2006; Mentschel 2007; Singh et al. 2015; Vadlamannati 2011). This biocultural diversity is a result of diverse sets of traditional agricultural practices, landscape management regimes, folk medicine and forest dependency—all facilitated by traditional knowledge (Singh and Sureja 2006). However, NE India, like any other part of India, is not immune to factors that lead to erosion of biocultural diversity, and despite the increasing focus on the region, there is plenty of work to be done to prevent loss of biocultural diversity. Hence, we collaborated with the Mao Naga community of the Senapati district in Manipur, to document their traditional ecological calendar, its history, significance and present status among the community. Much of the calendric knowledge could be considered passive, due to the erosion of

Table 3.1 List of collaborating knowledge partners

Sl. No.	Name of the knowledge partner	Age	Sex	Village
1	Adahrü Nepuni	86	M	Punanamei
2	Athikho Krenï	57	M	Punanamei
3	Besü Athia	63	F	Shajouba
4	Deli Kholi	45	M	Punanamei
5	Late Dihrü Kholi	92	M	Shajouba
6	Heni Chakhouu	82	M	Shajouba
7	Hrüni Adaphro	49	F	Punanamei
8	Hrüni Katia	49	F	Shajouba
9	Hrüni Salew	40	M	Punanamei
10	Koso Komuhra	76	F	Punanamei
11	Late Athisü Hrüni	98	M	Punanamei
11	Lohrü Lidzüsa	60	F	Punanamei
12	Lokho Ashuli	46	M	Shajouba
13	Loli Kapani	70	M	Pudunamei
14	Loli Salew	73	M	Pudunamei
15	Makabo Kaikho	62	M	Punanamei
16	Mathibo Khazha	80	F	Shajouba
17	Mobo Besa	74	F	Shajouba
18	Modoli Pfokrehrü	72	M	Shajouba
19	Sanuo Nepuni	80	M	Punanamei
20	Tasoni Ashührü Romeo	53	M	Punanamei

traditional institutions and cultural practices, the influence of the Gregorian calendar, and changing religious beliefs. By revealing the substantial passive knowledge on the calendar, this study lays foundation for the revitalisation of the Mao Naga[1] ecological calendar.

3.2 Methodology

Fieldwork was carried out during 2013–2018 by the first author during which 20 knowledge partners from the villages Punanamei and Shajouba were interviewed (Table 3.1). We use the term 'knowledge partners' to refer to the members of the Mao Naga community who had participated in the first phase of our study. We find this a better alternative to 'respondents' or 'participants' as it recognises their

[1] Mao Naga are anthropologically considered as one of the sub-groups of the Shüpfomei Naga, the other group being Poumai-Naga (Kapesa 2017; Nepuni 2010). The study focuses on the traditional ecological calendar of the Mao Naga alone.

intellectual contribution (traditional knowledge) to our study. The interviews were open-ended, carried out in a conversation style. The data collected is supported by participant observation of the first author who is also a member of the same community. The second phase of the study was conducted in December 2017 and January 2018, involving 20 respondents (m = 13, f = 7) to understand the flow of calendric information in the community. These respondents were different from the knowledge partners; they were selected through snowball sampling and interviewed with a structured questionnaire. To map the flow of calendric information in the community from people to people, we asked three questions: *Q1. From whom did you receive calendric information in the past two years? Q2. To whom did you transmit calendric information in the past two years? Q3. What would you prefer—printed calendar or the traditional system?* The questionnaire did not address information obtained from the newly introduced printed traditional calendar. The respondents of this questionnaire involved a *movuo* (the traditional community chieftain), kin of *movuo* and elders from Punanamei and Shajouba village. All respondents were above 40 years of age. Field data on *genna* (sacred holidays) and festivals were crosschecked with available literature such as Nepuni (2010) and Saleo (2011). The Madras Christian College in Chennai, under whose aegis the research was conducted, does not have an ethics board. Hence, the code of the International Society of Ethnobiology (2006) was used as a reference, and utmost care was taken to ensure that the study conformed to the code. Written Prior Informed Consent (PIC) was also taken from the knowledge partners and respondents prior to the interview.

3.2.1 The Mao Naga Community

Mao Naga, an ethnic community of Naga group, inhabits the Senapati district of Manipur in Northeast (NE) India. The study region falls between 24.37° North latitude and 93.29° East to 94.15° East longitude with an annual rainfall of 671–1454 mm. The total geographical area of the district is 3271 km^2 (District Administration Senapati Manipur 2019). Mao Naga inhabit 58 villages in the district, of which 20 are federal units (Kapesa 2017). The total population is 116,374 (Census 2011). The people of Mao Naga are also known as Ememei or Mao as a whole. However, the name Mao Naga is the popular term used to denote the community. The people are chiefly agrarian and cultivate rice as their staple food. A majority of the Mao Naga today practise Christianity, with less than 1% of the total population practising Mao Naga religion that follows the traditional doctrine of *pfope zhi*.

3.2.2 Botanical Inventorying

Fieldtrips were undertaken to specific habitats identified by the knowledge partners. Voucher specimens of plants identified by the knowledge partners on the field were

collected and identified using Floras including (Hooker 1872–1897; Kanjilal et al. 1934–1940; Singh et al. 2000, 2002) as well as e-floras of China, Nepal and Thailand (www.efloras.org). Identifications were confirmed by Dr. K. Ravi Kumar of Trans Disciplinary University (TDU), Bengaluru, and nomenclature was updated by referring to databases such as www.tropicos.org, www.theplantlist.org, www.ars-grin.gov, www.efloras.org, and relevant revisions and monographs.

3.3 Results

The Mao Naga traditional ecological calendar is composed of three components: the lunar calendar, the solar calendar and local seasonal indicators. The lunar calendar determines the dates for sacred holidays called *genna*, and festivals that regulate important activities of the community connected with landscape management, while the solar calendar is only used to keep track of years. The lunar calendar is harmonised with the solar calendar by the introduction of an intercalary month once every three years. Much of the landscape management activity undertaken by the Mao Naga community is concerned with agriculture. In the past, data obtained by observing the skyscape (phases of the moon and the sun) was triangulated with information from the landscape (phenology of plants, insects and birds) by the calendar keeper—a customary office held by the *movuo* (Fig. 3.1). The term *movuo* refers to the common chief of the entire Mao Naga community, as well as the chiefs of individual villages. Thus, in the past, village-level calendar keepers were affiliated to a chief community-level calendar keeper, all known by the term *movuo*. At present, the Mao Council has donned the role of community *movuo*. The Mao Council has introduced a printed ecological calendar that has replaced much of the calendric calculations that were otherwise carried out by the *movuo* along with the sun watchers and moon watchers. Detailed results are organised as follows:

Sections 3.3.1–3.3.3 outline the results of our effort to document the Mao Naga traditional ecological calendar. In Sect. 3.3.1, we present the Mao Naga lunar calendar, and the sacred holidays (*genna*) and festivals stipulated by it. In Sect. 3.3.2, we present the solar calendar, whereas in Sect. 3.3.3, we present the local seasonal indicators. Sections 3.3.4 and 3.3.5 provide an understanding of the role of *movuo* as calendar keepers. Section 3.3.6 gives an understanding of the Mao Naga calendar in 2019. Finally, Sect. 3.3.7 shows the flow of calendric information from the calendar keeper to the community members.

3.3.1 The Lunar Calendar

The Mao Naga lunar calendar consists of 12 months: *chüthuni* (January), *chüsolopra* (February), *orolopra* (March), *khranü* (April), *khrana* (May), *pfozü* (June), *sale*

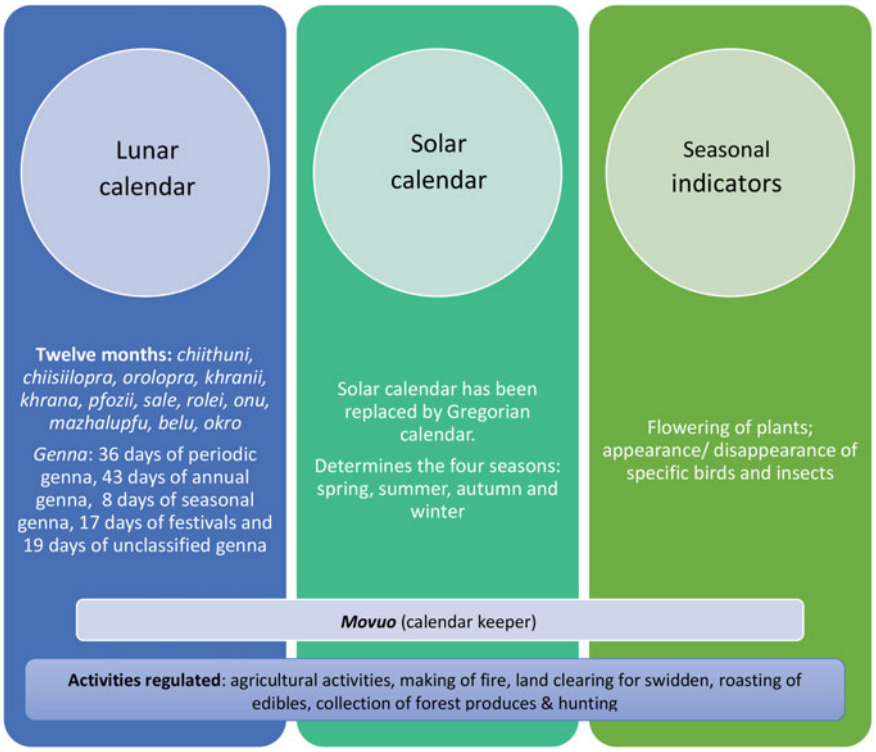

Fig. 3.1 Schematic representation of the Mao Naga traditional ecological calendar

(July), *rolei* (August), *onu* (September), *mazhalupfu* (October), *belu* (November) and *okro* (December).

The twelve months of the lunar calendar together account to 355 days in a year. In order to harmonise the lunar and solar calendars, the Mao Naga insert an intercalary month of 30 days called *sale kahei* (second *sale*) in every third year, after the regular month of *sale*. Traditionally, the chief *movuo*, who hailed from Pudunamei village used to effect the harmonisation by taking into consideration the local seasonal indicators, and data from sun watching. A festival called *saleni* is celebrated ahead of the inserted month, soon after paddy is planted in the wet terrace fields. The 355 days in the lunar year indicate that the Mao Naga lunar calendar is a synodic calendar. Thus, in 12 years, there would be four Mao Naga leap years. In the Gregorian calendar, 12 years equal 4383 days ($365 \times 12 + 3$ leap days). However, for the same period, Mao Naga lunar years would have amounted to only 4380 days [$(355 \times 12) + (30 \times 4) = 4380$]. Hence, to harmonise the lunar years with the solar years, the Mao Naga introduce an additional day to the intercalary months ($30 + 1$) for all leap years in the 12-year period, except the first. This would take the total number of days in every 12-year period of the Mao Naga lunar calendar to 4383 [$(355 \times 12) + (30 \times 4) + (3 \times 1)$]. The first day of the lunar month (i.e. *okhro kakha*) for

the villages was largely calculated by the respective village *movuo*. Thus, there used to be considerable diversity in the way the Mao Naga lunar month was determined across the villages. Errors used to occur at village levels in calculating *okhro kakha*; this phenomenon was reckoned as *okhro khamashü*, meaning 'an error in counting'. The cultural manner of applying the term *okhro khamashü* does not criminalise the perpetrator of the 'error' who is the village *movuo*, but only accounts for it.

The month of September (*onu*) was once considered as an unfavourable month, and allowed to 'pass by quickly'. Weddings and reunion of divorced couples were not permitted, as such couple would turn poor quickly just like the month. If weddings were to be permitted during this month, child delivery would happen in the month of *pfozü* or *rolei* when the community would be busy planting paddy, and nursing the child would hamper agriculture. Besides, *onu* is also the month preceding harvest when most food stock would be depleted, and people would have to be frugal with whatever was available. This shows that the calendar was regulating nuptial relationships and associated celebrations over the temporal scale, so as to avoid interference with paddy transplantation. The calendar also ensured that weddings happened at a time when enough food stock was available for feasting. The belief that a month can be allowed to 'pass by quickly' also indicates that the Mao Naga calendar considered time could be culturally controlled. However, the beliefs associated with the month of *onu* are not prevalent anymore. The Green Revolution and the government-run Public Distribution System (PDS) have ensured food security throughout the year. This eliminates the need for the community to plan weddings and celebrations anticipating lean seasons of food availability.

The month of December (*okro*) is the month of mourning. It is believed even today that the deceased come home to celebrate with the living. Villagers offer food and drinks to the spirits before consuming food; such ceremonial food is served on platforms out of reach for rodents and insects, but easily 'accessible' to the dead. During *okro*, people are advised by the elders to stay indoors after dark. It is also believed that if the first person to die in this month is an elderly person, then the deceased would open the *kathilu/kathilozhu*, a symbolic gate between the world of the mortals and the deceased. This would pave way for a series of deaths. On the other hand, if the first person to decease happens to be a youngster, she/he would not remember the route to the symbolic entrance and thus, there are fewer incidents of death.

3.3.1.1 Calculation of Lunar Months

Lunar months were calculated by both the chief *movuo* as well as the village *movuo*. The chief *movuo* would communicate the commencement of a new month by yelling from the top of a customary mound. A village *movuo* would then either follow the information as such or calculate it using his own expertise and inputs from moon watchers and observation of local seasonal indicators. According to the late *movuo* of Shajouba village, the accurate calculation of the lunar days in the past was done by the *movuo* by covering the face with a piece of white transparent cloth while gazing

Fig. 3.2 Cloth used for moon watching. Photograph Kreni Lokho

at the moon (Fig. 3.2). The white cloth has threads woven vertically and horizontally in a specific manner. The clothes are usually bartered from the Meiteis (an ethnic group of Manipur) or other neighbouring states such as Assam. The threads for weaving the shawls are traditionally made from the barks of the plants *Urtica dioica* L., *Girardinia diversifolia* (Link) Friis or *Hibiscus sabdariffa* L. Moon watching in the past was carried out by the community and village *movuo* themselves, or by a knowledgeable male elder of the community who would then relay the information to his calendar keeper. The practice has been abandoned since the introduction of the printed traditional calendar. However, some *movuo* are known to possess this clothing even today. Our knowledge partners said that these threads provided fine grids for observing the moon. However, the exact knowledge behind it was not revealed to us. This shows that though moon watching was not exclusive to the *movuo*, the holders of such knowledge attached certain levels of secrecy to it.

3.3.1.2 The Sacred Genna and Festivals of the Lunar Calendar

For the Mao Naga sacred holidays such as *genna*, festivals, prayers, thanksgiving, and offering are important occasions. *Genna* are sacred holidays stipulated by the lunar calendar during which the villagers abstain from physical work (Nepuni 2010). They were strictly followed in the olden days, and any failure to follow them by individuals was believed to bring misfortunes to the entire community. These *genna* have several species-specific and season-specific taboos attached to them. For example, planting

of *Euphorbia royleana* Boiss., *Erythrina stricta* Roxb., and *Erythrina variegata* L. is taboo during off-season, except *onu* (September). Violation of this taboo results in heavy rain and storm. Under such circumstances, people are asked by *movuo* or elders to uproot the plant. This taboo is observed till today. *Genna* such as *phehrü mani*, *dzükho mani*, *pfureshü mani*, *doshupirü mani* and *molu kosü mani* are followed mandatorily across religious barriers, as working in these days is considered a strong cultural taboo even today. Other *genna* may or may not be followed depending on individual beliefs. However, all festivals are celebrated today irrespective of the religious beliefs of the individuals.

Saleo (2011) lists 116 *genna*, while Nepuni listed 106 and 100 *genna* in 2010 and 2012, respectively. Eighty per cent of these *genna* are found to be similar to the dates and names of the 123 *genna* days recorded in this study. There are differences in the dates and misrepresentations of the *genna* as recollected by our knowledge partners. It appears that a considerable portion of the oral knowledge on the names, dates, rituals and other information on the *genna* has been eroded. Nepuni (2010) categorises *genna* into three, viz., *ora thini* (general holidays)—holidays observed by the whole Mao Naga community, *mopfuli thini* (yearly holidays)—holidays which occur throughout the year and *ohelei thini* (casual holidays)—holidays observed by an individual, family or by the whole village. We classify *genna* and festivals on the basis of usage, frequency and agricultural activities into six categories:

i. Periodic *genna* (*okhroli thini*)—*genna* occurring every month.
ii. Annual *genna* (*mopfuli thini*)—*genna* occurring once a year.
iii. Seasonal *genna* (*chüsi ye chüleli thini*)—season specific, occurs once a year.
iv. Casual *genna* (*oheli thini*)—unforeseen events; it can be at the level of individual, family or whole village.
v. Unclassified *genna*—*genna* which do not fit into any of the above categories.
vi. Festivals (*oni*)—mass celebration by the Mao Naga community.

According to our study, Mao Naga used to have 36 days of periodic *genna*, 43 days of annual *genna*, 8 days of seasonal *genna*, 19 days of unclassified *genna* and 17 days of festivals totalling to 123 days in a lunar year. The remaining 232 cannot be strictly defined as working days as there would be various casual *genna* occurring during this period. The list of various *genna* and the activities they govern are listed in Tables 3.2, 3.3, 3.4 and 3.5.

(i) **Periodic *genna***

Periodic *genna* occurs regularly every lunar month. Nepuni (2010) recorded five general holidays in a month, viz., *phehrü mani*, *ora mani*, *pfureshü mani*, *tokho mani* and *omi kazhü mani*. However, the author did not mention the dates of *phehrü mani* and *omi kazhü mani* in his monthly calendar. According to our knowledge partners, *ora mani*, *pfureshü mani* and *tokho mani* are the three prominent *genna* occurring every month. *Ora mani* usually falls on the third day of every lunar month and *pfureshü mani* between 4th and 10th day of every month while the occurrence of *tokho mani* varies from month to month. *Phehrü mani* is observed depending on the needs of the village such as the

Table 3.2 List of periodic *genna* and the beliefs/practices associated

Sl. No.	Name of *Genna*	Gregorian month	Associated beliefs/practices
1	*Ora mani*	No specific month	Prayers for long life and ease of suffering; offerings of eggs are made after crossing the village gate
2	*Pfureshü mani*	No specific month	Prayers to preserve food grains and wealth; taboo day for wild fruits consumption. People who do not follow this *genna* either over consume or waste food, leading to poverty and famine. When this *genna* is observed in September (*onu*), women go fishing in the paddy fields (*okho stü le*). When they return home, bachelors waiting at the village gate snatch the fish
3	*Tokho mani*	Throughout the year	Prayers for food (*tokho* from *to* denoting food; *kho*—to ask; *mani*—holiday)

pulling of memorial stones erected by ancestors, cutting trees meant for the village gate, hunting, war, etc. (Nepuni 2010; Saleo 2011). Hunting is usually carried out during the month of *khranü* (April) when the arrival of spring would bring thinner thickets with young shoots, which attracts herbivores. Besides, the thinner thickets also make it easier for the hunters to move. In the past, animals of all sorts were hunted including wild boar, deer, civet, monkeys and rarely bears. However, the Mao Council which has now assumed the role of the chief calendar keeper has recently advised the villagers not to promote hunting as the game count has been reduced below the optimal level. The only instance when *phehrü mani* is celebrated periodically is the first day *chüthuni* of the lunar new year. Likewise, *omi kazhü mani*—a *genna* to prevent fire is observed during the cold dry months of *okro* (December) to *khrana* (May) and not throughout the year. Table 3.2 lists the various periodic *genna* and the beliefs associated.

(ii) **Annual *genna***:
Annual *genna* largely occurs once a year. There are 34 annual *genna* (Table 3.3).

(iii) **Seasonal *genna***:
There are four season-specific *genna* (Table 3.4).

(iv) **Casual *genna***
Casual *genna* is results of unforeseen events such as the birth of a child, death in the family (the whole village abstains from work for a day while the family and relatives observe the *genna nobu* for 3 days). These *genna* could either be observed at the village level or confined to a single household. They are also called as *oheli theni*. Casual *genna* is also observed during the erection of memorial stones and village gate, construction of pond, preparation for war, feast of the affluent, natural calamities, etc.

Table 3.3 List of annual *genna* and the beliefs/practices associated

Sl. No.	Name of *Genna*	Mao Naga calendar	Gregorian month	Associated beliefs/practices
1	*Phehrü mani*	*Chüthuni*	January	Day for praying and self-purification. Men bathe in a pond as a sign of washing off their sickness, misfortune, bad deeds, etc.
2	*Osü pukakha mani*	*Chüsolopra*	February	*Osü* = millet; *pukha* = to stop. Day of rest after sowing of millets. Sowing of millets after this *genna* is taboo and it is believed to bring disaster to the millets. Lighting of fire and roasting in any form is prohibited on this day
3	*Lopra zho*	*Orolopra*	March	*Loprazho* is observed for three days when stone cenotaphs are pulled for *zhoso kosomei* (affluent families)
4	*Khrihu kashü mani*	*Orolopra*	March	Prayers to avert cyclonic rains and storms
5	*Ojü kathi mani*	*Khranü*	April	A day of rest for the soil. *Ojü* = earth; *kathi* = dead. Land is in a deep state of sleep. If any death occurs in the village, *genna* is postponed as the soil is disturbed for the burial

(continued)

(v) **Unclassified *genna***

Ongho sole and *ongho pa* occur more than once in the lunar calendar but cannot be considered as seasonal *genna* as they are not season specific (Table 3.5).

Table 3.3 (continued)

Sl. No.	Name of *Genna*	Mao Naga calendar	Gregorian month	Associated beliefs/practices
6	*Osü ra koso*	*Khrana*	May	Seeking protection of millets from pests and insects. Lighting of fire and roasting of food are prohibited as animals will be attracted by the warmth of the fire and rodents to the roasted food
7	*Ochü kozü mani*	*Khrana*	May	*Ochü* = sky; *kozü* = dark. Solar eclipse; planting of chilies on this day brings good harvest. However, the planter risks becoming blind due to the strong smell of chilies
8	*Thopreso kozhule*	*Pfozü*	May	Sharing meat for *thopre*
9	*Thopre*	*Pfozü*	June	Initiation of paddy cultivation by the village *movuo*
10	*Othe pei*	*Pfozü*	June	Uprooting rice seedlings for transplantation to wet terrace
11	*Thopre & thopre pa*	*Pfozü*	June	Two days of rest before paddy transplantation
12	*Movu ale*	*Pfozü*	June	A day of purification for *movuo* before paddy planting
13	*Ekrü le*	*Pfozü*	June	People forge or sharpen their tools required for rice cultivation
14	*Moso thole*	*Pfozü*	June	Prayers before the paddy plantation. End of restriction on harvesting and consumption of *Coix lacryma-jobi*

(continued)

Table 3.3 (continued)

Sl. No.	Name of *Genna*	Mao Naga calendar	Gregorian month	Associated beliefs/practices
15	*Ashu pfole or omora ashu*	*Sale*	July	Rituals involving *Rhus chinensis* branch. Prayers offered for prosperity. Children and men sing *ashe ashe ro, ashe ashe mokho re, oh! Kakra tho, oh! Kati tho, ahe vu-o*, meaning 'calling the god of spirits, inviting white and black paddy to come home'
16	*Kapeni sü pfüle*	*Sale*	July	Gather firewood for *saleni* festival
17	*Otupro*	*Sale*	July	Three days for gathering cattle fodder, and preparation for *saleni*
18	*Omo prakoho mani*	*Sale*	July	Prayers for the protection of paddy crop from pests and diseases
19	*Kathizho vule*	*Rolei*	July	A day of commemoration of those who died during previous *saleni*
20'	*Onira mani*	*Rolei*	July	Fowl set free in the jungle as an offering
21	*Okheshü mani*	*Rolei*	August	Prayers to protect paddy from insects and rodents; visitors and villagers not allowed to enter/leave villages; taboo to kill animals

(continued)

(vi) **Festivals**

All Mao Naga festivals are organised in the *mohru bu,* the common space where men discuss village welfare, learn traditional yells, folktales, folksongs, etc. (*mohru* = feasting; *bu* = place). The Mao Naga has two major festivals:

Table 3.3 (continued)

Sl. No.	Name of *Genna*	Mao Naga calendar	Gregorian month	Associated beliefs/practices
22	*Lijü vale*	*Onu*	September	Renovation of roads for easy paddy transport; a huge tree-like figure (*propa*) made from *Rhus chinensis*is is erected on the roadside to repel insects and rodents
23	*Lijü kava tokho mani*	*Onu*	September	Prayer for food required for road renovation
24	*Tapha*	*Onu*	September	One or two days of *tapha* is observed; vegetables from the farm and jungle are gathered and stored prior to *tapha*. Vegetable foraging is not permitted during *tapha*. Foraging vegetables during *tapha* increases appetite and in turn, decreases wealth
25	*Motho kotho mani*	*Onu*	September	Restriction on the consumption of harvested paddy is lifted
26	*Lohozü*	*Onu*	September	Village *movuo* sacrifices a fowl and predicts the future in an all-male ritual called *osa kopfü*
27	*Nahri*	*Onu*	September	Day of rest
28	*Tuphe chüno or out hobule*	*Onu*	September	Cattle are not allowed to graze outside. Cow owners not permitted to consume chilli

(continued)

Table 3.3 (continued)

Sl. No.	Name of *Genna*	Mao Naga calendar	Gregorian month	Associated beliefs/practices
29	*Khibodu kasha mani* or *khibodumani*	*Mazhalopfu*	October	Vegetables and fruits are harvested/gathered and stored with leaves of *Elsholtzia blanda* (*orakholo*) for fear of hailstorm and natural calamities. *E. blanda* is a moth-repellent, medicine and a magic potion to repel evil spirits
30	*Tobu koto*	*Belu*	November	Mothers from affluent families cook first rice from the barn and eat together with two cooked female crabs. It is believed that the rice barn does not deplete quickly
31	*Bepi apra or benghi padei kotho*	*Belu*	November	*Bepi apra* ends *tobu koto.* The barn seal is removed
32	*Molu Kosü mani*	*Okro*	December	Prayers to avert earthquakes. Working on this day causes frequent dizziness
33	*Mozümei oso dathale*	*Okro*	December	Slaughtering of pig and cow by the affluent (2 days)
34	*Omi koro kro*	*Okro*	December	Commemoration prayers for fire victims
35	*Shuzhü kro*	*Okro*	December	Commemoration prayers for those killed by enemies, wild animals, snakes, drowned or fallen from trees

(continued)

Table 3.3 (continued)

Sl. No.	Name of *Genna*	Mao Naga calendar	Gregorian month	Associated beliefs/practices
36	*Krojü*	*Okro*	December	Commemoration prayers for people who died due to natural causes. At night, a whole plant of *Rubus ellipticus* (*somoso shü*) is placed before the house entrance; leftover food not eaten on the next day

Table 3.4 List of seasonal *genna* and the beliefs/practices associated

Sl. No.	Name of *Genna*	Mao Naga calendar	Gregorian month	Associated beliefs/practices
1	*Chüthu pirü mani* and *dosu pirümani*	*Khranü & pfozü*	May and June	Two individual *genna*, to protect flowers and fruits from hailstorm; carrying of fodder and manure to fields and repairing of tools allowed. If a hailstorm falls during these *genna*, it is postponed to the next day. Violators lead the gods to bring hailstorm
2	*Dzükho mani*	*Pfozü & sale*	June and July	Prayers for monsoon for paddy plantation
3	*Ochü kazhü mani*	*Onu & mazhalopfu*	September and October	Prayers for favourable weather for harvesting
4	*Omi kazhü mani*	*Okro – khrana*	December to May	Prayers to avert fire accidents in village or forest (*omi* = fire, *kazhü* = good, *mani* = holiday). December to May remain cold and dry and fire on the forest floor is catastrophic. The burning of fire is prohibited in the fields. Violators encounter *chüro chüdi* (frequent fire destruction)

Table 3.5 List of unclassified *genna* and the beliefs/practices associated

Sl. No.	Name of *Genna*	Mao Naga calendar	Gregorian month	Associated beliefs/practices
1	*Ongho sole*	*Chüsolopra*, *orolopra*, *rolei and okro*	February, March, August and December	*Ongho sole* = initiation of work. Elders initiate agricultural activities; taboo for youngsters to report early for work (causes premature death). Elders not going to fields would resort to *ongho kokhu* (beating hollowed trees or dead wood outside the village to mimic working)
2	*Ongho pa*	*Chüsolopra*, *orolopra*, *rolei* and *okro*	February, March and August	*Ongho* = work, *pa* = twice. The saying *opa somoli, koro chükhu no nobi bidu tiwe* means 'do twice or else the village gate will cut off our ears'. Likewise, *ongho pa* is followed after *ongho sole*, as a repetition of *ongho* sole
3	*Movu mati kotho*	*Chüsolopra and orolopra*	February and March	Initiation of sowing by village *movuo. Oshütho* (*Coix lacryma-jobi*) and *süva* and *tomosü* (*Setaria italica* and *Pennisetum glaucum*) used to be sown in a symbolic ritual that initiated agricultural season. *Movuo* fasted until sunset. *Movu mati kotho* translates into 'the king's sowing'. After the *genna*, sowing of seeds is not taboo. Millets are cultivated only in smaller quantities today due to the prevalence of wetland paddy
4	*Mati kotho bamani*	*Chüsolopra and orolopra*	February	A day of rest after *movu mati kotho*

(continued)

Table 3.5 (continued)

Sl. No.	Name of *Genna*	Mao Naga calendar	Gregorian month	Associated beliefs/practices
5	*Zhongo mani*	*Chüsolopra* and *rolopra*	February and March	Housewarming ceremonies mostly by the affluent
6	*Ba mani*	*Orolopra and onu*	March and September	*Ba* = hands, *mani* = holiday or rest. The *genna* is observed after *movuo* sows first seeds
7	*Zhepe*	*Chüthuni*, *pfozü and sale*	January, June and July	*Movuo* asks villagers to begin rice beer brewing for upcoming festivals

chüthuni and *saleni*. Festival preparation begins on the day of *zhepe* when the village *movuo* instructs the villagers to start preparing the rice beer.

Chüthuni festival

Chüthuni is also called the festival of dawn and is celebrated in the month of January for the six days of *nisha*, *nijü*, *oshu kope*, *onizho padei*, *onizho pongo* and *pfoki kapra.*

- *Nisha*: The beginning of the festival and initiation of rice beer consumption. In the evening, unleavened bread (*lore*) is baked and shared communally with rice beer around a bonfire.
- *Nijü*: The second day of the festival. A sacred ritual called *ora khekho* is held where food including portions of slaughtered animals is offered to the gods at dusk.
- *Oshu kope*: Third day of the festival when people bid farewell to guests. Daughters married off to other villages return home to receive a strip of meat and rice beer. Village men go to the jungle in the morning to catch birds with bare hands to prove their physical fitness and worth to society (Nepuni 2010).
- *Onizho padei* and *onizho pongo*: These two days are celebrated as a continuation of the festivals where people feast, dance, sing, tell stories and recall old memories. This practice is on the wane.
- *Pfoki kapra*: *Pfoki kapra* is a romantic festival when men climb hills with spinsters. Traditional yell, bursting of crackers, playing of games and traditional dances (*dekocho*) are performed. While returning, spinsters carry *kapenisü*, a bundle of firewood from *Schefflera* sp., cut by her suitor to the village. At dusk, communal feasting and drinking take place around a bonfire. This *genna* is in practice till date in most of the villages except Punanamei. It is said that once when Punanamei villagers went on such hill-climbing, a wild boar injured a person, resulting in the ending of the traditional yell which is a bad omen.

***Saleni* festival**:

Saleni is a sacred feast for men celebrated in the Gregorian month of July after the completion of the paddy planting. There are two local seasonal indicators for this festival: the flowering of *Mussaenda frondosa* L. locally called as *saleni pa* and the appearance of cicada called as *saleni vo*. In the past, the *movuo* received information on these local seasonal indicators and determined the dates of the festival by corroborating it with data from moon watching. At present, people still observe these indicators. However, they wait for the date stipulated in the printed Mao Naga calendar to celebrate the festival. According to our knowledge partners, since the adoption of the printed traditional calendar, the local seasonal indicators have always been observed in advance of the festival dates printed.

The celebration days of *saleni* are:

- *Machazü*: First day of the festival. Cows are slaughtered followed by communal sharing and feasting with rice beers.
- *Nijü*: Animals except cows are slaughtered. A ritual called *lidzü* is observed by the affluent. Water from a spring is gathered using a spoon of *Elsholtzia blanda* (Benth.) Benth. leaves in a bowl of two *biro nghu* (*Alocasia sp.*) leaves.
- *Oshu kope*: Third day of the festival where villagers bid farewell to guests. *Todu* (rice beer) and *sonü* (strip of meat) are given to the married daughters who come home for celebration.
- *Ale lepa*: Fourth day of *saleni* festival. *Ale lepa* follows the sighting of new moon. In the event of *Ale lepa* falling on the third of the following month (*rolei*/August), July (*sale*) would have only 29 days. If it falls on the second, then *sale* (July) would have 30 days.
- *Ale lejü*: Fifth and the last day of *saleni* festival. On this day, Mao Naga men take a morning bath in the village spring. Before the bath, their legs are tied together with *Saccharum spontaneum* L. which gets snapped while washing. This signifies letting go of hardships and pre-empting future problems.

Oni anü is celebrated for a day, 15 days after the festivals of *chüthuni* and *saleni*. There are also three minor festivals called *chüjüni*, *onuni* and *belu ni* which are celebrated for a day each. *Chüjüni* is celebrated just before the paddy plantation in the month of June (*pfozü*), when herdsmen are offered a meal and rice beer for their service. Hence, *chüjüni* is also called *tokhumei ni*—festival for herdsmen. After this festival, planting of paddy is not a taboo anymore. According to Nepuni (2010), *onuni* is celebrated in the month of *onu* (September) to commemorate the harvest of fruits and other crops. *Belu ni* is celebrated for two days in the month of *belu* (November). On the second day, women wake up early in the morning and sprinkle water on the rice barn (*lidzü*).

3.3.2 The Solar Calendar

The Mao Naga kept track of the position of the sun, as the position of sunrise and sunset differ due to the inclination of the earth's rotation around its axis (Ros 2019). The community used to have an elaborate solar calendar that was later replaced by the Gregorian calendar as they gradually converted to Christianity. The Mao Naga in the past employed 'horizon sun watching', the art of observing the position of the sun relative to the mountains on the horizon to predict the onset of the seasons. The *movuo* received information on the position of the sunrise from 'horizon sun watchers' who regularly observed the sunrise from a particular spot in relation to a prominent mountain (Fig. 3.3). There was no dedicated sun watcher, and any elder could act as the sun watcher, and relay the information to the *movuo.* Sun watching helped to predict the four seasons (spring, summer, autumn and winter) which was important to ensure food security for the community.

It was a taboo in the Mao Naga community for youngsters to perform sun watching. By ensuring that sun watching was undertaken only by knowledgeable and experienced elders, the segmental taboo guaranteed that data from sun watching was error-free. In this connection, dreaming of sunrise, mid-day and sunset is believed to have both good and bad elements. As per our knowledge partners, people who dream about sunrise and mid-day do not live long, contrary to the people who dream about sunsets. Dreaming about sunrise and mid-day is characteristic of lazy people who do not engage in work, resulting in poverty that in turn cut shortens her/his life. Here, dreaming about sunrise/mid-day is considered analogous to sleeping during sunrise and mid-day. Horizon sun watching has become extinct, along with the segmental taboo on it. However, the belief connected to dreaming about sunrise and mid-day is prevalent even today.

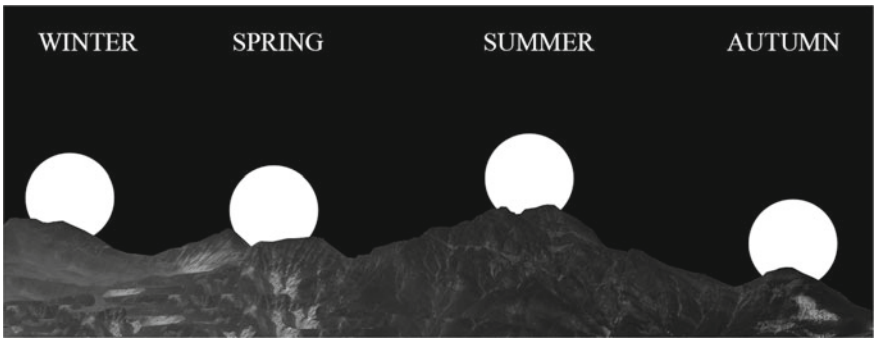

Fig. 3.3 Graphical representation of the changing relative position of sunrise according to the four seasons

3.3.3 *Local Seasonal Indicators: Calendar Plants and Animals*

The lunar and solar calendars depend on their respective celestial bodies. The timing determined by lunar and solar calendars is further made relevant at the landscape level by triangulating it with phenological data from calendar plants and animals. These local seasonal indicators help to maintain the Mao Naga ecological calendar relevant to the landscape even today, which is important to perform agricultural and other landscape management activities. Examples of local seasonal indicators are: the blooming of *Bombax ceiba* L. marks the onset of spring; the flowering of *Pyrus pashia* Buch.-Ham. ex D.Don signals the time for broadcasting paddy seeds on uplands; the flowering of *Bauhinia purpurea* L. and *Prunus persica* (L.) Batsch marks the timing for planting vegetable saplings and maize in the swidden fields; the flowering of *Hedychium coccineum* Buch.-Ham. ex Sm. marks the timing for transplantation of paddy seedling; the blowing down of wind from the top of a hill to the valley, and the singing of house crickets (*Acheta domesticus)* mark the onset of winter months; the flowering of *Mussaenda frondosa* L., and the appearance of cicada indicate the timing for *saleni vo* festival, which in turn signal the end of paddy planting.

3.3.4 Movuo*, the Calendar Keeper*

The term *movuo* is equivalent to the term ‘king’ and is hereditary in nature. In the Mao Naga community, it is the *movuo* who act as calendar keepers. The chief *movuo* in the past donned the role of calendar keeper, processing and superimposing data on phenology of plant, insects and birds over the solar and lunar cycles. He thus determined the festivals and rituals that governed community actions. The chief *movuo* acted as the primary calendar keeper by disseminating information on *genna* by yelling it to the community and other village-level *movuo* from the top of a little mound. The *movuo* of the neighbouring villages who picked it up relayed it further by yelling from the top of their own mounds. Messengers were also involved to relay information to distant villages where information could not be reached by mere yelling. These messengers were dispatched before the day of the *genna* for uniformity in observance.

Prior to the British colonial period, the *movuo* of Pudunamei village acted as the chief calendar keeper. He is still the chief *movuo*, but without the hereditary authority. In Pudunamei, the customary mound used by the chief *movuo* to shout the calendric information meant for the entire community is still present (Fig. 3.4). A smaller mound (Fig. 3.5) is also available in the same village which is used even today for shouting calendric information exclusively meant for the inhabitants of Pudunamei. It was common for certain villages/chiefs not to accept the leadership of the chief *movuo* and assert sovereignty over their village. Likewise, the village

Fig. 3.4 Customary mound at Pudunamei village once used by the chief *movuo* to shout calendric information to the entire Mao Naga community. Photograph Kreni Lokho

movuo were also at liberty to adjust the dates of the festivals and *genna* according to their own observation of local seasonal indicators and the moon. In the Mao Naga folk history, there are no records of female *movuo*, underlining the patriarchal nature of the institution of *movuo*. According to Nepuni (2010) and Chachei (2010), the role of *movuo* is to administer and officiate social matters and initiate rituals, ceremonies and festivals connected to the Mao Naga religion. At present, the Mao Council has established itself as the supreme authority due to the decline of the institution of chief *movuo*. The chief *movuo* was generally reputed for his valour, diplomatic capabilities (dispute settlement) and oratorical skills. The chief *movuo* also offers prayers for the prosperity of his people, and initiates the sowing of seeds, paddy plantation as well as the first harvest. Even today, the chief *movuo* initiates sowing and harvesting of paddy and offers rituals during paddy plantation by pouring rice beer on a banana leaf.

The village *movuo* are supported by elders known as *hodzü movuo*, and affluent families known as '*zhoso koso mei*' or '*omozü mei*' or '*orareiso koso mei*', who are identified by their unique shawls. These elders also share the knowledge on calendars. The title of *hodzü movuo* is hereditary. They receive a piece of land in the village called *movuo pfü* (*pfü* means dwelling). The number of *hodzü movuo* differs from village to village and any form of information about *genna*, rituals, war and other administrative works are passed down from the *hodzü* to the members of the clan. This oral tradition leads to the transmission of calendric knowledge between *hodzü movuo* and the villagers. The proficiency of the elders of today in folksongs, folktales, *genna*, rituals and position of the sun could all be attributed to this vertical transmission of knowledge. *Hodzü movuo* are also adept in ensuring the secrets remain concealed.

Fig. 3.5 Smaller customary mound at Pudunamei village still used by the *movuo* to shout calendric information to the villagers of Pudunamei. Photograph Kreni Lokho

3.3.5 The Calendar Keeper and His Importance in Landscape Management

The role of *movuo* is a highly venerated one. According to a Mao Naga folk story, there was a time when the Mao Naga community disliked the rituals of a village chief and banished him—a costly mistake that brought seven years of famine to the village. The famine forced the elders to request the chief to return. The chief refused, and the desperate villagers resorted to tying him up and carrying him back to the village. However, they had little success in pacifying him to share vital calendric information. The villagers then resorted to scouting around for calendric knowledge. A nursing mother who was rocking her child to sleep, noticed the elders moving aimlessly around the village and took pity on them. However, as a woman, she was prohibited from sharing the calendric knowledge. So she sang all the knowledge she had on the agriculture and seasons as a lullaby which led to the ending of the famine (see Mao and Hynniewta 2011).

According to another version of the story, there was a dreadful famine that lasted for seven years. The villagers then dispatched a spy to the neighbouring village to secure calendric information related to agriculture. In those days, women who were married off to other villages were also used as channels of communication. The spy failed to infiltrate the heavily fortified village and had to hide in the outskirts until he could meet his sister. Finally, when his sister found him, she feared that their interaction could be noticed. So she pinched her child and sang her calendric knowledge in the form of a lullaby. There are also other variations of the story. However, the elements of famine, search for a calendar, refusal of information from the other and the nursing mother are all common themes portrayed in all the folklores. Following is an excerpt from the lullaby that is sung even today.

Hoyi ho, howa ho,
(Non-lexical vocables)
Chütepa ti pali, mati tijü thowe
When *Pyrus pashia* flowers, seeds are sown (swidden)
Hoyi ho, howa ho,
Pfovapa pali mati thowe
When *Bauhinia purpurea* flowers, seeds are sown
Hoyi ho, howa ho,
Livopa ti pali, mati thowe,
When *Prunus persica* flowers, seeds are sown
Hoyi ho, howa ho

Five distinct observations can be made from these folklores: (i) The *movuo* is the official calendar keeper, without whom agriculture is impossible, (ii) although the Mao Naga society is largely patriarchal, the folklores indicate that women are the storehouse of important TK on time and seasons. While the menfolk are mostly busy with war and security of the village, it is the women who take up agricultural

works to keep the hearth burning, (iii) The community had lost a large portion of its calendric knowledge and whatever remained was acquired from the mother and (iv) famines are not entirely a weather-related disaster, but could also result from the loss of traditional calendric knowledge. The TK of Mao Naga is being lost rapidly and the trend is expected to continue as numerous folklores are incomplete like the lullaby mentioned above. Our knowledge holders attribute factors such as acculturation due to change in religious beliefs (embracing of Christianity), and vacillation within Mao Naga community as the primary reasons for the loss of TK. Nepuni's study in 2010 is also of the same opinion. The chief *movuo* has a sacred paddy field given by the villagers called as *chüna do* where the rituals for initiation of sowing and harvest are done (Fig. 3.6). Such sacred fields are common in agricultural communities with dedicated calendar keepers. For example, the Kanekes (Baduy) people of Banten, Indonesia are known to maintain sacred fields known as *huma serang* where rice is planted first by the *puun* (shaman) (Iskandar and Iskandar 2016). Traditionally, people used to give a small basket of rice or millets to the chief *movuo* for sowing. This practice which could have been an exercise to verify the viability of seeds is not prevalent anymore, further indicating the erosion of the importance of the calendar keeper.

Fig. 3.6 Photograph of *chüna do*, the sacred paddy field of the chief *movuo*. *Photograph* Kreni Lokho

3.3.6 The Mao Naga Calendar Today

According to Nepuni (2010), the Christian doctrine introduced by the British was resisted by the *movuo*, resulting in the banishment of early Mao Naga Christians. A case (Case No. 343, 1928 Hill case) was registered against the Christians for singing during *genna* days. A decree was issued by the government that Christians should be allowed to stay in the village, as long as they followed seven important *genna,* namely, *omi kazhü mani* (avert fire), *okheshü mani* (avert pests, insects, rodents and parasites), *ojü kathi mani* (avoid disturbance of soil to induce fertility), *phehrü mani* (self-purification), *movuo mati kotho* (sowing of seeds by *movuo*), *motho kotho mani* (end of restriction on consumption of harvest) and *chüjü ra* (eradication of human-related diseases) (Mao Baptist Churches Association 2002). Today, all of these *genna* except *okheshü mani* and *phehrü mani* are observed. The *movuo* continue to initiate paddy sowing (*movuo mati kotho*), paddy planting (*movuo thopre*) and harvest. The Mao Council that has assumed the role of chief *movuo* publishes the annual lunar calendar in printed form. The council collaborates with all village chiefs (village *movuo*) and directs them to follow common festival days as stipulated by the printed calendar. The printed traditional calendar has its own advantages and disadvantages. Advantages include (i) The lunar and solar calendars are available for ready reference for the community. This in turn ensures that the prevailing *genna* and festivals are followed without fail. (ii) It has triggered a renewed interest among the new generation on the *genna* and associated cultural practices. Disadvantages include (i) A village-level authority (village council) is set up in each village to administer and supervise the administration and other activities of the calendar. This undermines the authority of the village *movuo*, and reduces his power as the calendar keeper. (ii) It catalyses the loss of the institution of calendar keeper along with the associated body of knowledge, as no individual is involved in collecting, and interpreting and disbursing information on local seasonal indicators. (iii) It does not provide information on local seasonal indicators, a vital component of the Mao Naga calendar. (iv) The printed calendar provides only the dates of festivals and months but deliberately withholds the dates of sacred holidays (*genna*). This obscures the diversity of cultural practices (folklore, myths and beliefs system) associated with the calendar, rendering it a homogenous and static.

3.3.7 Mapping the Flow of Calendric Information

Prior to the British colonial period, calendric information used to be announced by the chief *movuo* who hailed from Pudunamei village, and the information was relayed from village to village by the respective *movuo* through yelling. For distant villages, a random person chosen as an informant was sent to pass on the message. Our structured interviews give an idea of people-to-people transmission of calendric information that occurred in the years 2016–2018. A majority of the respondents

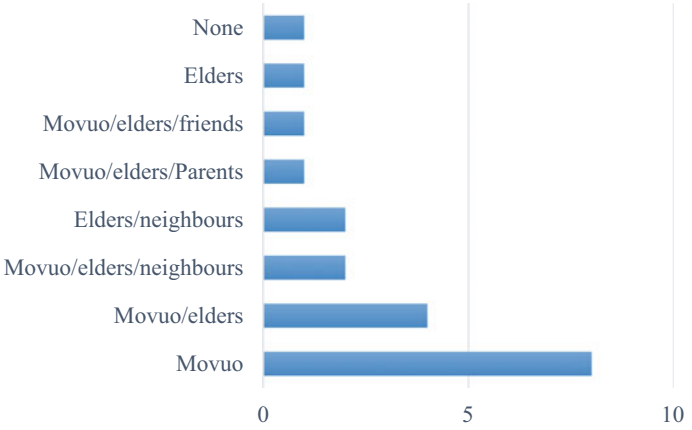

Fig. 3.7 Individuals from whom calendric information was received in 2016 and 2017

(80%) depended on *movuo* for receiving calendric information (Fig. 3.7). Elders rank next as the source of calendric information. The lone participant who reported that he received no information was the late *movuo* of Shajouba village himself. This shows that the calendar keeper is the keystone figure from whom processed calendric information continues to originate and flow to the community members. The lead author's observation also shows that transmission of information is dependent on the distance between the participant's house and the little mound from where the *movuo* announces the *genna.* Respondents who were distant received the information via elders, neighbours, parents, etc.

The people-to-people transmission of calendric information at present is village-centric (Figs. 3.7 and 3.8). Children, neighbours, friends and family are the main receivers of calendric information. Four respondents (25%) did not favour specific recipients, and their choices of recipients are general. All the recipients of the calendric information were from the village itself. This shows that for sovereign villages not affiliated to a community *movuo*, the flow of calendric information remains within

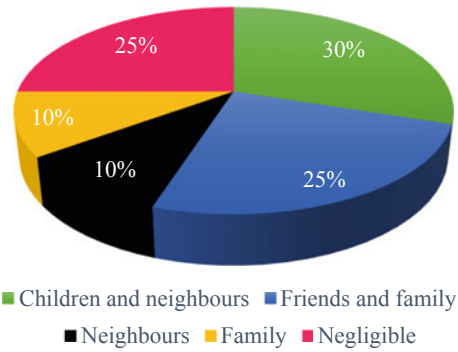

Fig. 3.8 Individuals to whom calendric information was passed during 2016 and 2017

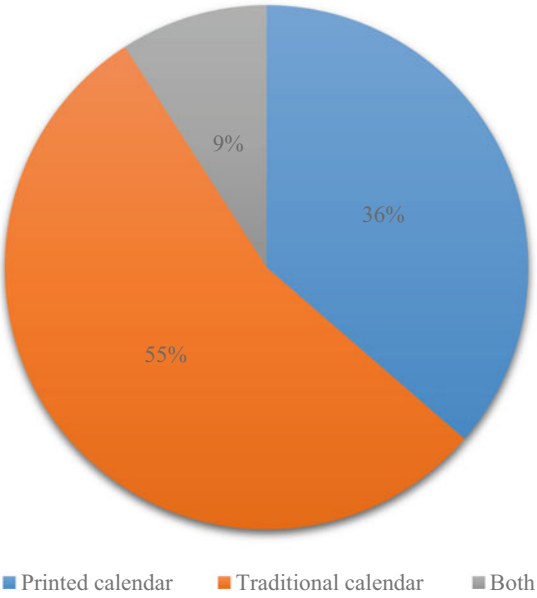

Fig. 3.9 People's preference for traditional and printed calendars

the boundaries of the village even today. As discussed earlier, this secretive nature of the information helped the village during days of tribal wars, and intra-village secrecy is still maintained.

Although the printed lunar calendar disbursed by the Mao Council may be a decade old, in July 2018, a customary law was passed to ensure that all Mao Naga villages follow the printed calendar for a common calendar time. Yet, our study shows 12 respondents were in favour of the traditional lunar calendar administered by a *movuo* (Fig. 3.9). The probability of accepting printed calendar was found to be higher with the formally literate people than those who learned from the traditional informal ways. The printed calendar lacks dynamic information on the role of *movuo*, the village-level *genna*, rituals and folklores, ethnoecology, taboos, construction of houses or mass digging of paddy field or pond, erection of stones, local seasonal indicators (calendric plants, birds, insects and animals), hunting period, gathering of non-timber forest products (NTFPs), etc. Most of these activities mentioned above are time specific. A wise *movuo* can still practise and administer the traditional dynamic calendar along with the printed calendar. However, the diktat of the council to use printed calendar reduces people's dependency on *movuo* which in turn leads to loss of respect to the already weakened institution of calendar keepers. Another notable issue is the acceptance of *movuo* by the people; *movuo* are followers of the traditional Mao Naga religion, which puts them in direct conflict with the Christian doctrine. Some *movuo* have discontinued the rituals following their conversion to Christianity. Even though the Mao Naga had earlier fought against the imposition of Christian doctrine, the Mao Naga beliefs have constantly been denigrated leading to acculturation. However, our observation shows that the Catholic Church and its

followers are more lenient towards the observation of *genna*, unlike the evangelical Protestants who form the majority and thus are able to enforce their will.

3.4 Discussion

3.4.1 Traditional Ecological Calendars Facilitate Landscape Management

Landscape management is both a spatial and temporal process. Yet, the temporality of the process has largely been neglected in conservation and ecology (Burgman et al. 2005). Agricultural communities construct ritualistic landscapes over the landscape (Khattri 2003). In such communities, the ritualistic landscape depends on the agricultural lands, crop patterns and rituals conducted. Traditional ecological calendars provide a culturally validated framework to link the ritualistic landscape with the landscape. They help the communities to plan, organise and execute their ecological, spiritual and cultural activities over time on the landscape (Franco 2015; Prober et al. 2011). Phases and positions of the sun, moon, and constellations, festivals, rituals, and local seasonal indicators are all temporal landmarks that help in determining the timing and duration of events that include landscape management activities such as agriculture, hunting, forest clearing, and fishing (Ammarell 1988; Gupta 2010; Sinha 2019). In the past (Sect. 3.3.1), the Mao Naga ecological calendar attached taboos to the month of *onu* to ensure food security, as well as to pool in human resources for facilitating agricultural activities. Local seasonal indicators (Sect. 3.3.3) signal the change of seasons, the arrival of months, the timing for undertaking paddy cultivation both in upland and wetlands, as well as the completion of the harvest. In the absence of this component, the calendar would have been highly centralised, precise, and rigid as it depends on the regular recurrence of lunar and solar events. Local seasonal indicators are capable of occurring early or late, depending on the environmental conditions prevailing at any given point of time. They thus introduce flexibility to the ecological calendar and landscape management practices which helps the community to adapt to changes in the landscape, especially fluctuations in the availability of resources resulting from climate change (Armatas et al. 2016; Savo et al. 2016).

The extant *genna* and festivals stipulated by the calendar determine when the Mao Naga would undertake landscape management activities, and other social events: *phehrü mani* is observed before the hunting party sets out for hunting even today; *chujuni* festival marks the onset of paddy planting season; *onuni* festival initiates the harvest of fruits and non-paddy crops. *Omi kazhü mani*, the *genna* for averting fires reminds the community to be guarded against forest fires. It ensures that the community undertake measures to prevent fire (Table 3.4). Scot (1908: 240) describes the agricultural system of Land Dayaks of Borneo as ‘a supernaturally protected process with constant festal interruptions’, highlighting the power of rituals in protecting agriculture. However, we know today that such temporal landmarks are important for the

sustenance of agricultural activities, and agrobiodiversity (Pfeiffer et al. 2006; Sinha 2019). The deployment of calendric festivals and rituals to stimulate or terminate landscape management activities has been known from the well-studied calendars such as those of the Nahuatl and Mayan people (Franco 2015; Klein 1993; Milbrath 1997). The Mao Naga calendar links the ritual landscape with activities on the landscape, thus playing a decisive role in the landscape management activities of the community.

3.4.2 Calendar Keepers, the Unsung Heroes in Indigenous Landscape Management

Shamans have been recognised for the multiple roles they play in a community. They practise techniques and activities that help them acquire, use and transmit knowledge that is usually not accessible to the average community member (Krippner 2002). They are the interpreters and safe-keepers of the community's beliefs and traditions (Steadman and Palmer 1994). They are also healers who effect healing by combining remedies from the spiritual realms with those of the physical world such as herbs and minerals (Greene 1998). In most communities, shamans are also the calendar keepers who possess calendric knowledge, along with knowledge on rituals, ceremonies and healing (Marshack 1985; Meggitt 1958). Rice (2007: 49–55) hypothesises that in ancient egalitarian communities of Mesoamerica, the shamans played a quintessential role in leading wars and planning hunting expeditions. With the advance in time, such individuals later rose to the position of calendar keepers, a position that was crucial in reinforcing the power of chieftains, and the subsequent formation of governments. In the case of Mao Naga, we see that the position of *movuo* is a culmination of all these powers hypothesised by Rice.

Although the knowledge on the Mao Naga calendar and calendric rituals in the past was fairly disbursed throughout the community, the chief *movuo* acted as the primary calendar keeper with Shamanic powers. His authority as the traditional chieftain, and the rituals he performed added authority to the calendric information disbursed by him, thereby rendering it acceptable for the community. These findings are in line with the role of calendar keepers described by Gell (1992: 307). Rice (2007) refers to the sun watchers of Mesoamerican calendars as 'day keepers', who played an important role in calendar keeping. Like the horizon sun watching practised by the Mao Naga, communities such as the Hopi tribe of America, and Ngas of Nigeria practised 'horizon moon watching', where the position of the moon against a landmark was used for calendrical calculations (Holbrook 2016; Zeilik 1986). Moustache shaped archaeological remains excavated in the Chelyabinsk Oblast of Russia shows that such structures were used by keepers of time to accurately determine timings for sunset, sunrise and also forecast lunar and solar eclipses in 500 BC (Kirillov and Kirillova 2016). In the present scenario, the community lacks a chief calendar keeper,

and the village *movuo* emerges as the chief custodian of calendric knowledge inaccessible to those relying on the printed traditional calendar. This is understandable from the mapping of the flow of calendric information described in Sect. 3.3.7.

The *movuo* as the calendar keeper is the chief custodian of traditional knowledge related to landscape management. Using the lunar calendar, the *movuo* determines the timing and duration of rituals and festivals, so as to facilitate collective actions of the community over the Mao Naga's landscape. According to Leach (1950), a standalone lunar calendar would be of scarce value to the respective community, unless there is a mechanism to harmonise the lunar calendar with the solar one. The task of harmonising lunar and solar calendars was played to perfection in the past by the chief *movuo*. The Mao Naga community indeed recognises the importance of calendar keepers, as understood from their folklores. Folklores are capable of communicating the importance of extinct cultural elements of the landscape (Preston and Harcourt 2009). As singers of lullabies, women transmit 'secrets, senses, emotions, etc.' connected to the community's societal norms and history. This in turn influences social relations in the community (Bilal and de la Bretèque 2013; Metzger 1984). The Mao Naga folk tales of which the lullabies form a part of (Sect. 3.3.5) recognise that a considerable portion of calendric knowledge is also known to the women folk who do not explicitly participate in calendar-related activities. These folklores venerate the *movuo* as the calendar keeper without whom undertaking agricultural activities to achieve food security is impossible for the community. It is high time that the academic community and practitioners also take note of the importance of calendar keepers.

3.4.3 Clash of Beliefs Explains Flattening of the Dynamic Calendar

The Mao Naga calendar keeper diligently harmonised the lunar calendar with the solar calendar by introducing the intercalary month. Errors on calculating the first day of the lunar month were culturally tolerated owing to the flexibility they brought in, and also for their ability to keep the calendar relevant to the landscape (Sects. 3.3.1 and 3.3.3). This shows that the community trusted the calendar keepers for their ability to harmonise the solar and lunar calendars when the appropriate time arrived. Calendrical errors and rectification actions are not uncommon in the history of the humankind. However, calendric errors in classical calendars were identified and eliminated. This is understandable as the mandate of such calendars were not to be locale and community specific but to control the actions of multiple communities living across multiple landscapes. For instance, the introduction of the Gregorian calendar following the decree of Pope Gregory XIII in 1582 resulted in the removal of 10 days from October 5 to October 14 in 1582. This was done to account for the error of ten days the Julian calendar had accumulated by then (Augustyn et al. 2018;

Plumer 2016). Later, when Britain switched over to the Gregorian calendar in 1752, 11 days were removed from the month of September 1752 (Hartson 2017).

The Mao Naga once venerated calendar keepers for their ability to process and disseminate calendric knowledge related to landscape management, rituals and festivals. The loss of the cultural importance of calendar keepers goes hand in hand with the loss of cultural importance of the sacred holidays (*genna*). These stem from the shifting of religious beliefs from the Mao Naga religion to Protestant Christianity which condemns Mao Naga religion and associated beliefs as paganism or idolatry (Harari 2014). On and Pugh-Kitingan (2015) record similar experience of the Dusun community in Sabah, Malaysia. Here too, change in religious values eroded the cultural status of the community's traditional priestesses, eventually leading to the loss of beliefs and rituals associated with agriculture and traditional healing. The treatment of the pagans by the Romans via persecution, prohibition and destruction of literature, temples, statues, etc. (Kirsch 2005; MacMullen 1997), or the trials and executions of witches in many parts of Europe (Lennersand 2004; Toivo 2004), are all reminders of the constant fight waged by organised religion against folk beliefs, which has caused the irrevocable loss of indigenous religions, cultural practices, and traditional knowledge.

Of the 123 *genna* (sacred holidays) recorded by us, only *phehrü mani*, *dzükho mani*, *pfureshü mani*, *doshupirü mani*, *molu kosü mani*, and festivals are practised across the community today. The Mao Naga solar calendar was replaced by the Gregorian calendar in the nineteenth century with the introduction of Christianity, eliminating the need for horizon sun watching and complex calculations associated with the process (Sect. 3.3.2). The recent introduction of printed traditional calendar further eliminates the need for moon watching (Sect. 3.3.1.1). Indeed, TK and cultural practices are not static and archaic, but constantly evolving through innovation and techniques (Berkes et al. 2000; Hastuti and Sumarmi 2017; Narasimhan and Franco 2009; Sunder 2006). However, the printed calendar withholds information on the sacred holidays (*genna*) rooted in the Mao Naga religion. It also lacks information on local seasonal indicators used by the calendar keepers to keep the calendar dynamic, flexible and relevant to the landscape (Sect. 3.3.6). Despite such shortcomings, there are positive signs on the ability of the printed calendar and its chief keepers—the Mao Council—to mimic the chief *movuo* in adapting calendric rituals and practices according to changes in the landscape. The Mao Council advising a halt on the practice of traditional seasonal hunting, taking into account the scarcity of game is an example of this (Sect. 3.3.1.2).

Pictorial calendars are records of the cultural, social and climatic events of the past (Graber 2017; Greene 2009). Neo-traditional measures such as the introduction of printed traditional calendar are known to enhance resilience capacity (Begossi 2000). For the printed calendar to metamorphose into an ideal calendar, it will have to reflect the dynamic nature of the Mao Naga ecological calendar. Including information on all *genna* and seasonal indicators would be the first step towards it.

3.5 Conclusion

The Mao Naga traditional ecological calendar enables the community to manage their landscape, and practise appropriate agriculture. However, its cultural importance has been lost gradually with acculturation due to the change in religious beliefs of the community. The community's lunar calendar employs 123 sacred holidays to regulate community activities. Yet, very few *genna* are adhered to these days, indicating the waning importance of the calendar. The Mao Naga folklores highlight the importance of calendric knowledge, the calendar keepers and the role of women in maintaining TK and food security. These folklores are reminders for the community to conserve the calendar and the institution of calendar keeping. In this context, the printed traditional calendars brought out by the Mao Council are a step in the right direction. Nevertheless, for the ecological calendar and the associated dynamic TK on landscape management to be holistically conserved, the community will have to strengthen the institution of calendar keepers, restore the flow of calendric information in the community, and ensure that the printed traditional calendar documents all *genna* and seasonal indicators. We recommend that such a well-documented calendar be administered by the calendar keepers themselves.

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Compliance with Ethical Standards Written Prior Informed Consent (PIC) was taken from all participants prior to the interviews. The study conforms to the code of Ethics of the International Society of Ethnobiology (ISE).

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Conflict of Interest None declared.

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Chapter 4
The Sundanese Traditional Ecological Calendar and Socio-cultural Changes: Case Study from Rancakalong of West Java, Indonesia

Johan Iskandar and Budiawati S. Iskandar

Abstract In the past, the Sundanese farmers of West Java, Indonesia, managed wet-rice (*sawah*) farming using *pranata mangsa*, the traditional ecological calendar. They cultivated rice varieties that were adapted to local environmental conditions. The *pranata mangsa* helped in determining the appropriate time to undertake rice farming activities, including preparation of land, planting, and harvesting. All these activities were accompanied by traditional ceremonies. Various natural indicators, such as the constellations of stars, leaf fall of certain plant species, sprouting of tubers, and call of insects, were used to determine the months (*mangsa*) of the ecological calendar. In addition, the calendar and the embedded traditional knowledge also helped in managing rice pests, prudent utilisation of water in irrigation, and effective utilisation of the social capital of villagers, through communal activities. However, after the Green Revolution, traditional rice cultivation practices changed, leading to the neglect of the *pranata mangsa.* Revitalising the *pranata mangsa* with inputs from formal scientific knowledge would help the community practise ecologically sound and economically viable agriculture that is adapted to the local environment and culture.

Keywords *Pranata mangsa* · *Sawah* farming · Traditional ecological knowledge · Rituals

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4.1 Introduction

Small scale farmers in the various agroclimatic zones of the world have made use of traditional ecological calendars to decide the timing of agricultural activities, including when to conduct rituals, prepare land and plant crops, and harvest (Adimihardja 1992; Ave and King 1986; Franco 2015; Iskandar 1998; Iskandar and Iskandar 2011; Orlove et al. 2010; Prober et al. 2011; Xu et al. 2009). Before the commencement of the Green Revolution in Indonesia, in the late 1970s, the Sundanese people of West Java and Banten managed the *sawah* farming system (wetland) using their traditional calendar or *pranata mangsa* (cf. Adimihardja 1992; Berkes 1999; Iskandar 2012; Mustapa 1996; Toledo 2002; Wiramihardja 2013). The Green Revolution refers to the breakthrough in the development and subsequent release of High Yielding Varieties (HYVs) of wheat and rice in the mid-1960s (Evenson and Gollin 2003). These high-yielding varieties were developed by scientists at the International Centre for Wheat and Maize Improvement in Mexico (CIM-MYT) and the International Rice Research Institute in the Philippines (IRRI). In Indonesia, the origins of the Green Revolution can be traced back to 1965/1966 when the BIMAS (*bimbingan massal*) programme was adopted to increase rice production. At the core of BIMAS was the ideology of *panca usaha* (five endeavours): proper soil preparation; improvement of wetland irrigation; introduction of new HYVs; use of synthetic fertilizer; and use of synthetic pesticides (Iskandar 2017; Rieffel 1969). The subsequent signing of contracts between the Indonesian government and foreign firms from Japan, Switzerland, and West Germany in 1968–1969 to cultivate improved IR5 and IR8 seeds using industrial pesticides and fertilizers was a major milestone. This massive campaign aimed to realise a Green Revolution by 1973 (see Hansen 1972).

Unlike the farming of tuber crops such as taro and sweet potato, cultivation of rice in wet fields and uplands (*ladang*) requires specific knowledge on soil, seasons, rainfall, drought, wind, diurnal variations and temperature, and suitable farming practices that include the selection of appropriate crops. Any errors in determining the appropriate time of planting and other agricultural activities would affect the harvest (cf. Dove 1999). Hence, the Sundanese farmers relied on the Traditional Ecological Knowledge (TEK) encoded in the *pranata mangsa* to determine appropriate timings for undertaking agricultural activities (cf. Berkes 1999; Gelpke 1986; Iskandar and Iskandar 2016; Lovelace 1984; Toledo 2002; Wessing 1978; Wiramihardja 2013: 26). The *pranata mangsa* is a temporal indexing mechanism that divides the year into months (*mangsa*). It serves as a framework for undertaking various agricultural activities connected to rice cultivation (cf. Ammarell and Tsing 2015; Arsana et al. 2003; Daldjoeni 1984; Hidayat 2011; Iskandar and Iskandar 2016; Shindunata 2011; Wiramihardja 2013; Wisnubroto 1999). Although the *pranata mangsa* is known to be prevalent in Javanese farming communities even before the arrival of the Hindus, it was formally recorded in 1555 *Saka* or 1633 Gregorian (Wisnubroto 1999: 13). It has been transmitted from generation to generation in the Javanese communities, including the Sundanese communities of West Java. Traditional ecological calendars in Indonesia are known by various local terms such as *kerta masa* in Bali, *lontara*

in Sulawesi (Kasryno et al. 2003), *kala mangsa* in Sundanese Kuta community, Ciamis (West Java) (Kadarisno 2019), and *pananggalan Baduy* or *kikandayan tani* in Baduy, Banten Sundanese (Iskandar 1998). Yet, the nature of the calendars and their application in guiding agricultural and ecosystem management activities are similar (Iskandar and Iskandar 2016; Wiramihardja 2013).

For the Sundanese people, there are specific rituals accompanying each stage of wet-rice farming, including preparing the land, sowing rice in seedbeds, planting, harvesting, and storing rice in rice barns. These rituals are a manifestation of the cosmology of the Sundanese people (Iskandar 2017: 182; Wessing 1978). Hence, traditional rice farming is not a mere set of agricultural activities, but a way of life. The Sundanese rural people, especially in the past, believed in various spirits, including dead spirit, place spirit, God (*dewa*), and Goddess (*dewi*). The rice goddess, locally named Nyi Pohaci (called Dewi Sri by Javanese People), played a prominent role in the beliefs related to agriculture (Iskandar 2017: 182; Wessing 1978: 76). Before cultivating the land, people performed rituals in sacred places, including in the sacred forest (*hutan keramat*), the water spring (*mata air*), and the node where river water enters the paddy field (*hulu wotan* (Mustapa 1999; Prawirasuganda 1964). The time for preparing the paddy field and planting rice was chosen using the *pranata mangsa.* Various natural indicators, such as the appearance and disappearance of certain stars, shedding of plant leaves, and calls of certain insects, have normally been used as local seasonal indicators (Iskandar 2014).

The calendar through its rituals regulates the collective actions of local communities (Franco 2015). On the temporal scale, it influences the timings of festivals, rituals, and agricultural and ecosystem management activities. On the spatial scale, it influences the geographical area over which an activity is carried out, and access to ecosystems and species through taboos (Franco 2015). The *pranata mangsa* and the various rituals ensure that the planting and harvesting of rice are simultaneously undertaken by all farmers in the community, and the land is followed for a while before the next agricultural cycle. This cuts off the food supply to the agricultural pests and truncates their life cycle (cf. Lansing 1991). In addition, the traditional system of irrigating wet-rice fields is a prudent system, designed to pre-empt any possible deficit of water during the dry season (cf. DGIS 1982 cited by Iskandar 2007; Lansing 1991; Soemarwoto 1988). Since the rituals for planting and harvesting rice performed for Nyi Pohaci are a communal affair, they promote communal bonding (cf. Iskandar 2017; Khattri 2003; Lovelace 1984). Calendric knowledge thus contributes to contemporary natural resource management and enhanced resilience of socio-ecological systems (Prober et al. 2011).

In recent years, there have been changes in the socio-economic conditions of the Sundanese community, and the environment. Increasing human population, intensive penetration of market economy, unpredictable weather and climatic conditions due to climatic anomaly, and modernisation of the wet-rice farming systems are the factors driving this. Intensive use of HYVs, inorganic fertilizers and pesticides introduced by the Green Revolution in the early 1970s have brought drastic changes in Sundanese traditional wet-rice farming. High External Input Agriculture (HEIA) depends on external inputs such as hybrid seeds, synthetic fertilizers,

pesticides and fossil energy, which have to be purchased (cf. Reijntjes et al. 1992). HEIA focuses on maximising the output, as a result of which the rice fields have been under rice cultivation throughout the year, contradicting the season-specific farming facilitated by the *pranata mangsa.* Thus, for farmers practising HEIA, the calendric information disbursed by the *pranata mangsa* is no longer relevant. However, the older generations of *sawah* farmers of West Java, including Rancakalong village of Sumedang, West Java, Indonesia, have retained knowledge on the *pranata mangsa*. This paper elucidates the Sundanese *pranata mangsa* and ecological and socio-economic changes, based on a case study in the Rancakalong village of West Java.

4.2 Materials and Methods

4.2.1 Sampling and Interviews

We use a combination of qualitative and quantitative methods to collect and analyse data (Albuquerque et al. 2014; Creswell 2009; Newing et al. 2011). Data was gathered through participant observation, semi-structured interviews and structured interviews. General environmental conditions of the agroecosystems, including rice fields, mixed-garden, and garden, activities of informants in rice farming, and rituals of the community were observed by the authors and noted down. Researchers accompanied informants during their daily activities related to the wet-rice farming system and during rituals. Semi-structured interviews were conducted with competent informants who are purposively selected. The informants consist of the village's formal leaders (3 individuals), agricultural extension officers (3 individuals), informal leaders (3 individuals), elder male farmers (15 individuals), and elder female farmers (3 individuals). Structured interviews were undertaken with randomly selected respondents. A field survey conducted in 2008 showed that out of the 1,100-household population of farmers in Rancakalong village, 783 households farmed paddy in the wetlands (Rancakalong Village Statistical Data 2014). Only 194 households planted both high-yielding rice varieties (HYVs) and local rice varieties (LRVs) in their village. Most of these 194 households were still involved in the cultivation of local rice varieties and followed traditional rituals associated with planting, harvesting, and post-harvesting of rice (Malia 2007; Tiani 2007; Warsiti 2009). From this pool of 194 households, we randomly selected 65 farmers for the structured interviews.

4.2.2 Rancakalong Village

Rancakalong is a village in the Rancakalong sub-district of West Java, Indonesia. It lies 14.5 km away from West Sumedang, the capital of the district, and 45 km

away from Bandung, the capital of West Java (Fig. 4.1). Geographically, Rancakalong village is located 6° 49′ 27.2″ South and 107° 48′ 34.7″ East, at an altitude of 700–1,250 m above sea level. The daily average atmospheric temperature is 23 °C. Rancakalong has two major seasons: the wet season occurring between September and February, and the dry season between March and August. The total area of Rancakalong village was 207.9 ha in 2013. The agricultural land in Rancakalong can be divided into two categories: dry land and wet land. The dry land comprises the home garden (*pekarangan*), garden (*kebun*) and mixed-garden (*kebun campuran* or *talun*), while the wet land consists of the rice field (*sawah*). The wet-rice field can be further divided into two categories: the irrigated rice field and the non-irrigated rice field. The general landscape of the wet-rice farming of Rancakalong is shown in Figs. 4.2 and 4.3. The total population of Rancakalong village in 2008 was recorded as 4,100 people consisting of 2,024 males and 2,076 females from 1,514 households. Five years later in 2013, the total population was 4,082 people comprising of 2,016 males and 2.066 females from 1,538 households. The population further increased to 4,911 people (2,435 males and 2,476 females from 1,861 households) in 2017. Farming is the chief occupation (68%), followed by employment as petty traders, labourers/employees and civil servants/soldiers (Rancakalong Village Statistical Data 2014).

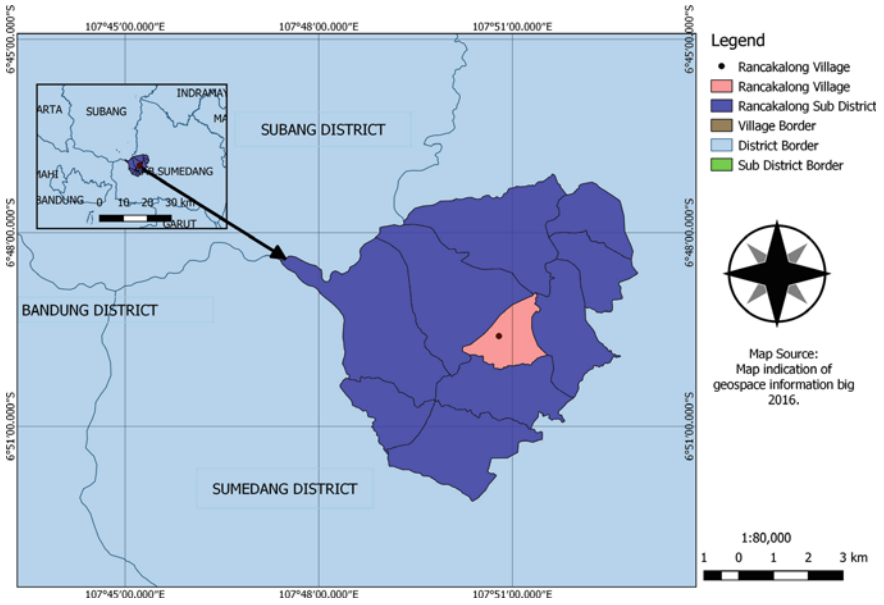

Fig. 4.1 Map showing the location of Rancakalong in West Java, Indonesia

Fig. 4.2 A wet-rice field (*sawah*) of Rancakalong being prepared for cultivation. *Photo* Johan Iskandar (2018)

Fig. 4.3 A *sawah* field before harvest. *Photo* Johan Iskandar (2018)

4.3 Findings

4.3.1 Traditional Rice Cultivation in Rancakalong

Most local cultures of Indonesia can be referred to as rice-based cultures (cf. Beets 1990; Brush 1992; Sastrapradja and Widjaja 2010). Before the onset of the Green Revolution, Indonesia had at least 8,000 local rice varieties, mostly planted in Java (Bernsten et al. 1982; Fox 1991; Whitten et al. 1999). This high diversity of local rice varieties mirrors the diversity of ecosystems, as traditional rice varieties were developed to suit the local cultural needs and environmental conditions. Thus, the diversity of agroecosystems, rice varieties, and cultural practices go hand in hand. Prior to the Green Revolution, there were at least 60 local rice varieties (landraces) cultivated by the Rancakalong farmers. Post-Green Revolution, this number had come down to 35, as local rice varieties were replaced by new rice varieties (Malia 2007; Warsiti 2009). Farmers who farm local rice varieties (*paré buhun*) cite maintaining heritage, adaptability to local rice field environments (altitude, humidity, water availability, soil fertility), resistance to pests, requirement for traditional rituals and making of traditional cakes, and higher economic value as reasons for their practice.

4.3.2 Folk Classification

4.3.2.1 Folk Classification of Land

Rice cultivable land is classified into swidden (*ladang*) and wetland (*sawah*). Rancakalong people classify wetland rice field (*sawah*) into several types, based on water availability, location, size, and soil fertility (Iskandar 2012; Warsiti 2009). Based on water availability, the *sawah* is divided into *sawah ranca* with abundant water, and the *sawah guludug* or *sawah tadah hujan* that is rainfed. *Sawah ranca* can be cultivated throughout the year, with the traditional rice varieties that can be cultivated twice a year, or the modern rice varieties that can be cultivated thrice a year. Based on location, *sawah* is classified into *sawah landeuh* located in lowlands and *sawah pegunungan* in the upland areas. The plots of *sawah landeuh* are larger in size, while the *sawah pegunungan* is smaller and usually terraced to avoid soil erosion. On the basis of soil fertility, the *sawah* may be divided into *sawah subur* or *sawah ledok* that has fertile, muddy soil and *sawah cengkar* with soil considered non-fertile (*tidak subur*).

4.3.2.2 Folk Classification of Rice Varieties

Paré is the Sundanese term used by the people of Rancakalong to refer to rice. Traditional or local rice varieties are named as *paré buhun* or *paré ranggeuyan* and

modern ones are named as *paré énggal*. The local rice varieties are classified into several types based on the hairy and non-hairy nature of seeds, the colour of hulled rice, the colour of the stem, and rate of maturation (cf. Iskandar and Ellen 1999; Iskandar and Iskandar 2018; Malia 2007; Soemarwoto 2007; Warsiti 2009). Based on the hairy and non-hairy nature of grains, rice can be classified into two: *paré bulu* (hairy), and *paré gundil* (non-hairy). Based on morphology, it is classified using size, shape, and colour into big (*gabah gedé*), slightly smaller (*gabah sedengan*), small (*gabah leutik*), roundish (*buleud*), oval (*lonyod*), thick (*gendut*), flat (*gépéng*), white hulled rice (*béas bodas*), bright hulled rice (*béas bodas hérang*), milk white hulled rice (*béas bodas susu*), red hulled rice (*béas beureum*), and black hulled rice (*béas hideung*). Rice plants with black stem are known as *tangkal paré hideung* or *jarami hideung* and brownish ones as *jarami coklat*. Based on culinary properties, rice is divided into two main groups, namely, glutinous (*paré ketan*) also known as sticky rice (fragrant and delicious) and non-glutinous rice (*paré biasa* atau *paré lain ketan*) that can further be divided into two sub-categories, namely, sticky and fragrant (*sangu pulen*) and non-sticky and not fragrant (*sangu béar*). Based on the harvesting time, the local rice varieties can be divided into three categories: *paré biasa* or *normal*, *paré hawara*, and *paré leuir* that are normally harvested approximately in 5–6 months, 4–5 months, and 6–7 months, respectively (Malia 2007; Warsiti 2009).

4.3.2.3 Classification of Rice Pests

Pests of *sawah* are grouped into six on the basis of damaged plant organs, as destroyers of grain, leaves, stem, roots, a combination of root and stem, and a combination of stem, leaves, and grain. Pests of the rice grain, including grain-eating birds, are *manuk peking* (*Lonchura punctulata* Linn.), *manuk piit* (*Lonchura leucogastroides* Horsf and Moore), and the insect *kungkang* (*Leptocorisa acuta* Thunb.). Pests destroying leaves include insects of *hama bodas* (*Nymphula depunctalis* Gn.), *hileud paré* (*Scriphoga innonata* Wlk.), *lembing* (*Nezara viridula* L.), *simeut* (*Locusta* spp.), and *wereng coklat* (*Nilarvarpata lugens* Stal.). Pests destroying stem; root; root and stem; and stem, leaves, and grain are *hama beureum* (*Tryporzia incerulans* Walker), *keuyeup* (*Parathelpusa/Potamon* sp.), *gaang* (*Gryllotalpa africana* Pal. B), and *beurit* or *tikus sawah* (*Rattus argeventer* Robinson & Kloss), respectively (Iskandar et al. 2016).

4.3.3 Management of Rice Pests

Although most farmers of Rancakalong village use synthetic pesticides to eradicate rice pests, some farmers use traditional botanical pesticides (biopesticides). At least 18 plant species from 14 families were found to be used: *bratawali* (*Tinospora tuberculata* Beumee), *beungbeureuman* (*Vitis discolor* Dalz.), *cabe rawit/céngék* (*Capsicum frutescens* L.), *comrang* (*Nicolaia speciosa* Horan), *gadung* (*Diocorea*

hispida Bl.), *hanjuang beureum* (*Cordyline fruticosa* L.), *jengkol* (*Archidendron pauciflorum* (Benth.) I.C. Nielsen), *kacang babi* (*Tephrosia vogelii* Hook), *kahitutan* (*Paederia foetida* L.), *konéng gedé* (*Curcuma xanthorrhiza* Roxb.), *laja* (*Alpinia galanga* (L.) Willd.), *pandan* (*Pandanus amarylifolius* Roxb.), *panglay* (*Zingiber cassumunar* Roxb.), picung (*Pangium edule* Reinw.), *sereh wangi* (*Cymbopogon nardus* (L.), *suren* (*Toona sureni* (Bl.) Merr.), *tembakau* (*Nicotiana tabacum* L.), and *teureup* (*Nicotiana tabacum* L.) (Iskandar et al. 2016).

Plants used as biopesticides have been widely studied by researchers (cf. Djunaedy 2009; Reijntjes et al. 1992; Santoso et al. 2005). According to Utami and Haneda (2010), *brotowali* (*Tinospora tuberculata* Beumee) and *jéngkol* (*Archidendron pauciflorum* (Benth.) I.C. Nielsen) have the potential to repel rats (*tikus*), while *gadung* (*Diocorea hispida* Bl.) has been used to poison animals. The tobacco/*bako* (*Nicotiana tabacum* L.) has been used as biopesticide not only in Indonesia, but also in other countries including North Africa (Nyirenda et al. 2011). The farmers of Luzon in the Philippines use hot chilli/*céngék* (*Capsicum frutescens* L.) as a biopesticide to eradicate rice pests (Nicolas and Cabagorias 2015).

Unlike chemical synthetic pesticides that kill insects, the biopesticides used by farmers of Rancakalong village are intended to repel them (cf. Reijntjes et al. 1992). Hence, the use of biopesticides does not eradicate the natural enemy of pests and is perceived safe for the environment and human health. They are also cheap as the source plants are plenty in the rural ecosystems (cf. Majumder et al. 2013). Similarly, since Baduy people have completely rejected the Green Revolution, synthetic pesticides are not allowed in their swidden farming. Additionally, the fallowed time employed in the Baduy swidden farming ensures that the life cycle of pest insects, including brown plant hopper (*wereng*) may be broken. As a result, unlike wet-rice farming that experiences annual attacks by *wereng* (cf. Winarto 2016), the Baduy swidden is rarely attacked by *wereng* (Iskandar and Iskandar 2015).

4.3.4 Pranata Mangsa

The origin of *pranata mangsa* as a calendar can be traced back to the decree of the King of Mataram, Pakubuwono VII, on 22 June 1855. The calendar makes use of the position of the sun, constellations (Orion/*bintang wuluku*), and local seasonal indicators to detect the change of seasons (Partohardjono 2003: 177). Time reckoning is achieved by triangulating the celestial data with various seasonal indicators such as shedding of leaves of certain plant species, calls of insects, and migration of birds. This is similar to the calendar of the Baduy community called *panaggalan* or *kalender Baduy* (Iskandar and Iskandar 2016). The first day of a new year (*tindak tahun*) is determined using calculations based on a wooden device called a *kolényér*, and celestial indicators such as the position of the belt of Orion (*béntang kidang*) and the Pleiades (*béntang kartika*), and flowering of plant species such as *jampang kidang* (*Centhoteca lappacea* (L) Desvauk), *jampang kerti* (*Centhoteca* sp.), and *kanyéré*

tree (*Bridelia monoica* (Lour.) Merr). However, the most important factor determining New Year (*tindak tahun)* is harvesting the *huma sérang*, the sacred swidden, the default scheduling of which is three months before *tindak tahun* (Iskandar 2007).

Farmers of Sulawesi have a traditional ecological calendar called *lontara* (Arsana et al. 2003; Kasryno et al. 2003). It is determined in a community meeting called *tudang sipulung*. The meeting is attended by various stakeholders, including the farmer community, informal leaders, formal leaders, experts in traditional calendric knowledge (*palontara*), and agricultural extension officers. The calendar is divided into twelve months and eight years (*tasipariamae*) or *windu. The tasipariamae* consists of *tahun alif*, *tahun ha*, *tahun jiem*, *tahun zaey*, *tahun daalem*, *tahun bea*, *tahun wau*, and *tahun dalem.* The position of some stars (*bintang*) in the sky, namely, *bintang bakua*, *bintang mangiweng*, *bintang ikan pari*, *bintang pakjeko*, *bintang gadis*, and *bintang raja* is predominantly used for the prediction of the seasonal changes and the wet-rice farming activity times (Saenong et al. 2003).

The *pranata mangsa* of Rancakalong divides the year into 12 months, namely, *kasa/kahiji*, *karo/kadua*, *katiga/katilu*, *kapat/kaopat*, *kalima*, *kanem/kagenep*, *kapitu/katujuh*, *kawolu/kadalapan*, *kasongo/kasalapan*, *kadasa/kasapuluh*, *desta/kasabelas* (*hapit lemah* in Baduy community), and *sada/kaduabelas* (Table 4.1). The first month of the *pranata mangsa* is named *kasa* which coincides with June–July, while the end of the year is called *sada* or *kaduabelas* that corresponds to May–June. The *pranata mangsa* of Rancakalong is similar to the *pananggalan* of Baduy community in having 12 months; there are also certain month names common to both calendars, but the months do not correspond to the same. For instance, *kalima* (May–June) is the second month of the Baduy calendar, whereas *kalima* in Rancakalong is the fifth month (12 October–7 November). The first month of the year (*tunggul tahun*) of the Baduy calendar is named *sapar* (June–July), whereas in Rancakalong, it is the *kasa/kahiji* (June–July) (Table 4.1).

Nowadays, the traditional ecological calendars in different regions of Java have been rarely practised, except in the Baduy community and Kasepuhan community (*sawah*) (Adimihardja 1992; Iskandar 2007; Iskandar and Iskandar 2016). Both the Baduy community and Kasepuhan community are known to maintain and cultivate their traditional rice varieties that are adapted to the local environmental conditions. In Rancakalong village, the *pranata mangsa* has rarely been used by the *sawah* farmers; the farmers who still use the *pranata mangsa* are the ones who cultivate traditional varieties of rice.

4.3.4.1 Celestial Information

Both the Rancakalong community and Baduy community have traditionally used various local seasonal markers such as flowering, fruiting and leaf shedding of plants, and animal behaviour besides information on the position of the sun and constellation for time reckoning. Rancakalong calendar is similar to Baduy in using positions of the Orion Belt (*béntang wuluku* in Rancakalong and *béntang kidang* in Baduy) to decide the beginning of the farming cycle, and timing of various activities connected to the

Table 4.1 Comparison of the *pranata mangsa* of Rancakalong, and the *pananggalan* of the Baduy, South Banten

Baduy of South Banten[a]			Rancakalong, Sumedang, West Java[b]		
Name of month	Indicators and characteristic	Swidden activities and rituals	Name of month	Indicators and characteristics	Wet-rice farming activities and rituals
Sapar as New Year/ *tunggul taun* of Baduy calendar (April–May)		*Huma sérang* (communal sacred swidden): clearing; *huma puun* (swidden owned by Baduy traditional priest): fallowed; *huma masyarakat* (swidden of ordinary Baduy household): fallowed. Ritual of *Séba*	*Kasa/Kahiji* (21 June–31 July)	Arrival of wind from the northeast. Some plant species, including *randu/kapok* (*Ceiba petandra* (L) Gaertn) and *karet* (*Hevea brasiliensis* Willd ex A. Juss) Mull. Arg) shed leaves. Eggs of small animals, and insects such as crickets hatch. The *wuluku* (the belt of Orion) is on the eastern horizon. Extreme atmospheric temperatures: hot during the day and cold at night. Traditionally, the months were perceived as inappropriate for rice cultivation	Planting rice of the dry season. Ritual of *nitipkeun*, and *ngalaksa*
Kalima (May–June)		*Huma sérang*: felling; *huma puun*: clearing; *huma masyarakat*: fallowed. Ritual of *ziarah* at the sacred place in Inner Baduy	*Karo/Kadua* (1 August–25 August)	Flow of wind from north and south to west. Temperature is hot during the day and cold during the night. *Wuluku* (the belt of Orion) is in the east. Lack of water in wells and rivers. Certain plant species, including carrot, sprout. Fruiting season	
Kanem (June–July)	*Kidang* (the belt of Orion) appears on the eastern horizon; flowering/ fruiting of *kanyere* (*Bridelia monoica*), *jampang kidang* (*Centhoteca lappacea*) and *jampang kerti* (*Centhoteca* sp)	*Huma sérang*: burning; *huma puun*: felling; *huma masyarakat*: fallowed	*Katiga/Katilu* (24 August–16 September)	Wind flows from the north; temperature gets optimal. Trees exhibit good leaves. Traditionally, the annual non-rice crops (*palawija*) are harvested	

(continued)

Table 4.1 (continued)

Baduy of South Banten[a]			Rancakalong, Sumedang, West Java[b]		
Name of month	Indicators and characteristic	Swidden activities and rituals	Name of month	Indicators and characteristics	Wet-rice farming activities and rituals
Kapitu (July–August)	*Kidang* (the belt of Orion) appears on the eastern horizon; Trees of *kanyere* (*Bridelia monoica*) and grasses of *jampang kidang* (*Centhoteca lappacea*) and *jampang kerti* (*Centhoteca* sp) flowering and fruiting	*Huma sérang:* re-burning and planting rice (*ngaseuk*); *huma puun*: burning; *huma masyarakat*: clearing. Ritual of *ngaseuk huma serang*	*Kapat* (17 September–11 October)	Wind blows from the west and start of rainy season. Breeding season of birds. Fish of rivers and lakes emerge from their holes. *Randu/Kapok* (*Ceiba pentandra* (L) Gaertn) trees fruit. Traditionally, harvesting of *palawija*	Land preparation for planting rice
Kadalapan (August–September)		*Huma sérang*: first weeding; *huma puun*: Reburning and planting rice; *huma masyarakat*: felling. Ritual *narawas* and *nukuh* of *huma masyarakat*	*Kalima* (12 October–7 November)	Wind blows from the northwest. Rainy season. Winged termites emerge from nests; snakes move out from their holes. *Wuluku* (the belt of Orion) appears earlier	Traditionally, appropriate time for planting rice in the wet-rice field
Kasalapan (September–October)	*Kidang* (the belt of Orion) appears overhead or sideways to the west. *Lancah kidang* (grass spider) prepares its nest on grasses and her web has a hole in the middle; the spider is seen mostly on the edge of the nest	*Huma sérang*: second weeding; *huma puun*: first weeding; *huma masyarakat*: burning, re-burning, planting rice. Ritual of *ngaseuk* of *huma masyarakat*	*Kanem/ Kagenep* (8 November–20 December)	Strong wind blows from the west, and high rainfall. Maturing of fruit plants, including *rambutan*, *duku*, *durian*	Planting rice of the wet season, ritual of *nitipkeun*; Commencement of the first weeding of the wetland fields
Kasapuluh (October–November)		*Huma sérang*: second weeding; *huma puun*: first weeding; *huma masyarakat*: first weeding and conducting the ritual of *ngirab sawan*	*Kapitu/ Katujuh* (21 December–1 February)	Wind blowing from the west and cold temperature. Heavy rains with occasional flooding	

(continued)

Table 4.1 (continued)

Baduy of South Banten[a]			Rancakalong, Sumedang, West Java[b]		
Name of month	Indicators and characteristic	Swidden activities and rituals	Name of month	Indicators and characteristics	Wet-rice farming activities and rituals
Hapit lemah (November–December)		*Huma masyarakat*: second weeding	*Kawalu/Kadalapan* (2 February–28 February)	Wind blows from the west and rotates. Reduction in rainfall. Breeding season of cats. Rice plants of swidden fields start to grow panicles	
Hapit kayu (December–January)		*Huma sérang*: harvesting ritual of mipit pare in *huma serang* of Cibeo on day 24, harvesting rice strats on day 28	*Kasanga/ Kasalapan* (1 March–25 March)	Wind blows from the south. Insects, including *tongérét* (*Dundubia mannifera* Linnaeus), and *turaés* (*Cryptotympana acuta* (Signoret) give out loud shrill. *Tongérét* predominantly shrill in the morning, while *turaés* shrill in the afternoon	Panicles of rice are ripe and yellow in colour, before harvesting time
Kasa (January–February)		*Huma sérang*: harvesting rice; *huma puun*: –; *huma masyarakat*: ready to harvest–. Ritual of *kawalu kahiji* in Inner Baduy	*Kadasa/Kasapuluh* (29 March–17 April)	Wind blows from the southeast. Breeding season of animals, nesting of birds	Rice panicles are homogenously ripe. After 2 days, rice is ready to be harvested
Karo (February–March)		*Huma sérang*: fallowed; *huma puun*: harvesting rice; *huma masyarakat ready to harvest*: –. Ritual of *kawalu tengah* in Inner Baduy	*Desta/Kasabelas* (18 April–10 May)	Wind arrives from the southeast. Air and soil temperature is hot. The pests of *kungkang* insect (*Leptocrisa acuta* (Thunberg) appear and destroy rice. Traditionally, planting of rice or non-rice crops, including tobacco, corn, and sweet potato	Harvesting of rice. Ritual of *nyalin, ngampihkeun paré*
Katiga (March–April)		*Huma sérang*: fallowed; *huma puun*: fallowed; *huma masyarakat*: harvesting rice. Ritual of *kawalu tutug* in Inner Baduy, and *ngalaksa* in Inner Baduy and Outer Baduy	*Sada/Kaduabelas* (11 May–20 June)	Wind coming from the east. Air temperature is hot during the day, and is very cold at night. Planting time for non-rice crops (*palawija*)	

Source [a] Iskandar (2007: 117); [b] Warsiti (2009)

cultivation of wet and swidden fields. The position of the *bentang kidang* has been mainly used by the Baduy community to decide the right time for different stages of swidden farming (Iskandar 2007: 116). The *prananta mangsa* of Rancakalong determines the dry season based on the appearance of *bentang wuluku* on the eastern horizon at dawn in *kasa/kahiji* (June–July) and *karo* (August). Traditionally, planting rice is not appropriate during this month due to the dry season. The appropriate time for planting rice is *kalima* (October–November) when winds from the northwest would bring rain. Winged termites and snakes emerge from their holes during this season. Traditionally, this marks the appropriate time for planting rice in the wet-rice field. However, as mentioned earlier, since they began intensive wet-rice farming agriculture, the Rancakalong community has continuously cultivated the irrigated wet-rice field even during the dry season (*kasa/kahiji*) (Table 4.1).

4.3.4.2 Local Seasonal Indicators

As seen in Table 4.1, the *pranata mangsa* facilitates time reckoning by triangulating the celestial observatory data with various local seasonal indicators such as shedding of leaves of certain plant species, calls of insects, and migration of birds. The shedding of leaves of the *randu/kapok* tree (*Ceiba petandra* (L) Gaertn) and maturation of its fruits indicate the commencement of the dry season and coincide with *mangsa kasa/kahiji* (June–July) of the *pranata mangsa*. According to Western scientific knowledge (etic view), the shedding of leaves of *randu* coincides with the dry season to cope up with the lack of water in the soil (cf. Purseglove 1974: 36).

Calls of cicadas such as *tongérét* (*Dundubia mannifera* L.) in the morning and *turaés* (*Cryptotympana* sp.) in the afternoon indicate the change of the wet season to the dry season. The males of the *tongérét* as well *turaés* give out loud calls during the onset of dry seasons. The sound is generated from the base of the ventral abdomen to invite the female insect to mate. After mating, the eggs are laid in the crevices of tree bark (cf. Borror et al. 1979). The eggs hatch and the emerging nymphs are locally named *kuuk*. The *kuuk* fall and burrow into the soil, and feed from the plant roots until they emerge out of the soil upon maturity. The mating call of the cicadas coincides with the month of *kasongo/kasalapan* (March) (Table 4.1). This month usually coincides with the transition from wet to the dry season, as indicated by a reduction in rainfall, locally named as *musim dangdangrat* or *musim pancaroba* (Darpan et al. 2013: 55).

Migrant birds such as *manuk kapinis* or *manuk hujan* (*Hirundo rustica*) and *manuk teri* (*Glareola maldivarum*) appear in the village ecosystem between September–March and indicate the onset of the rainy season (Iskandar 2007). *G. maldivarum* is a resident bird of the Northern Hemisphere (Siberia, Mongolia, China). During winter (September–March), the species migrate to Southeast Asia, including West Java. Like *Glareola maldivarum*, species of *manuk entod leuncang* (*Motacilla alba*, *M.caspa* and *M. flava*) also appear in West Java as migrant birds from the Northern Hemisphere at the same time, and their arrival is traditionally perceived to signal the start of the rainy season. Swidden farmers of Borneo name *manuk entod leuncang* as

burung beras-beras (rice bird) because these birds appear in the swidden ecosystem of Borneo during the planting season of rice (Smythies 1960: 264).

4.3.5 Rituals Associated with Traditional Agriculture

According to the Rancakalong farmers, the planting of rice should be carried out on an auspicious day and must be accompanied by traditional rituals. The precise day for planting rice is based on the farmer's or his wife's birthday, or the day of their marriage, in relation to the past experience of the most auspicious days for planting. In addition, the direction of planting is also influenced by the date of planting the rice. For instance, on the 1st, 2nd, and 3rd days, the direction of planting rice is towards the east, south, and north, respectively. Some activities, including planting and harvesting rice, are also avoided during taboo days (*waktu larangan*). Planting and harvesting of rice are prohibited on Saturdays and Sundays in the months of *muharram*, *safar*, and *mulud*; Mondays and Tuesdays in the months of *silih mulud*, *jumadil awal*, and *jumadil akhir*; Wednesdays and Thursdays in the months of *rajab*, *rewah,* and *puasa*, and Fridays in the months of *sawal*, *hapit*, and *rayagung* (Darpan et al. 2013; Warsiti 2009). Planting and harvesting during taboo days are said to result in crop damage or poor harvest.

Besides considering auspicious days, the Rancakalong farmers perform *upacara nitipkeun* (*nitipkeun* = entrusted), a domestic calendric ritual of planting rice. This ritual seeking blessings of God for the crops is usually conducted between 10 and 15 days after harvesting rice. These domestic rituals were facilitated by the male leaders of the family in the past. As the proficiency of men in rituals declined, they sought the help of informal spiritual leaders (*sesepuh/paraji*). Various plants such as *jawér kotok* (*Coleus atropurpureus* (L.) Benth), *taleus hideung* (*Colocasia esculenta* (L.) Schott, and *tamiang* (*Schizostachyum blumei* Nees) are collected and used in these rituals. Each plant used in the ritual has a different resonance. For example, *colocasia* has two colours: green and black, with green indicating fertility and black indicating protection (Table 4.2). The Baduy swidden farmers too practise a similar ritual. One of the plants predominantly used in Baduy is *hanjuang* (*Cordyline fruticosa* L.) which has two colours: green and red that symbolise body (*lahir*) and soul (*batin*) respectively (Iskandar 1998).

The ritual performance begins when an informal leader squats in front of the offerings. Incense is burned and prayer is recited (Warsiti 2009), seeking safety and success in planting rice. Like planting of rice, the time of harvesting rice must also follow an auspicious day and must be accompanied by traditional rituals. The special ritual undertaken before harvesting rice is *upacara nyalin.* A day before the harvest, a wooden platform named *rarangken*, *sawen* or *sanggar* made of wood is erected close to the farm shelter (*saung*) (Fig. 4.4).

Various plants, including leaves and fruits of *kawung* (*Arenga piñata* (Wurmb.) Merr), *sulangkar* (*Leea indica* Burm.f.) Merr.), and local rice varieties (*Oryza sativa* L) and their panicle are put in the *sanggar*. On the following day, banana, coconut,

Table 4.2 Some plants predominantly used for performing the ritual of planting rice in Rancakalong village

No	Scientific name	Family	Local name	Symbolic meaning
1	*Coleus atropurpureus* L	Lamiaceae	*Jawér kotok*	*Jawér kotok* comes from the word *jawér* (Sundanese) or *jengger* (*Indondesian*) and *kotok* (Sundanese) or *ayam* (Indonesian-chicken). *Jawer kotok* thus means chicken comb. *Kotok* is a metonym with another sense *kotokeun* meaning 'night blindness'. So, the plant is used to symbolically communicate that the activities of rice farming must be carried out carefully, unlike being *kotokeun*
2	*Colocasia esculenta* L	Araceae	*Taleus hideung*	*Taleus hideung* has two colours: green and black; green symbolises fertility and black symbolises protection
3	*Costus speciosus* L	Costaceae	*Pacing*	*Pacing* is a calendrical metonymy. *Pacing* is interpreted as *cicing* which means 'it does not move'. So, *pacing* is used to symbolically communicate that rice farming must be maintained forever
4	*Justica gendarusa* L		*Handarusa*	The name *handarusa* is derived from *diriksa* or *diraksa* which means it must be maintained; the rice crop planted in the wet-rice field must be maintained
5	*Schizostachyum iraten Widjaja*	Gramineae	*Tamiang pugur*	*Taming pugur* refers to the bamboo species *Schizostachyum iraten* Widjaja that has fallen leaves. The bamboo species are perceived to be strong. Therefore, rice farming activities must be strong or continue to be maintained throughout the period and should not stop or drop (*pugur*)

(continued)

Table 4.2 (continued)

No	Scientific name	Family	Local name	Symbolic meaning
6	*Styrax benzoin* Dryland	Styrataceae	*Menyan*	The aromatic smoke is culturally perceived as a medium of communication between farmers and mystic forces. In addition, it also repels insect pests

Fig. 4.4 A male farmer standing next to the *sanggar* in the plot of a wet-rice field before harvesting rice. *Photo* Johan Iskandar (2018)

tamarind, bread, red and white rice porridges, top of cone-shaped rice (*puncak nasi tumpeng* or *puncak manik*), coconut oil, turmeric, strand of betel leaf are left, covered by sugar palm leaves (*daun kawung* = *Arenga pinnata* (Wurmb.) Merr.) that are considered as decoration (*rarangken*). Traditional snacks such as *kupat*, *leupeut*, *bubur beureum*, *bubur bodas*, *papais bodas*, *papais beureum*, and *kueh bugis* are also left. The *sanggar* is then covered by a cotton white cloth or shroud (*kain kapan* or *boeh*). On the day of the rice harvest, a *paraji* is invited to perform the ritual *nyalin* in the *sangar* (Warsiti 2009). After the ritual, the foods in the *sanggar* can be consumed by the harvesters, particularly if the *sawah* owner comes late to deliver food for the labourers.

A traditional thanksgiving festival of post-harvesting rice, popularly known as the ritual of *ngalaksa*, is also celebrated by Rancakalong people. In the past, the *ngalaksa* festival was annually undertaken on a date determined by the *pranata mangsa*. Today, however, the festival and associated rituals are undertaken every 3 or 5 years, and more recently it has been linked to tourism promotion. Initially, the ritual *ngalaksa*

aimed to provide a tribute to the spirits of ancestors who had succeeded in finding and sustaining rice seeds and to show gratitude for the safety, blessings, and fortune afforded to the farmers. The hamlet where the ceremony is held is called *rurukan.* Today, 5 *rurukan* of sub-district Rancakalong have been determined by the local government as a centre of *ngalaksa.* The *rurukan* of Rancakalong, Cibunar, Cijere, Legok Picung, and Pasir Biru take turns to perform the ritual of *ngalaksa* in the month of the *kahiji* (July) of the *pranata mangsa.* The term *ngalaksa* is derived from *laksa,* i.e., food made from various rice flour. The *laksa* is made from local rice varieties called *paré buhun* or *paré ranggeuyan.* Three local rice varieties, namely, eldest water (*cikal cai*) from the wetland, eldest dry land (*cikal darat*) from the swidden, and youngest rice (*paré ketan*) of the sticky type are used for cooking. Plants including *congkok* (*Curculigo cavitulata* Gaertn.) and *cariang* (*Homalomena cordata* Schott.) are used for wrapping *laksa* and wrapping rice (*pangineban*), respectively. After the harvest, the traditional art of *tarangwangsa* is performed in the Rancakalong village when *kacapi* (zither) is played. Black, white, red, and yellow cloth, kris, comb, mirror, coin, grilled chicken meat, coconut oil, bamboo fan, chicken egg, grilled common carp fish, white rice, traditional cakes, fruits, flowers, incense, and *rujak* (banana, coconut, tamarind, coffee drink) also find major uses (Fig. 4.5).

Performing *tarawangsa* after harvesting rice ensures certain benefits, including the maintenance of traditional art and strengthening of communal bonding (*gotong royong*), as well as respect for rice and the local environment. In addition, *tarangangsa* has begun attracting tourists to Rancakalong village, bringing additional benefits for rural people.

Fig. 4.5 The performing of *tarawangsa* by playing a *kacapi* (zither) and offering various ceremonial materials as part of the traditional ritual of *ngalaksa. Photo* Johan Iskandar (2018)

4.3.6 Pranata Mangsa, *the Green Revolution, and Socio-cultural Changes*

When the Green Revolution was introduced in Indonesia in the 1970s, the aim was to increase paddy production through five approaches: introduction of HYVs, including IR5, IR8, IR22, and IR24; use of inorganic fertilizer and synthetic pesticides; improvement of rice cultivation; and improvement of irrigation. Unlike the lowlands of the Northern Coast of Java (cf. Breman and Wiradi 2002; Hart et al. 1989), the farmers of Rancakalong adopted the Green Revolution ten years later, in the 1980s. Since then, traditional wet-rice farming of Rancakalong has gradually changed. The modernisation of wet-rice farming through the Green Revolution has dramatically affected the ecological, socio-economic, and cultural aspects of the community. Post-Green Revolution, rice fields (*sawah*) are cropped with HYVs thrice every year, earning the name 'rice-rice-rice'. Dryland rice fields are mainly cropped with rice twice every year, interspersed with *cilembu* (*ubi cilembu* = *Ipomoea batatas* (L.) Lam.) crop. The system is named 'rice-*cilembu* sweet potato-rice'. The non-rice crops (*palawija*) have been replaced by *ubi cilembu*, because of the demand for *ubi cilembu* in urban markets.

In the past, all farmers cropped the traditional LRVs. However, a field survey conducted by Warsiti (2009) and our field research (2018) in Rancakalong village in 2008 documented that out of the 783 farming households, only 194 households (25%) cropped both the LRVs and HYVs, and the majority of the farmers (589 households 75%) cropped the HYVs. Respondents cultivating LRVs under the traditional system cited suitability for cropping in the highlands and good production (65%); requirement for traditional rituals, including *nitipkeun*, *nyalin*, and *ngalaksa* (20%); good taste for home consumption (10%); high price (3%); and resistance to pests (2%) as factors driving them. Before the Green Revolution, 60 local rice varieties were commonly farmed in the wetland fields of Rancakalong village. After the Green Revolution, only 20 local rice varieties are planted (Iskandar et al. 2018; Iskandar and Iskandar 2018; Warsiti 2009).

As mentioned earlier, farmers who have adopted HYVs do not follow the *pranata mangsa*, which stipulates two rice crops in a year and requires traditional LRVs to be planted. Of the 65 farmers cultivating both HYVs and LRVs, only 15 respondents (23%) recognised the traditional calendar (*pranata mangsa*), but reported applying it rarely now. Their planting season in the wetland field is just determined by the commencement of rain (*turun hujan*). The uniformity in collective actions determined by the *pranata mangsa* earlier does not exist anymore. Consequently, the planting and harvesting of rice are not synchronous across the community. Continuous cultivation of fields with the same crop has sustained the population of pests throughout the year. In the past, the *pranata mangsa* required the field to be fallowed or cultivated with non-rice crops after the rice harvest. As a result, populations of insect pests such as brown plant hopper were unable to survive continuously in the field. In addition, natural enemies of the brown hopper, including spiders and birds have been eradicated by pesticides introduced by the Green Revolution. Infestation of

pests including the brown plant hopper/*wereng coklat* (*Nilaparvata lugens* Stal) has frequently recurred since the switch over to intensive farming (cf. Fox 1991; Iskandar and Iskandar 2018; Winarto 2016). In addition, abnormal climatic patterns such as abundant rain in the dry season make situations conducive for the breeding of insect pests, and the rice crop is damaged by the brown plant hopper. The *pranata mangsa* would have predicted such outbreaks as it is refined through observation of local seasonal indicators that respond to the abnormal climatic patterns. In addition to pest disturbance, the climate change-induced drought disaster regularly hits the *sawah* farming system in the West Java region in recent decades. For example, in 2018, at least 22 districts of West Java, including 41,946 ha of Sumedang district, were hit by drought (https://regional.kompas.com/read/2018/09/05/21465611/22). Today, more frequent drought disasters and damage to the water basin are driving rice crop failure, because farmers are forced to cultivate HYVs throughout the year, regardless of the *pranata mangsa.* Therefore, the failure of rice crops due to drought and lack of water has become inevitable.

Traditional calendric rituals and ceremonies including *nitipkeun*, *nyalin*, and *ngalaksa* are rarely undertaken by the majority of farmers. According to our informants, in the past, majority of the farmers believed in the rice goddess, Nyi Pohaci. Rituals and festivals commemorating Nyi Pohaci required traditional rice varieties (LRVs) and were conducted by specialists called *rurukan.* As the belief in the rice goddess has decreased, the respect of farmers for traditional rice has also decreased. Together with the adoption of HYVs and modern irrigation, the need for consulting the *pranata mangsa* does not arise anymore. Tourism has led to the revival of festivals such as *ngalaksa.* However, the festival requires traditional rice varieties for the rituals. As a result, farmers are unable to fully participate in this festival. In addition, the timing of *ngalaksa* is not determined by the *pranata mangsa*, but by the government who has set July as the fixed month. Many *paraji* (informal spiritual leaders) who once facilitated domestic calendric rituals such as *nitipkeun* and *nyalin* have passed away, taking their knowledge with them.

Wetland rice farming based on the *pranata mangsa* and its associated beliefs foster a strong sense of group solidarity among community members irrespective of differences in demographic and socio-economic status (cf. Lovelace 1984). As the power and authority of *pranata mangsa* (Franco 2015) in directing the community's collective actions fade, the social capital declines, which in turn hampers agroecosystem management (cf. Franco 2015; Iskandar and Iskandar 2016; Khattri 2003; Lovelace 1984; Orlove et al. 2010; Prober et al. 2011; Xu et al. 2009; Yenrizal et al. 2018). Thus, the situation is complex, with changes in agricultural practices and religious beliefs leading to loss of calendric knowledge associated with the *pranata mangsa*; the loss of the *pranata mangsa* on the other hand deprives the community of an opportunity to practise climate-friendly agriculture that fosters communal bonding while maintaining agricultural productivity.

4.4 Conclusion

The traditional ecological calendar (*pranata mangsa*) is strongly embedded in the traditional beliefs of the Sundanese community. The *pranata mangsa* is complexly interrelated among factors such as climate and weather, water, rice diversity, local ecological conditions, and rituals. It had once played an important role in the management of rice farming in wetlands. However, the onset of the Green Revolution and the HYVs, together with the change in religious beliefs have weaned the people away from the *pranata mangsa.* In the context of sustainable and climate-friendly agriculture, we suggest that it would be in the interest of the community to hybridise the *pranata mangsa* with formal scientific knowledge to attain ecologically sound and economically viable agriculture that is adapted to the local environment and culture.

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Compliance with Ethical Standards In accordance with the requirements of the code of ethics, we conducted research firstly by asking for permission from the formal leader of the village, and before conducting interviews with the informants and respondents. We also received permission to ensure that the rights of individuals were not infringed upon.

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Conflict of Interest We declare that we do not have any conflict of interest associated with this paper.

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Chapter 5
The Intersection of Kedayan Folk Medicine and Traditional Ecological Calendar

Nurzahidah Bakar, F. Merlin Franco, and Noor Hasharina Hassan

Abstract A noteworthy feature of folk and codified traditional medicines is their ability to combine drug-based therapies with spiritual therapies. This unique combination differentiates them from the drug-based approach employed by modern biomedicine and renders them highly relevant to contemporary healthcare. Like folk medicine, traditional ecological calendars also embody the traditional knowledge held by local communities. However, the influence of ecological calendars on folk medicine has been largely underexplored; studies have mostly considered ecological calendars and folk medicine independent of each other. In this chapter, we provide an understanding of the traditional knowledge of the Kedayan community of Brunei Darussalam with specific reference to their folk medicine and their traditional ecological calendar. Data was collected through in-depth interviews that the first author held with sixteen knowledgeable elders from the Kedayan community of Brunei Darussalam between January 2018 and June 2018. The Kedayan classify causes of ailments broadly into two: ailments caused by factors of the unseen realm and factors of the seen realm. The former are treated by spiritual therapies and the latter using practices rooted in the humoral concept of well-being. The Kedayan traditional ecological calendar stipulates the right time for harvesting medicinal herbs and administering them. It links the potency of medicinal herbs to tidal cycles and also provides information on the seasonal occurrence of ailments. By focussing on the interface between the Kedayan folk medicine and the ecological calendar, the chapter draws attention to a hitherto underexplored area in folk medicine.

Keywords Traditional medicine · Humours · Healing · Medicinal plants · Post-Partum care

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5.1 Introduction

Formal science and traditional knowledge are often seen as two contrasting types of knowledge (Herbert 2000). Formal science is considered open, systematic and real, while the latter is considered as closed, unsophisticated, unintellectual, primitive and emotional. Thus, formal scientific knowledge is widely accepted and predominantly perceived as the whole idea of modernity, while traditional knowledge (TK) is either viewed as a traditional and backward way of life or as product of mere trial and error. In the context of poor and marginalised communities, traditional knowledge provides considerable benefits over western science as it is applied in the everyday life of the community (Davies 1994; Kallard 2000). It provides locale-specific information about trees and plants that grow well together, plants that serve as an indicator of soil quality, or the changing of seasons and local weather patterns (Dixit and Goyal 2011). It also serves as the basis for decision-making at the local level in agriculture, food preparation, education, natural resource management and healthcare. Studying traditional knowledge provides an insight into how people have used and depended on the environment as well as its resources (Veitayaki 2004).

Healing is one of the most important applications of traditional knowledge. Traditional codified medicine was popular as early as 1600 B.C. among Syrians, Babylonians and ancient Hebrews (Edae et al. 2017). In India, the earliest reference of the use of plants for medicinal purposes appears in Rig Veda, which is said to be written between 1600–3500 B.C. (Prakash and Gupta 2005). By the end of the twentieth century, most of the population in developing countries were still relying on traditional codified and folk medicines to meet their primary healthcare needs (Balick and Cox 1996; Etana 2010; Setswe 1999). Contrary to modern biomedicine, folk and codified traditional medicines employ a combination of spiritual and drug-based healing approaches (Edae et al. 2017; Franco and Narasimhan 2012). In folk medicines, herbs and other remedies are used to treat infections, disorders and physical injuries, while rituals, counselling and folk wisdom are used to enhance spiritual well-being (Kamsani et al. 2020). Thus, folk medicines aim to promote mental, physical and spiritual well-being in a holistic way, characteristic of the respective cultures (Coleman 1996; Kibebew 2001).

Although folk medicine is associated with the beliefs of the community, the underlying knowledge is not widely dispersed throughout the community. Rather, it is concentrated in the hands of folk healers who have painstakingly conserved and put it into practice on a daily basis (Kamsani et al. 2020). In addition, folk medicines usually lack written texts. Thus, folk healers play a crucial role in local healthcare by virtue of being the living repositories of medicinal knowledge. Pretorius (1999) defines a folk healer as someone who is recognised by the community for her/his competence in providing healthcare by using plants, animals and other mineral substances. Their way of treating patients is holistic, dealing with the physical and psychological aspects of a disease. Folk healers often specialise further, focussing on certain aspects of healthcare such as injuries, poisonous snakebites, skin ailments, fever, allergies, diarrhoea, stomachache, etc. (Tapan 2014).

Procurement of resources from the environment (including plants used in folk medicine) requires specific knowledge on the habitats where they are found, and the appropriate time to collect. Yet, overharvesting of these could lead to depletion. This is prevented by customary laws and taboos that regulate access to and withdrawal of resources. The phenology of plants and animals, their habitats, cultivation of crops and medicinal plants are all locale and time-specific knowledge embedded in the traditional ecological calendars (Franco 2015). In Northern Australia, diverse sets of traditional ecological calendars are used to make decisions related to gathering wild edibles, hunting, fishing, etc. (Woodward et al. 2012). The farmers in the Southwestern Free State of South Africa also use traditional ecological calendars to forecast weather phenomena and undertake agricultural activities (Zuma-Netshiukhwi et al. 2013). Ethiopians are known to rely on a seasonal calendar to predict the availability of medicinal plants. The month of *pagume* in the Ethiopian calendar is considered to be the best time to collect medicinal plants. Marking a specific month of the year for medicinal plant harvest perhaps prevents the overharvesting of medicinal plants (Mesfin et al. 2009). The importance of calendar and time in healing is not limited to predicting the seasonal availability of medicinal plants. Healers might consider certain days as auspicious days to treat ailments. Discipleship, which is an important means of transmission of knowledge in folk medicine, might also depend on the prediction of auspicious timing (Franco and Narasimhan 2012). Most studies dealing with ecological calendars, however, have focussed on the seasonal availability of natural resources and climate change mitigation; their relevance in folk medicine has been overlooked. Thus, this research was conceived to understand the interface between folk medicine and the traditional ecological calendar. We collaborated with the Kedayan community in Brunei Darussalam to document their folk medicine and their ecological calendar with the following objectives:

(a) To understand the philosophical basis of the Kedayan folk medicine; and
(b) To elucidate the interface between the Kedayan folk medicine and ecological calendar.

5.2 Research Methods

5.2.1 Study Design

This study employs a qualitative approach. We used in-depth interviews carried out in a conversational style, to elicit information on the Kedayan folk medicine and traditional ecological calendar. New knowledge is obtained through in-depth conversations between the interviewer and the interviewee on the theme of interest (Kvale and Brinkmann 2009). Hiatt (1986) considers qualitative research as a method of discovering and understanding the experiences, perceptions and thoughts of knowledge partners. As qualitative research is aimed at generating rich data, it relies heavily on purposive sampling (Patton 1990), where the researcher chooses the knowledge

partners on the basis of their presumed expertise/in-depth knowledge/experience on the topic under investigation (Bernard 2002; Lewis and Sheppard 2006).

5.2.2 *Location and Area of Study*

The study was carried out in Brunei Darussalam from January 2018 to June 2018 in collaboration with the Kedayan community. According to the Preliminary Report of the Population and Housing Census (2011), the Kedayan population of Brunei Darussalam in 2011 was 23,720, of which 12,291 (51.8%) were males and 11,429 (48.2%) were females (Fig. 5.1).

A total of sixteen (n = 16) community members purposively sampled on the basis of their reputation for possessing TK related to folk medicine and calendar participated in the study. We refer to them as 'knowledge partners' to recognise their contribution to the study in the form of TK. In the past, the Kedayan were either farmers, hunters or fishermen—all occupations dominated by the male folk. Thus, most of the knowledge partners we could identify were male (n = 13; female n = 3). The knowledge partners were community elders ranging from approximately 40 to 95 years of age and six of them were healers (male n = 5; female n = 1). Results were organised on the basis of the following themes: concept of health and well-being,

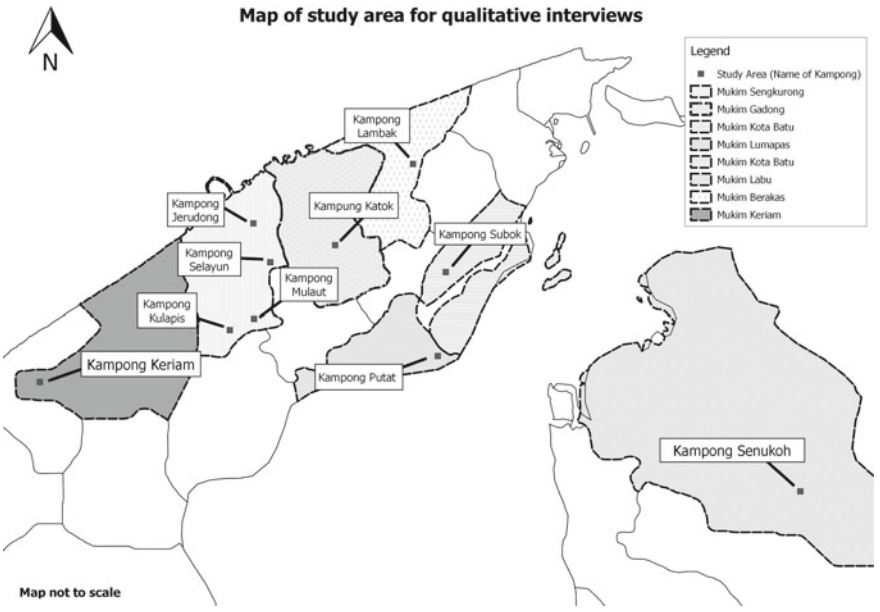

Fig. 5.1 Map of the study area for qualitative interviews

causes of ailments, methods and the synergies between the Kedayan folk medicine and their traditional ecological calendar.

5.2.3 The Kedayan Community

The term 'Kedayan' is defined in *Kamus Dewan* as an 'escort' or 'slave' (Noresah 2005: 702). This term is often linked with the life of the community during the feudal era as escorts to the king. Many scholars have attributed a Javanese origin to the community, relying on oral history (Bantong 1984; Shariffuddin 1969). It is widely said that Sultan Bolkiah (1473–1521 A.D.), the fifth Sultan of Brunei was impressed by the green rice fields he visited in Java and decided to bring a few Javanese rice farmers to Brunei to initiate paddy cultivation. Syair Awang Semaun, an epic poem suggests that the Kedayan came to Brunei in the fourteenth century. When the prince of Java, Raden Ang Suka Dewa lost in cockfighting to the first Sultan of Brunei Awang Alak Betatar (1363–1402 A.D.), he had to surrender his Kedayan sailors to the Sultan of Brunei as a reward (Hasan 2008; Rahim 1992; Sablee 1994). This formed the basis for interpreting the meaning of Kedayan as an escort of the king. However, Druce (2020) argues that the Kedayan community originated in Borneo, and in the past, the Barunay (Brunei Malay) and the Kedayan should have formed a single homogenous group. The fact that both Kedayan and Brunei Malay languages share high similarities (Clynes 2001; Nothofer 1991; Rosinah 2007), is cited in favour of such argument.

The Kedayan initially practised their indigenous folk religion (Ramlee 2006). Later, they began following Hinduism, Buddhism and Islam (Osman 1989). The Kedayan conversion to Islam is believed to have occurred in the late fifteenth century (Harrison 1972; Ramlee 2006). The Kedayan traditionally practised agriculture (Shariffuddin 1969), fishing, hunting and gathering jungle products (Ramlee 2006). During the Japanese invasion of 1941, the Kedayan of Brunei contributed to local food security by prospecting naturally available plant resources such as *Nypa fruticans* Wurmb to produce famine foods (Franco and Bakar 2020). In contemporary Brunei, the Kedayan have diversified into various occupations brought in by the oil and gas-based economy (Maxwell 1996).

5.3 Results and Discussion

This section is divided into two: the first Sect. 5.3.1 deals with the Kedayan folk medicine where we discuss the findings related to the Kedayan understanding of ailments, ailments caused by factors of the unseen and seen realms and the associated healing practices, the philosophical basis of Kedayan folk medicine, humours and medicinal plants. In the second Sect. 5.3.2, we focus on the intersection of Kedayan

folk medicine and their ecological calendar, where we examine the influence of the ecological calendar on Kedayan folk medicine.

5.3.1 Kedayan Folk Medicine

5.3.1.1 Kedayan Understanding of Ailments

Folk healers of the Kedayan community are known by the term *orang pandai* which is translatable into 'knowledgeable person'. The term is commonly applied in contemporary Brunei Darussalam to refer to folk healers irrespective of ethnic background. The *orang pandai* are healers who have harmonised their indigenous beliefs with that of Islam to avoid cultural conflicts (Roseberg 2017). They are culturally described as folk healers who are skilled in conducting rituals and prayers to obtain harmony and blessings. The term *orang pandai* appears to be non-controversial and is an acceptable term for healers who used to be known as *bomoh* decades ago (Roseberg 2017). It is widely believed in Brunei Darussalam that the practices of *bomoh* deviate from the teachings of Islam, while those of *orang pandai* do not (Muller 2018).

In Kedayan folk medicine, a person is considered healthy if he or she has the capability to perform routine work. According to our knowledge partners, the understanding of good health and ill health in the past was quite different from now. People's conceptualisation of health in the past was the state of being free from any ailments including those attributable to the influence of factors of the unseen realm, often involving 'witchcraft'. At present, the concept of ailments has evolved to encompass several 'modern ailments' such as diabetes, high blood pressure, etc. caused by lifestyle changes. From the findings, we understand that people's conceptualisation of health does not only focus on the physical condition, but is also linked with the mental well-being of an individual. The findings reveal that according to the Kedayan beliefs, the world comprises of *alam halus* (unseen realm) and *alam kasar* (seen realm). Accordingly, human ailments are caused by two major factors: (i) *punca halus* (factors of the unseen realm) and (ii) *punca kasar* (factors of the seen realm). Irun (2005: 10, 27) also reports these two categories, while Roseberg (2017: 80) reports the categorisation as usual (*biasa*) and unusual (*luar biasa*) ailments.

5.3.1.2 Ailments Caused by Factors of the Unseen Realm (*Punca Halus*)

For the Kedayan, certain ailments are caused by forces such as *jinn*, evil spirits, failure to observe taboos or casting of evil spirit (*pantak* or *sihir*). Similar to the experience of the Brunei Malay community (Roseberg 2017), much of the present-day Kedayan beliefs related to ailments caused by factors of the unseen realm appear to be a hybridisation of Kedayan indigenous beliefs and Islamic ones. The Kedayan believe that spirits have existed since the beginning of human history, and they define them as 'creatures that live in the unseen realm' (Moeliono 1988; Noresah 2013).

Their beliefs today, are in sync with the Islamic concept of *jinn*. Consequently, they draw a distinction between *jinn* and *iblis*. In Arabic, the word *jinn* refers to something that is concealed and hidden. According to Leaman (2006), the *jinn* are a part of divine creation, but share certain qualities with humankind, like intellect, discrimination and the capacity for freedom even though they are separate from humanity and angels (Glasse 1989). They also live among humans and in unhygienic places such as bathrooms, graveyards, slaughterhouses, rivers and ponds (Limenih et al. 2015). *Jinn* are also considered capable of making themselves visible, often presenting themselves in the form of an animal such as a cat, a dog (black), a donkey, a scorpion, a bird, a goat, or a snake (Ameen 2005; Lebling 2010). Unlike *jinn*, the concept of evil spirits comprises the devil (*iblis*) and *shaytan* (satan). Ibn (2008) states that whoever prefers to disturb *jinn*, humans and animals are called Satan.

Ailments caused by factors of the unseen realm predominantly occur when someone wanders outside the house or sleeps during *maghrib* (sunset prayer/dusk). For the Kedayan, it is traditionally forbidden to sleep between *asar* (afternoon prayer) and *maghrib* (sunset prayer) prayers. They believe that the spirits are at the peak of their strength during this time, rendering situations conducive for them to possess a victim. According to the healers, the spirits look for opportunities to enter human bodies, especially those who have weak souls (*lemah semangat*). They can enter the human body assuming various ethereal forms such as monkey, tiger, pig, *pontianak* (female vampiric ghost), or Satan (*iblis*) to possess them. These spirits typically enter the human body through orifices such as private parts, mouth, ears and sometimes through the umbilicus (navel), inflicting both physical and mental ailments. Hence, for the Kedayan, it is important to cover one's private parts and navel while sleeping.

For the Kedayan, the *jinn* are benevolent spirits, while the *iblis* are evil. The *iblis* are capable of causing trouble anytime, while the *jinn* do not harm humans unless disturbed. Disturbing a *jinn* could lead to various ailments. Failure to observe taboos such as entering a forest without asking 'permission' from the tutelary *jinn*, felling trees that are guarded by a guardian *jinn*, and purposely desecrating the abode of *jinn* would lead to ailments that can only be cured by a healer. One of the knowledge partners described an instance of *keteguran*, the ailment that befalls people who violate guardian spirits of particular localities:

> *I once treated a Filipino patient…He had urinated over a place that had its jinn (caretaker of the place). Once he got home, he felt very sick and his body felt heavy until he was brought to me to be treated. When I looked at him, there was 'something' (spirit) hanging around his body, and now he's fully healed after being treated by me.*

The above statement establishes the disturbance of a *jinn* as the cause for *keteguran*. However, by choosing the example of a foreigner, our knowledge partner also underlines the need for being aware of local customs and beliefs. Patients suffering from *keteguran* show symptoms of fever, which cannot be cured through modern biomedicine.

Ailments could also be caused by evil spirits cast by an enemy (*pantak* and *ranggau*). Our knowledge partners report that such ailments are rare to come by these days.

5.3.1.3 Healing Ailments Caused by Factors of the Unseen Realm (*Punca Halus*)

The healing practice for ailments caused by factors of the unseen realm focuses on restoring the spiritual health of an individual for which the healer conjures benevolent spirits using rituals that are in harmony with the Islamic faith. Treatments for afflictions caused by factors of the unseen realm include exorcism. The healer first examines the patient to understand the kind of spirit that entered his/her body. Evil spirits or *jinn* with hideous faces are non-Muslim in nature and have to be converted to Islam prior to the treatment. The healers find it easier to deal with evil spirits that had invaded the patient's body, than those who have not. The healer can thus initiate a dialogue and probe into the reasons for entry into the person, the origin of the spirit and its requirement, before warning it and casting it away.

Exorcism involves the application of medicinal plants and an appeal to spiritual forces (Qur'anic verses). One of the knowledge partners uses *bidara* (*Ziziphus mauritiana* Lam.) leaves and coarse salt during the exorcism; the leaves are applied in odd numbers. *Bidara* leaves are used for bathing along with the recital of proper prayers. It is also believed that both evil spirits and *jinn* are afraid of *bidara* plants, and hence it is advisable to eat the fruits of *bidara* to prevent any disturbance from them. The function of the coarse salt here is to neutralise the negative energy from the patient's body when the exorcism is carried out. According to an 87 years old knowledge partner, *keteguran* is cured by *mandi bertawari* (the act of reading Qur'anic verses on water) or bathing during incantation and reciting prayer over the patient. Holy water will be provided to drink and nausea would then indicate the presence of evil spirits or *jinn* in the body.

Healers find it difficult to perform an exorcism when the patient is a female on her menstrual cycle. Evil spirits or *jinn* are believed to be attracted to women who are not 'clean' and thus refuse to leave the patient's body. Such experiences are commonly associated with the *pontianak* (female vampiric ghost). There are abstinences to be followed post-healing such as: avoiding staring at the mirror for too long, avoiding ornaments that chime, whistling, and sleeping between *asar* (afternoon prayer) and *maghrib* (sunset prayer) prayers. Failure to adhere to these would attract the spirits back to the body. Interestingly, consumption of wild game such as deer, mousedeer, etc. should also be avoided as they are believed to belong to the caretaker *jinn* of the forests. Post healing, coarse salt is sprinkled around the house to protect the house from the re-entry of the spirit. Such an act should not be done during *maghrib* prayer and care should be taken not to look back while sprinkling the salt. To protect individuals against spirits and poisonous wild beings (snakes and scorpions), *mali mali berduri* (*Leaa indica* (Burm.f.) Merr.) is recommended to be planted in the home garden. *Talimpanas* stalks can also be used to repel wild and poisonous animals. To protect oneself from the disturbance of evil spirits and *jinn*, species of *talimpanas* (*Goniothalamus* spp.) can be used as an amulet. The belief in the magical power of *Goniothalamus* spp. has also been reported from the Dusun community of Brunei Darussalam (Kamsani et al. 2020; Voeks and Nyawa 2006).

5.3.1.4 Ailments Caused by Factors of the Seen Realm (*Punca Kasar*)

Most ailments in this category arise due to the disobedience of cultural norms that are meant to help humans live in harmony with nature. Such causes of ailments described by our knowledge partners are as follows:

(a) **Infectious agents**: Ringworm, *huntut* (swelling), *sekalur* (pain in the feet), various types of fever locally categorised into *demam panas*, *demam kura*, *palih* and *senudong*, and *sawan* (seizures) in children fall into this category. The Kedayan believe that these ailments originate due to the violation of cultural norms such as having skin contact with an infected person. These ailments are thus capable of being transmitted from one person to another. Such cultural norms are part of the human behavioural immune system meant to minimise the spreading of infectious ailments through proximity, and are commonly observed in collectivistic societies (Schaller 2011; Schaller and Park 2011).

(b) **Change in foodways**: According to one of our knowledge partners, change in dietary practices and food culture explains the difference in the nature of the ailments experienced by the people in the past and present. People in the past did not eat sugary and salty foods, hence ailments such as diabetes and high blood pressure were uncommon to them. Whereas, at present, the intake of such foods has increased, leading to the emergence of 'new' ailments such as high cholesterol, diabetes, high blood pressure, kidney failure, heart attack, etc.

(c) **Change of season**: Several ailments, predominantly common cold and cough, are often attributed to seasonal changes, especially during the flowering season that precedes the fruiting season.

(d) **Postpartum disorders**: It is believed that new mothers experience a mix of physical and emotional changes if they do not follow the stipulated abstinence (food restriction and certain practices) after childbirth during the confinement period.

(e) ***Angin* or wind and tide of the ocean**: Hernia in children locally known as *burut* for male infants and *buntal-buntalan* for female infants is believed to be caused by *angin* (wind). This is discussed further in Sect. 5.3.1.5.

5.3.1.5 Healing Ailments Caused by Factors of the Seen Realm (*Punca Kasar*)

The Hippocrates corpus espouses the humoral approach to human well-being (Javier 2014). According to the humoral approach, the human body is comprised of four humours (fluids), viz. phlegm, blood, yellow bile and black bile (Bhikha and Glynn 2017). A proper state of health requires a balance of these humours within the human body (Bhikha and Glynn 2017; Bujalkova et al. 2001; Javier 2014; Kalachanis and Michailidis 2015). The humours are linked with the four fundamental elements of the 'natural world', viz. fire, air, water and earth. Phlegm is related to water, blood with air, yellow bile with fire and black bile with earth. This belief is also widely

shared by the medicines of the Malay Archipelago (Hart 1969). In line with the view of Hippocratic corpus, medicines of the Malay Archipelago advocate that the proportions of humours in a human body define human temperament, giving rise to hot, cold, damp or dry constitutions (Hart 1969; Kalachanis and Michailidis 2015; Kushner 2013).

The Kedayan recognise human constitution as either 'hot' (*panas/hangat*), 'cold' (*sajuk/dingin*) or 'normal' (*selulu*). Like most humoral medicines (Bhikha and Glynn 2017), the Kedayan approach to healing rests on balancing the 'hot' and 'cold' nature by employing contraries. An overtly hot nature is balanced by prescribing cold medicinal formulations, and vice versa (Aamir 2018; Bhikha and Glynn 2017; Kushner 2013; Tuschinsky 1995). It is noteworthy that the imbalances could also result from food, weather and other routine activities (Tobyn 1997). Thus, an appropriate diet is an integral part of any healing process. In the following paragraphs, we provide examples of fever, post-partum healthcare and hernia to illustrate the Kedayan approach to healing diseases due to natural factors by employing contraries.

The Kedayan recognise infections, change in foodways, change of seasons and child delivery as natural causative factors of ailments. These factors alter the 'normal' nature of the human body—a view, as mentioned earlier, shared by the medicines of the Malay Archipelago (Hart 1969; Manderson 1987; Tuschinsky 1995). For instance, fever is caused by infections and change in season, which renders the human body 'hot'. To restore balance, the Kedayan healers administer *pandingin* as a contrary. *Pandingin* (*Bryophyllum pinnatum* Kurz.) is believed to possess cooling properties and thus prescribed to relieve headache and reduce body heat.

Post-partum ailments are treated similarly. Many cultures stipulate post-partum confinement periods to restore the health of the new mother (Dennis et al. 2007). The Kedayan believe that after childbirth, new mothers enter a state of 'cold' as they lose 'hot' blood during delivery. Hence, cold foods including certain fruits and vegetables, and chilled drinks are forbidden for new mothers. There are also restrictions on women's movement as well as confinement practices to be followed for 44 days. Strenuous household chores such as lifting heavy materials should be avoided during this period. The Kedayan believe that new mothers experience physical and emotional changes if they do not follow the stipulated abstinence (food restriction and other taboos). During the 44 days post-partum period, her body balance must be restored by the addition of heat both internally and externally. This can be achieved by consuming hot food such as warm chicken soup and anchovies with ginger. The chicken soup is believed to enhance digestion, circulation and metabolism, while anchovies are great sources of protein, low in calories, high in omega and fatty acids, also an excellent source of calcium. Ginger helps to warm the body of a new mother. New mothers also practise '*berdiang*' where warm charcoal is placed near their stomach to heal the internal injuries. This practice bears similarities to *yu fai* (mother-roasting) practised by local communities in Laos, where bamboo beds of new mothers are heated with hot coals placed underneath (Sychareun et al. 2016).

The cold nature of new mothers results in their 'melancholic' state. To restore mental health during the post-partum period, Kedayan healers prescribe a traditional massage for the new mother. This helps in reducing post-partum depression, anxiety

and fatigue, restoring tense or inflamed muscles, joints and nerves in the pelvic region and improving lactation. In addition, the massage promotes good sleep. The Kedayan healer would also prescribe 'hot' medicinal plants mixtures to rectify the 'cold' nature of mothers. For example, the concoction of medicinal plants such as *sambung* (*Blumea balsamifera* (L.) DC.), *ringan-ringan* (*Flemingia strobilifera* (L.) W.T.Aiton) and *kuduk-kuduk* (*Melastoma malabathricum* L.) is used to bathe the mother on the 3rd, 7th, 14th and 44th day after giving birth. Mothers in post-partum confinement should also avoid exposure to wind and cold. The belief that new mothers enter a 'cold state' is also shared by various other cultures that use a humoral approach to healing including Amazonian, Chinese, Hmong, Laotian and Burmese cultures (Chien et al. 2006; Morrow 1986; Piperata 2008; Sein 2013; Sychareun et al. 2016). A central theme in these medicines is the focus on restoring the mother's body to a normal state of health through the use of contraries.

Hernia (*burut* and *buntal-buntalan*) is another disease that is treated by the Kedayan healers using contraries. The Kedayan associate *angin* (wind) and tides as the causative factors of hernia. The exact causation factor is determined symptomatically. Hernia caused by *angin* (*burut* and *buntal-buntalan*) is diagnosed by a 'wind' sound in the abdominal part of the infant. Treatment employed involves the application of lime chalk to the tip of a nail (fastener) and rubbing it on the infant's abdominal part. Hammering the nail (fastener) into the wood, following this treatment is believed to shift the focal point of the disease from the infant to the wood. Another method involves using a spoon to remove the 'wind' by stirring it in the painful area, accompanied by a recital of prayers.

Hernia associated with tides is diagnosed by the symptoms of swelling and foaming at the abdominal region of infants which is similar to the characteristics of high tide. Crushed betel nuts (*Areca catechu* L.) are chewed to a smooth paste and wrapped around the infant's stomach for three days in a row. The Kedayan believe that betel nuts are 'hot' in nature, capable of countering 'cold' hernia. There are also abstinences to be followed by the healer when healing hernia; people other than the infant and their mother are not allowed to witness the healing procedure. Also, the healing process cannot be conducted during high tide. According to Roseberg (2017: 92), the term *angin* is used by Brunei Malays and Kedayan as a metaphor for 'spirits'. The application of lime and hammering of nail all tend to concur with Roseberg's observation. However, none of our knowledge partners interpreted *angin* as a supernatural factor.

5.3.1.6 Prophets and Medicinal Plants

One of our healers narrated a folktale. According to him, a prophet named Astaqim was murdered, and all of his body parts were cut and dispersed over hills, water and flat land. Those that were dispersed over flat land grew into medicinal plants. The bitter taste of the medicine is the bile (*hempedu*) of prophet Astaqim. Thus, for the Kedayan, there are various guardians of medicinal plants. Medicinal plants on the hills are watched over by the prophets Alias and Yunos, while the guardian of

medicinal plants on flat land is prophet Astaqim. Medicinal plants that grow in or near water bodies are guarded by prophet Hailir. Hence, it is important to greet the respective prophets first by mentioning their names before harvesting the medicinal plants. This act of seeking permission is known as *menjunjung*. All the procedures and precautions mentioned by the knowledge partners on how to harvest the medicinal plants are similar to those reported by Irun (2005).

There are proper conducts on how to plant and harvest medicinal plants for healing purposes. While planting or sowing, the planter is required to breathe out and then recite prayers. The invocation while sowing the medicinal plants into the soil is: '*I plant this medicine for the offspring of Adam*'. The understanding is that the resource is meant for the well-being of the entire humankind irrespective of cultural and religious differences. Likewise, the healer or anyone must inhale deeply while harvesting the medicinal plant/part, followed by the invocation. Leaves of medicinal plants must be harvested in odd numbers such as three (3), five (5), seven (7) or nine (9) leaves. The significance of these numbers is unknown. The harvester has to face the east side, where the sun rises (*matahari hidup)* and the *qiblah is*, the direction of the Kaaba (the sacred building at Mecca, to which Muslims turn for prayer). It is important to make sure that no one enquires where he or she is going when harvesting the medicinal plants. Such enquiries would turn the medicine ineffective.

The findings of this study are consistent with reports of similar beliefs of Brunei Malays (Kipli 1994; Roseberg 2017). Irun's (2005) study reports that the Malay communities including the Kedayan believe that ailments are caused by factors of the unseen and seen realms which is recorded in our study as well. The Kedayan claim that an imbalance of hot and cold humours in the body leads to the manifestation of ailments, and the balance can be restored by employing 'contraries' is similar to the Unani System of Medicine (Aamir 2018; Hart 1969). Communities are known to attribute a diverse range of causative factors for ailments (Foster 1978). Such cultural understandings of ailments are not definite and are bound to change as the horizons of knowledge also change. For instance, the Konso people of southwestern Ethiopia traditionally believed that ailments are caused by supernatural forces, while the young and educated people of the current generation attributed the causes of ailments to natural factors such as contagious germs (Workneh et al. 2018).

5.3.2 Intersection of Kedayan Folk Medicine and the Traditional Ecological Calendar

Local communities often see a causative relationship between calendric time and ailments (SantoDomingo et al. 2016). They have specific time preferences for harvesting medicinal herbs and their administration for healing (Franco and Narasimhan 2012: 116–117). Folk medicinal practices are also embedded in the spiritual beliefs of the local communities (Kamsani et al. 2020). Therefore, it is not surprising that in most local communities, shamans are the healers as well as

calendar keepers (Ho and Lisowski 1993: 8). The role of ecological calendars in bridging the spiritual aspirations of communities with temporal scale is well-known (Khattri 2003; Franco 2015; Prober et al. 2011). The intersection between calendric time and folk medicine, however, has largely been overlooked.

In addition to healing, our knowledge partners also reported that they consult *orang pandai* on calendric activities such as agriculture, hunting and fishing that require knowledge on local seasonal indicators. This indicates that the *orang pandai* had also traditionally acted as the calendar keeper. For the Kedayan community, the harvesting of paddy is usually initiated by the *orang pandai*, followed by other members of the Kedayan community. They are also skilful in observing the local seasonal indicators, phases of the moon and advise the community on communal activities to be carried out. Our study finds the Kedayan calendar and time intersecting with the healing practices in three different areas: (1) medicinal plant harvest, (2) occurrence of ailments and (3) treatment of ailments.

5.3.2.1 Kedayan Ecological Calendar and Medicinal Plant Harvest

Phytochemical content in medicinal plants is known to vary according to seasons. Adverse weather conditions are known to increase phytochemical levels, which is often cited as the reason behind temporal preferences shown by local communities to harvest medicinal plants (Mwale et al. 2005; Ncube et al. 2011). The Kedayan have specific days and times for harvesting medicinal plants and using them in treatments. However, we could not come across any medicinal plants that are harvested only at certain months or seasons. In western biomedicine, many doctors believed in the influence of planets on the potency of medicinal herbs, and the need for harvesting them at appropriate planetary hours. Culpeper (1814) provides a list of such planetary hours. This tradition within biomedicine gradually faded off with scientific advancements. Yet, folk healers all over the world continue to prescribe auspicious timings for harvesting medicinal herbs. The folk healers of Ethiopia prefer to collect medicinal plants during the summer season and in the month of *pagume* as per their traditional ecological calendar (Limenih et al. 2015; Mesfin et al. 2009). The folk healers of the Bonda community of the Koraput region of India prefer to collect medicinal herbs only on dry days (Franco and Narasimhan 2012: 116–117). Albuquerque (2016) reports that local pharmacopoeias in areas of Northeast Brazil with Caatinga vegetation are influenced by the seasonality of plants available. Unlike the highly seasonal Caatinga vegetation, Brunei's forests are non-seasonal, owing to the equatorial climatic conditions with year-round rainfall. Brunei has only two distinct seasons: a first rainy season due to the influence of the Northeast monsoon, and a second rainy season due to the influence of the Southeast monsoon (Shams and Juani 2014). Such conditions that permit the year-round availability of medicinal plants are reflected in the Kedayan calendric preferences for harvesting them throughout the year.

The findings reveal that for the folk healers, there are specific days and times to prepare the medicine for healing as means of enhancing the potency of medicine.

Healers stated that the best time to extract medicinal plants is early in the morning. This is attributed to the cultural notion that the sun is considered 'alive' or optimal during dawn. Consequently, this is the time when plants receive energy from the sun, which increases the potency of medicinal plants. A few knowledge partners we interviewed claimed that harvesting medicinal plants can be done at any anytime except during *maghrib* (sunset prayer or dusk) and anytime during *azaan/adhan* (call summoning Muslims for mandatory prayer). This could be due to the belief that evil spirits or *jinn* wander around during *maghrib* (sunset prayer or dusk), hence making individuals vulnerable to more ailments. This is in contrary to the preference of reports from Ethiopia where folk healers preferred to harvest medicinal plants at dusk on Wednesdays and Fridays (Limenih et al. 2015). The diversity in time preferences reported indicates that such preferences are rooted in the respective cultures.

5.3.2.2 Calendar and Occurrence of Ailments

Local communities see a causative relationship between certain periods of the year and the occurrence of ailments. Rate of the prevalence of infectious ailments such as malaria spike during certain seasons that are conducive for the proliferation of the pathogen vectors (SantoDomingo et al. 2016). There are also ailments such as cancer, Alzheimer's disease and depression that are linked to the human biological clock (Deng 2018). The Kedayan see a similar connection between time and ailments caused by factors of both realms. Rapid change of season is a natural factor believed to cause ailments such as cold and cough. Likewise, high incidences of cold and cough are encountered during *musim bunga*, the flowering season. The Kedayan also see a correlation between the occurrence of hernia (*penyakit burut* and *buntal-buntalan*) and high tides (Sect. 5.3.1.5), a belief also reported by the Malay community of Kampong Ayer in Brunei Darussalam (Irun 2005). On the other hand, ailments such as spirit possession typically occur during *maghrib*. Our knowledge partners link this belief to Islam where *maghrib* is considered as a favourable time for evil spirits.

5.3.2.3 Calendar and Treatment of Ailments

The folk healers of the Kondh, Poraja and Gadaba communities of Koraput region of India consider certain days and times as auspicious and inauspicious for carrying out (or not) healing procedures (Franco and Narasimhan 2012: 116–117). The Kondh also believe that the rat snake turns poisonous on a Sunday. Therefore, the *dishari* (shaman) would deny treatments to such victims (Franco and Narasimhan 2012: 116–117). In Zimbabwe, poultry farmers prefer certain periods of the year to administer *Aloe vera* and *A. spicata* to fowls although both species of *Aloe* are available throughout the year (Mwale et al. 2005). Temporal preferences for administering medicine are observed in Kedayan folk medicine too. Most of our knowledge partners stated that low tides are the best times to consume medicinal preparations. High tide is believed to increase the potency of sickness (*menahan penyakit*), while low

tide cures (*membuang penyakit*). The high and low tides of the ocean are also associated with certain ailments such as hernia (*burut* and *buntal-buntalan*) that appear in correlation with high tides, showing symptoms of swelling and foaming of the organ affected. Hence, the treatment of such ailments (*burut* and *buntal-buntalan*) must be performed during low tides to avoid worsening of the condition (Sect. 5.3.1.5). It is also forbidden for the Kedayan to consume medicinal plants when it rains as the harvested medicine would lack potency. The findings are consistent with that of Irun (2005) that environmental elements such as the sun, moon and water are widely associated with the potency of medicine in Brunei Darussalam.

5.4 Conclusion

Our study focuses on the Kedayan folk medicine and its interface with their traditional ecological calendar. The findings reveal that the Kedayan have their own understanding of health and ailments. The causes of ailments can be broadly categorised into two—those inflicted by factors originating in the unseen realm and those caused by factors of the seen realm. The Kedayan associate the ailments caused by factors of the unseen realm to the actions of spirits such as *jinn* and evil spirits. These types of ailments are cured by folk healers who are knowledgeable in spiritual healing that includes the recitation of Qur'anic verses. For patients who are possessed, the spiritual healing method is used in combination with medicinal plants. The ailments caused by natural factors are attributed to the disobedience of natural laws or infectious agents of ailments, due to changes in foodways, change of season, post-partum disorder or due to *angin* (wind) and tidal cycles. Such factors alter the normal state of the human body, which is then rectified by employing contraries that include food and medicinal plants.

Our study finds specific areas where the Kedayan folk medicine intersects with their ecological calendar. The Kedayan believe that there are specific days and times to harvest and administer herbal medicine. However, there are no medicinal plants that can only be collected at certain months or seasons in the Kedayan calendar. There are specific time preferences for harvesting medicinal plants and their administration. There are also specific times that are considered conducive for the occurrence of ailments due to the possession by evil spirits. The tidal cycle plays an influential role in the community's folk medicine. Ailments such as hernia (*penyakit burut* and *buntal-buntalan*) occur during high tide. Likewise, treatment of ailments should only be carried out during low tides as low tides are known to enhance the potency of herbs.

Our study provides an understanding of the Kedayan traditional knowledge related to folk medicine and ecological calendar. However, much of these could be passive, as our study did not differentiate between active and passive traditional knowledge. Future studies should look at the prevalence and dependency of these knowledges throughout the community.

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Compliance with Ethical Standards Before the commencement of the fieldwork of the study, approval was obtained from University Research Ethics Committee, Universiti Brunei Darussalam (UBD/FASS/ETHICS/2018/FEB-01). Due care was taken to ensure conformity to the code of ethics in ethnobiology (International Society of Ethnobiology 2006). In addition, all knowledge partners who participated in this study gave informed consent after they were provided information about the nature of the study, and assurance that the individual's identity would not be revealed.

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Chapter 6
Traditional Medicinal Knowledge of Vendors and Their Contribution Toward Community Healthcare in Baguio City, Philippines

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Abstract Herbal plants are among the products sold in many urban markets in Asia. They play a vital role in alleviating various and common ailments among city-dwellers. People buy them because of their availability, ease of preparation, low cost, and effectiveness as compared to synthetic and commercial drugs. This study was conducted to identify and document the uses of the medicinal plants sold in the streets and market places of Baguio City, Philippines. Information on the part/s used, method of preparation, and mode of use/application were collected through semi-structured questionnaires and interviews. The data gathered from 42 local street and stall vendors were analysed using use value (UV) as a quantitative tool. A total of 59 species belonging to 52 genera and 29 families were recorded to treat various health-related problems or ailments and diseases. More than 50 health problems were identified. Cough is the most common ailment treated. The leaves are the most frequently used plant part for the treatment of various diseases. Decoction and drinking are the most common modes of preparation and administration respectively. Over-all, Lamiaceae is the most dominant (11 species) and important family (UV 2.26), while *Angelica keiskei* (Miq) Koidz is the most important species (UV 1.05). Thus, this study shows that medicinal plants continue to be widely sold by local vendors for primary health care in an urban context.

Keywords Medicinal plants · Use value · Lamiaceae · *Angelica keiskei*

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6.1 Introduction

The World Health Organization (2018) defines traditional medicine as the 'sum total of knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures that are used to maintain health, as well as to prevent, diagnose, improve or treat physical and mental illnesses'. All over the world, traditional medicinal systems continue to aid in the primary healthcare of different communities. About 65–80% of the world's healthcare practice involves the use of traditional medicine (Pan et al. 2014). Traditional medicine varies from one country to another, and among different cultural groups within a country, depending on historical influences, ecological conditions, and other factors. Ayurveda, Siddha, Unani, yoga, naturopathy, and homeopathy are among the oldest traditional systems of medicine in India (Sen et al. 2016). Meanwhile, traditional, complementary, and alternative medicine are common in developed countries and Asia (Yuan et al. 2016). Traditional medicine can be classified into two systems: codified and folk. Codified medical systems include Ayurveda, Siddha, and Unani, traditional Chinese medicine, and acupuncture. These are, among others, based on physiology and pharmacology. Folk medicine, on the other hand, refers to traditional medicinal knowledge on locally available and accessible plants and their uses that have been orally passed on across generations (Telles et al. 2014).

Plants are commonly used in traditional medicine to promote healing. According to Ekor (2014), 80% of the population worldwide relies on herbal medicines as part of their primary health care. Benzie and Galor (2011) report that 90% of the population in Africa, 70% in India and 40% in China and Hong Kong use herbal medicine. In the United States, about 38% of adults and 12% of children use herbal medicines. In the Philippines, a total of 1,500 medicinal herbs have been recorded (Dela Cruz 2010). There is a large number of Filipino herbolarios or herbalists who still practise traditional healing. The Philippine Department of Health (DOH) has recorded 250,000 traditional healers in the country (a ratio of 1 healer for every 300 persons). In Cebu, traditional healers called '*mananambal*' (both male and female) are highly regarded in folk healing because of their experience (Berdon et al. 2016). Despite the popularity of modern medicines, more than 50% of the population uses traditional medicine. The Filipino government recognises the importance of traditional and alternative medicines in the country's health care delivery system. This support is reflected in the 'Traditional and Alternative Medicine Act of 1997' which promotes the development of traditional and alternative health care to improve the quality and delivery of health care services (WHO 2002). The DOH has also taken on the role of regulating the production and sale of traditional medicines in the country (WHO 1998).

Traditional knowledge on medicinal plants in the Philippines is commonly transmitted through oral traditions. Herbolarios have learned to perform folk healing through observation, imitation, and experience (Berdon et al. 2016). However, with the spread of modern education and the growing influence of western medicine, traditional knowledge and healing practices have been pushed into the margins and

labelled unscientific or as mere superstition. Hence, to avoid further loss of traditional medicinal knowledge, there is a need to document the rich knowledge about medicinal plants in the country (Gruyal et al. 2014; Tantengco et al. 2018). Such a revitalization is also needed to ensure that large segments of the Filipino population have access to affordable healthcare. Besides, traditional medicine and its custodians are important components of cultural heritage and are pertinent in bioprospecting (Tantiado 2012), as these medicines contain properties or compounds that can be used for therapeutic purposes or those that synthesize metabolites to produce drugs (Doughari 2012).

Traditionally, Filipinos use medicinal plants to treat minor sicknesses (e.g., colds, coughs, flu, and others). Contrary to popular belief, dependence on traditional medicine is not limited to the rural areas alone. Medicinal plant vendors are a common sight in cities as well, indicating the continuous patronage they receive.

Various researchers have documented the utilisation of medicinal plants from different parts of the Philippines, namely Albay (Mirandilla and Abalon 2013), Benguet (Balangcod and Balangcod 2015), Cavite (Balinado and Chan 2017), Dumagat (Sia et al. 1998), and Iloilo (Tantiado 2012). Other studies have looked into the knowledge of vendors (Flores et al. 2016), resident consumers (Ammakiw and Odiem 2013; Baleta et al. 2016; Gruyal et al. 2014; Mata et al. 2012), and indigenous tribes such as Ati (Madulid et al. 1989), Ati Negrito (Ong and Kim 2014), Ayta (DOST-PCHRD et al. 2009; Ragrario et al. 2013), Bagobo (Paluga et al. 2013a), Bugkalot (Sia et al. 2002), Ivatan (Abe and Ohtani 2013), Kalanguya (Balangcod and Balangcod 2011), Mandaya (Paluga et al. 2013d), Mangyan (Lacdan et al. 2001; Rubite et al. 2002; Sebastian et al. 2013a, b), Manobo (Paluga et al. 2013b), Siquijor tribe in Mt. Bandilaan (Mansueto et al. 2015), Subanon (Elago et al. 2013a), Subanen (Elago et al. 2013b), and Tagakaolo (Paluga et al. 2013c). Several studies reported on the loss of traditional knowledge in the country (Mata et al. 2012; Ong and Kim 2014; Rubite et al. 2002) and the decline of medicinal plants (Ragrario et al. 2013). These are due to factors such as dislocation of communities, loss of forest and acculturation (Ragrario et al. 2013).

In this study, the researchers identified the different medicinal plants sold at the markets and streets in Baguio city, documented the traditional knowledge associated with the plants, and computed the use value of plant species and families respectively. Thus, this chapter provides a practical reference for their identification and proper utilisation for future generations. It also intends to disseminate information and create awareness of the importance of medicinal plants for the alleviation of health problems. Findings of this study contribute to future researches on plant drug discovery.

6.2 Materials and Methods

6.2.1 Study Area

The study was conducted in Baguio City, Philippines (Fig. 6.1). Specifically, there were seven (7) places selected. (A) First is located at 16° 24′ 44.2584 North, 120° 35′ 46.1112 East of 37 Harrison Road, (B) the second is located at 16° 24′ 48.366 North, 120° 35′ 47.7852 East of Rudel Building V, Mabini Street, (C) third is at 16° 24′ 51.588 North, 120° 35′ 43.4364 East of Magsaysay Avenue (Public Market), (D) fourth is at 16° 24′ 38.6712 North, 120° 35′ 33.6516 East of Orchidarium, (E) fifth is at 16° 24′ 54.8532 North, 120° 37′ 1.3656 East of Baguio-Bua-Itogon Road (Wright Park), (F) sixth is located at 16° 25′ 10.56 North, 120° 37′ 38.6004 East of 19 Outlook Drive South (Mines View), and (G) seventh at 16° 24′ 43.9992 North, 120° 35′ 54.6036 East of 3rd Floor Porta Vaga Mall, Session Road. These are the main sites where herbal plants are commonly sold by vendors in open areas, stalls, and along the side of the road where people pass and see their products.

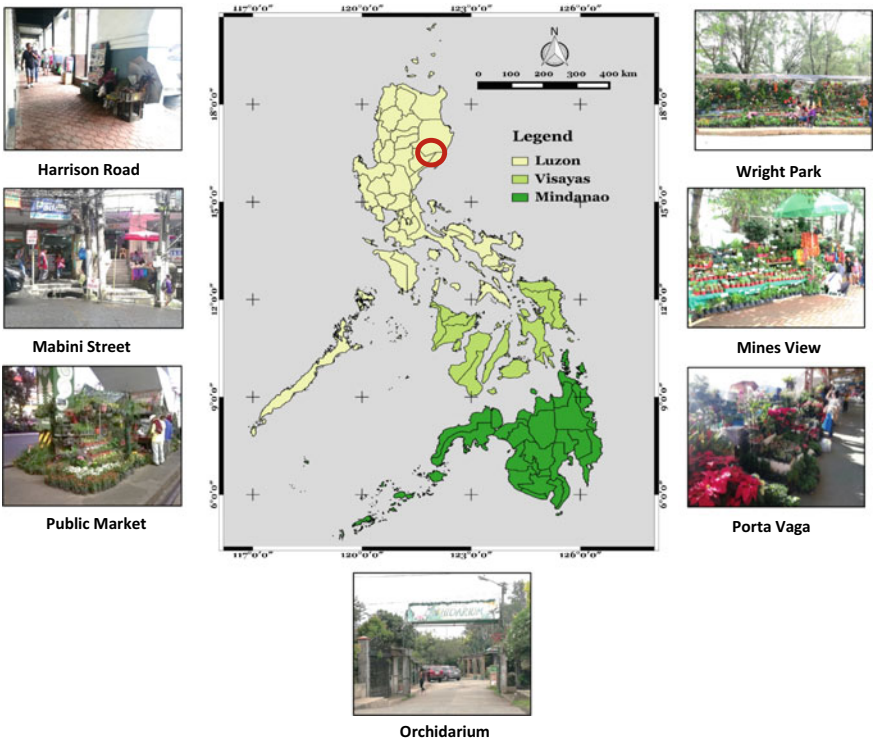

Fig. 6.1 Location map of the study area

6.2.2 Data Collection

The data was collected from June to September 2018 after ethical clearance (No. 2018–048) from SLU—Research Ethics Committee (Table 6.1). The researchers conducted a descriptive survey with prior informed consent and employed purposive sampling by interviewing all the local vendors in seven (7) study sites using field data sheet and semi-structured questionnaire based on the study by Thring and Weitz (2006).

Interviews were conducted in the local language. At least 20–30 min was allotted for the interview of each informant. The interview was carried out in a place where they were most comfortable. Various details regarding the medicinal plants were asked, such as local name, use, method of preparation, method of application, dosage, source, side effects, and storage conditions among others (Table 6.1).

6.2.3 Collection and Identification of Plant Samples

The researchers collected and bought each plant mentioned at the end of each interview to be used as a voucher specimen. Initially, plants were labelled with their local and scientific name, contained in polyethylene plastic zipper bags and transported to the laboratory using a clean dry basket before being deposited as voucher specimens at the Fr. Braeckman Museum of Natural History at Saint Louis University.

Plants were identified through using keys, online plant databases, pictorial floras, plant dictionaries, and taxonomic references (ASEAN Tropical Plant Database 2005; Brown 1960; Castro 2006; Cullen 1997; Kew Royal Botanic Gardens 2013; La Frankie 2010; Madulid 2001, 2002; Merill 1912; Plants of Southeast Asia 2018; Pelser et al. 2011 onwards; Taiwan Plant Names-Flora of Taiwan and China 2013; Tropicos 2013; United States Department of Agriculture (USDA) Natural Resource Conservation Service 2013; Verheij and Coronel 1991). Verification of plant ID was done by comparing the plant specimens to online and actual herbaria and through consultation with local plant experts and botanists.

6.2.4 Data Analysis and Validation

Data was grouped into various use categories based on health problems identified and was summarised in a table form. The most common ailments were recorded along with the plants used to treat them. A corresponding numerical code was assigned to the responses given for each question.

The ‘use-value’ was calculated using a method by Cotton (1996) and Phillips and Gentry (1993) as cited in Thring and Weitz (2006) in order to identify which among the plants mentioned was commonly used and sold for each ailment or health

Table 6.1 Demographic profile of the interviewed respondents in the seven study sites in Baguio city

Study site	No. of respondents	Average age			Gender		Average years of selling medicinal plants					Source of knowledge			
		16–25	26–45	46-up	M	F	1–10	11–20	21–30	31-up	Suppliers	Physicians	Family/relatives/friends	Own Experience	Internet/books
Harrison Road	5			5		5	2		1	2			√	√	√
Mabini Street	6		2	4	1	5	3	1	1	1			√	√	√
Mines View	16	6	8	2	2	14	15			1	√	√	√	√	√
Orchidarium	6	2		4	1	5	3	1		2			√		√
Porta Vaga	2		1	1		2	2							√	√
Public Market	3			3		3	2	1					√		√
Wright Park	4	1	2	1		4	3		1				√	√	√

M—Male, F—Female

problem. The use values were calculated using the equation:

$$\text{UVs} = \sum \frac{\text{UV}_{I_s}}{I_S}$$

where UVs is the overall use of species (S), UV_{Is} is the mean number of all uses of a given plant species (S) as determined by informant (I), and Is is the total number of informants interviewed for species (S). Every plant species mentioned by an informant within one-use category was counted as one-use-report.

This index value has taken into account the spread of use for each species and versatility. The theoretical maximum value of the index is the total number of the different use categories.

Meanwhile, to measure the use value or importance of families (UV_f), the UV of the species from each family was added (Pardo-de Santayana et al. 2007). The highest $\text{UV}_\text{s}/\text{UV}_\text{f}$ confirmed the most widely used and hence, most important medicinal plant species/family for a given category of usage, while the plant with the lowest $\text{UV}_\text{s}/\text{UV}_\text{f}$ indicated that it is least used or of minimum importance.

The ranking of plant species and families were based on the overall use value or significance of each plant and family arranged from highest to lowest using the total UV of each plant (sum total of UV_s in all use category) and computation of UV_f for each family.

Finally, verification of uses was done by supporting them with published studies.

6.3 Results and Discussion

6.3.1 Medicinal Plants Sold by Vendors

A total of 59 species belonging to 52 genera and 29 families were recorded to treat various ailments and diseases (see Table 6.2 and Fig. 6.2).

Table 6.2 Medicinal plants sold in Baguio City, their scientific classification, part/s used, selling place, uses, mode of preparation and application, dosage, use value, and literature cited

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Acorus calamus (L.)	Araceae	Lubigan/Bengaw	01	S	Mab	Arthritis, Dizziness, Flu, Gastritis, Muscle Spasms	Boil	Drink, Inhale (Dizziness)	3 × a day	0.17	Arthritis (Singh et al. 2011)
Allium odorum (L.)	Alliaceae	Kutsay	02	L	Orc	Lumps	Fresh (Crush)	Poultice	As needed	0.02	
Aloe vera (L.) Burm.f	Asphodelaceae	Aloe vera	03	L	Min, Orc, Por, Pub, Wri,	Burns, Cancer, Dandruff, Hair fall, Indigestion, Inflammation, Skin Problems, Wounds	Fresh	Poultice	4–5 × a day	0.29	Burns, Cancer, Dandruff, Inflammation, Skin Problems (Imran Qadir 2009) Hair fall (Jadhav et al. 2009) Wounds (Joshi et al. 2011)
Alstonia scholaris (L.)	Apocynaceae	Dalipawen	04	B	Har, Mab	Constipation, Diarrhoea, Gastritis, Stomachache, Ulcer, Vomiting	Fresh (Powdered)	Drink with water	2 × a day	0.17	Constipation (Ashok Kumar et al. 2014) Diarrhoea (Shah et al. 2010) Ulcer (Meena et al. 2011)
Andrographis paniculata (Burm. f.) Nees	Acanthaceae	Serpentina	05	L	Min, Por	Cancer, Diabetes, Leukaemia, UTI	Boil	Drink/Chew/Eat	3 × a day	0.21	Cancer (Desai et al. 2008) Diabetes (Hossain et al. 2014) Leukaemia (Cheung et al. 2005) UTI (Sahare et al. 2014)

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Angelica keiskei (Miq.) Koidz	Apiaceae	Ashitaba	06	L	Min, Por, Orc	Anaemia, Cancer, Cough, Diabetes, Dysmenorrhea, Food Poisoning, Gall Stones, Heartburn, High Blood Pressure, High Cholesterol, Indigestion, Insomnia, Kidney Problems, Lumps, Ulcer, UTI	Boil/Fresh	Drink/Chew	2–3 × a day	1.05	Anaemia, Cancer, High Cholesterol (Lee et al. 2018) Cough, Gall Stones (Dela Pena 2018) Diabetes (Enoki et al. 2007) High Blood Pressure (Shimizu et al. 1999) Indigestion (Lee 2013)
Anisomeles indica (L.) Kuntze	Lamiaceae	Catnip	07	L	Min	Hyperacidity	Boil	Drink	3 × a day	0.02	
Annona muricata (L.)	Annonaceae	Guyabano	08	L	Har	Cancer, Cyst, UTI	Boil	Drink	3 × a day	0.12	Cancer (Najmuddin et al. 2016) UTI (Oyedeji et al. 2015)
Annona reticulata (L.)	Annonaceae	Anunas	09	L	Har	Fever	Boil	Bathe	3 × a day	0.02	(Jamkhande and Wattamwar 2015)
Annona squamosa (L.)	Annonaceae	Atis	10	S	Har	Muscle Spasms	Boil	Bathe	1 × a day	0.02	

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Apium graveolens (L.)	Apiaceae	Celery	11	L	Min	Inflammation, Memory Loss	Fresh (Inflammation), Boil (Memory Loss)	Chew (Inflammation), Drink (Memory Loss)	As needed	0.05	Inflammation (Mencherini et al. 2007) Memory Loss (Gutierrez et al. 2014)
Arcangelisia flava (L.) Merr	Menispermaceae	Albotra	12	B	Har, Mab	Dysmenorrhea, Stomachache, Ulcer	Boil	Drink	3 × a day	0.10	Stomachache (Rubite et al. 2002) Ulcer (Carag and Buot 2017)
Artemisia dracunculus (L.)	Asteraceae	Tarragon	13	L	Min, Orc, Por, Wri	Arthritis, Cough, Gastritis, Indigestion, Menstruation, Toothache, UTI	Boil	Drink	1 × a day	0.40	Arthritis (Eisenman and Struwe 2011) Gastritis (Maham et al. 2013) Menstruation (Lamian et al. 2017) Indigestion (Mir et al. 2012) Toothache (Haghi et al. 2010)
Artemisia vulgaris (L.)	Asteraceae	Erbaka	14	W/L	Har, Min, Orc	Dysmenorrhea, Hairfall, Menstruation	Boil	Drink	3 × a day	0.12	Dysmenorrhea (Sujatha et al. 2013) Menstruation (Lee et al 2000)

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Blumea balsamifera (L.) DC	Asteraceae	Subusub/Sambong	15	L	Har, Mab	Cough, Fever, Flu, Kidney Problems	Boil	Drink	2 × a day	0.10	Cough, Fever, Flu (Bhuiyan et al. 2010) Kidney Problems (Montealegre and De Leon 2016)
Bryophyllum pinnatum (Lam.) Kurz	Crassulaceae	Katakataka	16	L	Wri	Lumps	Boil	Poultice	As needed	0.02	Lumps (Balinado and Chan 2017)
Cassia alata (L.)	Caesalpiniaceae	Akapulko	17	L	Orc	Eczema	Boil	Poultice	As needed	0.02	Eczema (Gaddam et al. 2014)
Centella tussilaginifolia (Baker) Domin	Apiaceae	Gotu kola	18	L	Min, Por, Orc	Diabetes, Epilepsy, High Blood Pressure, Memory Loss	Boil	Drink	3 × a day	0.21	Diabetes (Chauhan et al. 2010) Epilepsy (Viweswari et al. 2010) High Blood Pressure (Krishnaiah et al. 2009) Memory Loss (Hemamalini 2016)
Cinnamomum verum (J. Presl)	Lauraceae	Cinnamon	19	B	Har	Insomnia, Leukaemia	Boil	Drink	3 × a day	0.05	Insomnia (Ghaderi et al. 2018) Leukaemia (Assadollahi et al. 2015)
Cleidion javanicum Blume	Euphorbiaceae	Sarigaw	20	S	Mab	Constipation	Fresh (Peel)	Drink	1 × a day	0.02	Constipation (Sanseera et al. 2016)

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Coriandrum sativum (L.)	Apiaceae	Kulantro	21	S	Mab	Chickenpox, Measles	Boil	Bathe	1 × a day	0.05	Chicken pox (Ragragio et al. 2013) Measles (Kumar et al. 2011b)
Costus sp. (L.)	Costaceae	Insulin Plant	22	L	Por, Wri	Diabetes	Boil	Drink	3 × a day	0.05	Diabetes (Talasila et al. 2014)
Cymbopogon citratus (D.C) Stapf	Poaceae	Lemon Grass	24	R	Har	Insomnia, UTI	Boil	Drink	3 × a day	0.05	Insomnia (Guzman-Gutierrez et al. 2009) UTI (Pereira et al. 2004)
Cymbopogon winterianus Jowitt ex Bor	Poaceae	Citronella	25	L	Orc	Heart Disease, High Blood Pressure	Boil	Drink	3 × a day	0.05	High Blood Pressure (Côrtes De Menezes et al. 2010)
Drimys piperita Hook.f	Winteraceae	Sapal	26	S	Mab	Stomachache	Boil	Drink	3–5 × a day	0.02	Stomachache (Plandio and Villaseñor 2004)
Eluesine indica (L.) Gaertrn	Poaceae	Paragis	27	L	Har	UTI	Boil	Drink	3 × a day	0.02	UTI (Desai et al. 2017)
Entada phaseoloides (L.) Merr	Fabaceae	Gugu	28	B	Mab	Hair fall	Fresh (Mix with water)	Bathe	3 × a day	0.02	

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Equisetum ramoissisimum Desf	Equisetaceae	Horse tail	29	W/S/L	Har, Mab, Min, Wri	Arthritis, High Cholesterol, Kidney Problems, UTI	Boil	Drink	3 × a day	0.12	Arthritis, Kidney Problems (Dedy et al. 2016) UTI (Radojevic et al. 2012)
Eucalyptus globulus Labill	Myrtaceae	Eucalyptus	30	L	Har	Fever, Flu	Boil	Drink	3 × a day	0.05	Fever (Bachir and Benali 2012) Flu (Vimalanathan and Hudson 2014)
Euphorbia hirta (L.)	Euphobiaceae	Tawa tawa	31	S/L	Har, Orc	Dengue	Boil	Drink	3 × a day	0.12	Dengue (Perera et al. 2018)
Goniothalamus amuyon (Blco.) Merr	Annonaceae	Sagyat	32	Sd	Har	Arthritis	Fresh (Soak)	Poultice	3 × a day	0.02	Arthritis (Aslam et al. 2016)
Gynura procumbens (Lour.) Merr	Asteraceae	Gynura	23	L	Orc	High Blood Pressure, High Cholesterol	Fresh	Eat	3 × a day	0.05	High Blood Pressure (Tan et al. 2016) High Cholesterol (Hew et al. 2013)
Hibiscus rosa-sinensis (L.)	Malvaceae	Gumamela	33	F	Pub	Boils	Fresh (Crush)	Poultice	3 × a day	0.02	
Lagerstroemia speciose (L.)	Lythraceae	Banaba	34	L	Har, Mab	Heart Disease, High Cholesterol, Kidney Problems, UTI	Boil	Drink	3 × a day	0.24	Heart Disease, Kidney Problems (Chowdhury et al. 2017) UTI (Laruan et al. 2013)

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Lavandula anustifolia Mill	Lamiaceae/Labiatae	Lavander	35	L	Min, Orc, Por, Wri	Fever, Goitre, Inflammation, Insect bites, Insomnia	Boil	Drink	3 × a day	0.31	Fever (Zhao et al. 2015) Insomnia (Bakhsha et al. 2014)
Melissa officinalis (L.)	Lamiaceae	Lemon balm	36	L	Wri	Cough	Boil	Drink	As needed	0.02	Cough (Sultana et al. 2016)
Mentha arguta Opiz	Lamiaceae	Peppermint	37	L	Min, Orc, Por, Pub, Wri	Bad breath, Cancer, Colds, Cough, Diarrhoea, Dysmenorrhea, Gastritis, Headache, Heartburn, High Blood Pressure, High Cholesterol, Indigestion, Lumps, Stomachache, Vomiting	Boil	Drink	3 × a day	0.67	Bad Breath, Diarrhoea, Dysmennorhea (Thawkar et al. 2016) Cough, Colds, Indigestion (Mekonnen et al. 2015) Headache, Vomiting (Biswas et al. 2014)
Mentha spicata (L.)	Lamiaceae	Spearmint	38	L	Min	Colds, Cough	Fresh (Mix with water)	Drink	1 × a day	0.05	Cough, Colds (Kakati et al. 2016)
Mentha x piperita f. citrata 'Chocolate'	Lamiaceae	Chocolate mint	39	L	Orc	Cough	Boil	Drink	As needed	0.02	

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Ocimum basilicum (L.)	Lamiaceae	Basil	40	L/S	Har, Por, Pub	Colds, Cough, Fever, Inflammation, Memory Loss, Skin Problems, Stomachache	Boil	Drink/Eat/Bathe	3 × a day	0.21	Cold, Cough, Fever, Skin Problems (Dev et al. 2011) Kidney Problems (Rattanachaikunsopon and Phumkhachorn 2010) Inflammation (Okoye et al. 2014) Memory Loss (Sarahroodi et al. 2013) Stomachache (Ojo et al. 2012)
Parameria laevigata (Juss.) Moldenke	Apocynaceae	Lupiit	41	S/B	Har, Mab	Arthritis, Blocked Blood Vessels, High Cholesterol, Sprain, Wounds	Boil	Drink	3 × a day	0.29	High Cholesterol, Wounds (Pratiwi et al. 2015)
Passiflora ligularis A. Juss	Passifloraceae	Passion flower	42	L	Orc	Diarrhoea, Insomnia	Boil	Drink	As needed	0.05	Diarrhoea, Insomnia (Patil et al. 2013)
*Pelargonium graveolens*Ait	Geraniaceae	Malvarosa	43	L	Orc	Cancer, Cough, Heart Disease	Boil	Drink	As needed	0.07	Cancer, Heart Disease (Hamidpour et al. 2017) Cough (Kumar et al. 2012)
Petroselinum crispum (Mill.) Fuss	Apiaceae	Parsley	44	S	Min, Orc, Por, Pub	Kidney Problems, UTI	Boil/Fresh	Drink/Eat	3 × a day	0.12	Kidney Problems (Karimi et al. 2017)

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Pittosporum moluccanum (Lam.) Miq	Pittosporacese	Dail	45	S/L	Har, Mab	Diarrhoea, Stomachache	Fresh (Mix with water)	Drink	2 × a day	0.07	
Plectrantus amboinicus (Lour.) Spreng	Lamiaceae	Oregano	46	L	Orc, Wri,	Asthma, Cough, Fever	Boil	Drink	3 × a day	0.17	Asthma, Cough, Fever (Arumugam et al. 2016)
Portulaca oleracea (L.)	Portulacaceae	Purselain	47	L	Orc	Appendicitis	Boil	Drink/Eat	As needed	0.02	Appendicitis (Lei et al. 2015)
Rosmarinus officinalis (L.)	Lamiaceae	Rosemary	48	L/S	Har, Min, Por, Pub, Wri	Blocked Blood Vessels, Cancer, Colds, Cough, Dengue, Hair fall, Headache, Heartburn, High Blood Pressure, Indigestion, Memory Loss, Toothache	Boil	Eat/Drink	3 × a day	0.62	Cough, Colds, Memory Loss, High Blood Pressure (Satyal et al. 2017)
Salvia officinalis (L.)	Lamiaceae	Sage	49	L	Orc, Pub	Bad Breath, Inflammation, Skin Problems	Boil	Bathe	1 × a day	0.07	Inflammation (Abu-Darwish et al. 2013) Skin Problems (Dawid-Pac 2013)
Selaginella tamariscina (Beauv.) Spring	Selaginellaceae	Kayumkom	50	W	Har, Mab	Haemorrhoids, Infertility (Women)	Boil	Drink/Bathe	3 × a day	0.05	Haemorrhoids (Setyawan 2009)

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Stevia rebaudidiana (Bertoni) Bertoni	Asteraceae	Stevia	51	L	Min, Orc, Por, Pub, Wri	Diabetes, Diarrhoea, Inflammation, Kidney Problems, Wounds	Boil/Fresh (Grind)	Drink	5 or more leaves a day	0.48	Diabetes (Lemus-Mondaca et al. 2012) Inflammation (Jeong and Holden 2010) Kidney Problems (Rizwan et al. 2018) Wounds (Babakhanyan et al. 2017)
Swietenia mahogany Jacq	Meliaceae	Mahogany	52	Sd	Har, Min	Arthritis, Constipation, Cough, Diabetes, Goitre, High Blood Pressure, Toothache	Boil	Drink/Chew	3 × a day	0.43	Cough (Bhurat et al. 2011) Diabetes (De et al. 2011) High Blood Pressure (Jawi et al. 2017) Toothache (Panda et al. 2010)
Syzygium cumini (L.) Skeels	Myrtaceae	Duhat	53	B	Har	Diabetes	Boil/Fresh (Chop)	Drink	3 × a day	0.02	Diabetes (Schossler et al. 2004)
Tagetes erectas (L.)	Asteraceae	Marigold	54	L	Wri	Allergies	Fresh	Poultice	As needed	0.02	Allergies (Vlahovic 2008)
Taraxacum officinale Web	Asteraceae	Dandelion	55	L	Orc	Gall Stones	Fresh (Grind)	Drink	As needed	0.02	Gall Stones (Wirngo et al. 2016)
Thymus sp. (L.)	Lamiaceae	Thyme	56	L	Min, Orc, Pub	Asthma, Cough, Dengue	Boil/Fresh	Drink/Eat	As needed	0.10	Asthma, Cough (Dauquan and Abdullah 2017) Dengue (Bouguerra et al. 2017)

(continued)

Table 6.2 (continued)

Scientific name	Family	Common name	Voucher No	Part/s Used	Selling Place	Medicinal use/conditions treated	Mode of preparation	Mode of administration	Dosage	Use value	References
Tinospora crispa (L.) Hook.f. & Thoms	Menispermaceae	Makabuhay	57	S	Har, Mab	Arthritis, Constipation, Cough, Diabetes, Goitre, High Blood Pressure, Malaria, Skin Problems, Toothache, Varicose Veins	Boil	Drink	2 × a day	0.33	Arthritis, Diabetes, High Blood Pressure, Malaria, Skin Problems (Ahmad et al. 2016) Cough, Toothache (Hamid 2013)
Vitex trifolia (L.)	Verbanaceae	Dangla	58	L	Har, Mab	Cough, Flu	Boil	Drink	3 × a day	0.10	Cough (Punjani and Kumar 2002) Flu (Mustarichie et al. 2016)
Vitex negundo (L.)	Verbanaceae	Lagundi	59	L	Har, Mab, Orc	Cough, Flu	Boil	Drink	3 × a day	0.07	Cough (Punjani and Kumar 2002) Flu (Vishwanathan and Basavaraju 2010)

Legend L-Leaves; S-Stem; Sd-Seeds; B-Bark; F-Flower; R-Roots; W-Whole Plant; Orc-Orchidarium; Har-Harrison; Mab-Mabini; Min-Mines View; Por-Porta Vaga; Pub-Public Market; Wri-Wright Park


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◄**Fig. 6.2** Medicinal plants sold by vendors in Baguio City. 1. *Acorus calamus* (L.) (lubigan), 2. *Allium odorum* (L.) (kutsay), 3. *Aloe vera* (L.) Burm.f. (aloe vera), 4. *Alstonia scholaris* (L.) (dalipawen), 5. *Andrographis paniculata* (Burm. f.) Nees (serpentina), 6. *Angelica keiskei* (Miq.) Koidz. (ashitaba), 7. *Anisomeles indica* (L.) Kuntze (catnip), 8. *Annona muricata* (L.) (guyabano), 9. *Annona reticulata* (L.) (anunas), 10. *Annona squamosa* (L.) (atis), 11. *Apium graveolens* (L.) (celery), 12. *Arcangelisia flava* (L.) Merr. (albotra), 13. *Artemisia dracunculus* (L.) (tarragon), 14. *Artemisia vulgaris* (L.) (erbaka/damong maria), 15. *Blumea balsamifera* (L.) DC. (subusub), 16. *Bryophyllum pinnatum* (Lam.) Kurz(katakataka), 17. *Cassia alata* (L.) (akapulko), 18. *Centenella tussilaginifolia* (Baker) Domin (gotu kola), 19. *Cinnamomum verum* (J Presl) (cinnamon), 20. *Cleidion javanicum* Blume (sarigaw), 21. *Coriandrum sativum* (L.) (kulantro), 22. *Costus sp.* (L.) (insulin plant), 23. *Gynuraprocumbens* (Lour.) Merr. (gynura), 24. *Cymbopogon citratus* (DC.) Stapf. (lemon grass), 25. *Cymbopogon winterianus* Jowitt ex Bor (citronella), 26. *Drimys piperita* Hook.f. (sapal), 27. *Eleusine indica* (L.) Gaertn. (paragis), 28. *Entada phaseoloides* (L.) Merr. (gugu), 29. *Equisetum ramoissisimum* Desf. (horsetail), 30. *Eucalyptus globulus* Labill (eucalyptus), 31. *Euphorbia hirta* (L.) (tawa-tawa), 32. *Goniothalamus amuyon* (Blco.) Merr. (sagyat), 33. *Hibiscus rosa-sinensis* (L.) (gumamela), 34. *Lagerstroemia speciose* (L.) (banaba), 35. *Lavandula angustifolia* Mill. (lavender), 36. *Melissa officinalis* (L.) (lemon balm), 37. *Mentha arguta* Opiz (peppermint), 38. *Mentha spicata* (L.) (spearmint), 39. *Mentha x piperita f. citrata 'Chocolate'* (chocomint), 40. *Ocimum basilicum* (L.) (basil), 41. *Parameria laevigata* (Juss.) Moldenke(lupiit), 42. *Passiflora ligularis* A. Juss(passion), 43. *Pelargonium graveolens* Ait. (malvarosa), 44. *Petroselinum crispum* (Mill.) Fuss. (parsley), 45. *Pittosporum moluccanum* (Lam.) Miq. (dail), 46. *Plectrantus amboinicus* (Lour.) Spreng. (oregano), 47. *Portulaca oleracea* (L.) (purselane), 48. *Rosmarinus officinalis* (L.) (rosemary), 49. *Salvia officinalis* (L.) (sage), 50. *Selaginella tamariscina* (Beauv.) Spring, 51. *Stevia rebaudidiana* (Bertoni) Bertoni (stevia), 52. *Swietenia mahogani* Jacq (mahogany), 53. *Syzygium cumini* (L.) Skeels (duhat), 54. *Tagetes erecta* (L.) (marigold), 55. *Taraxacum officinale* Web. (dandelion), 56. *Thymus sp.* (L.) (thyme), 57. *Tinospora crispa* (L.) Hook.f. & Thoms (makabuhay), 58. *Vitex trifolia* (L.) (dangla), 59. *Vitex negundo* (L.) (lagundi)

Fig. 6.2 (continued)

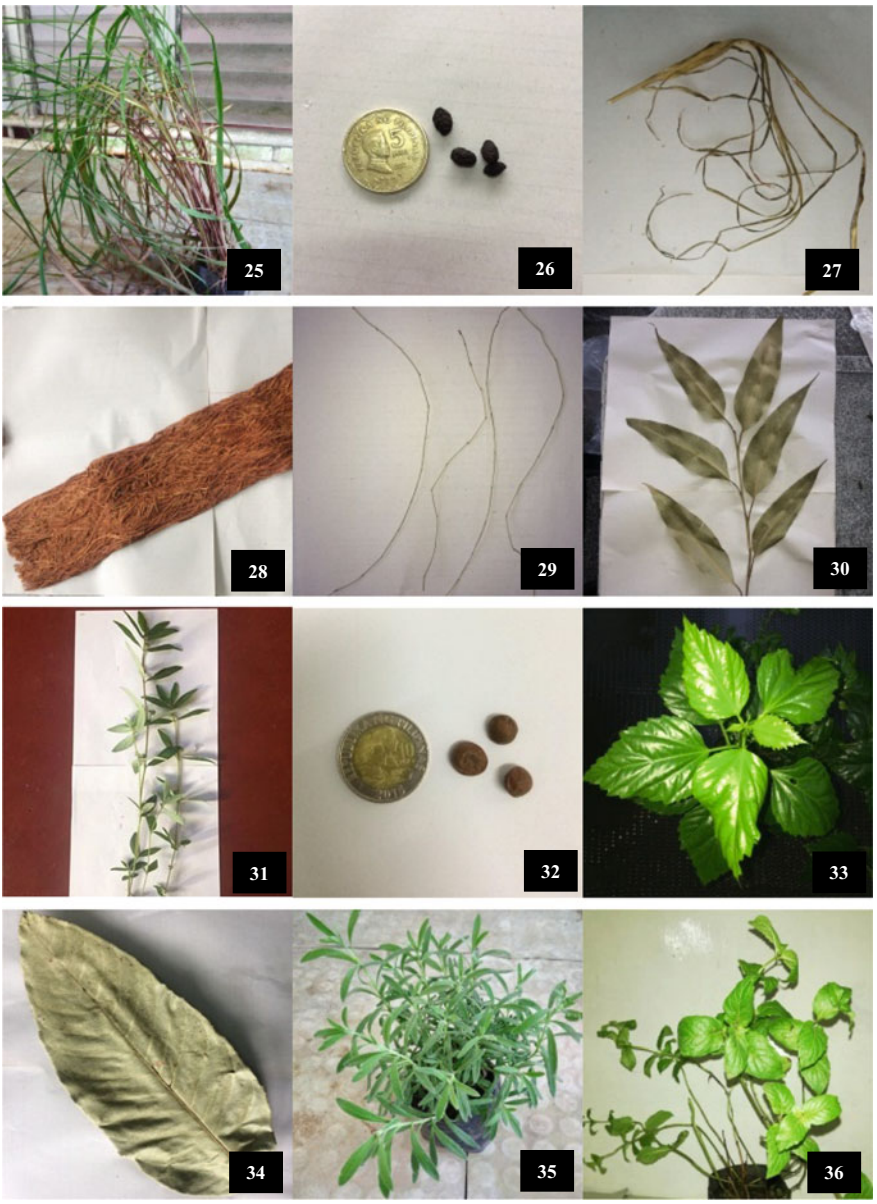

Fig. 6.2 (continued)

Fig. 6.2 (continued)

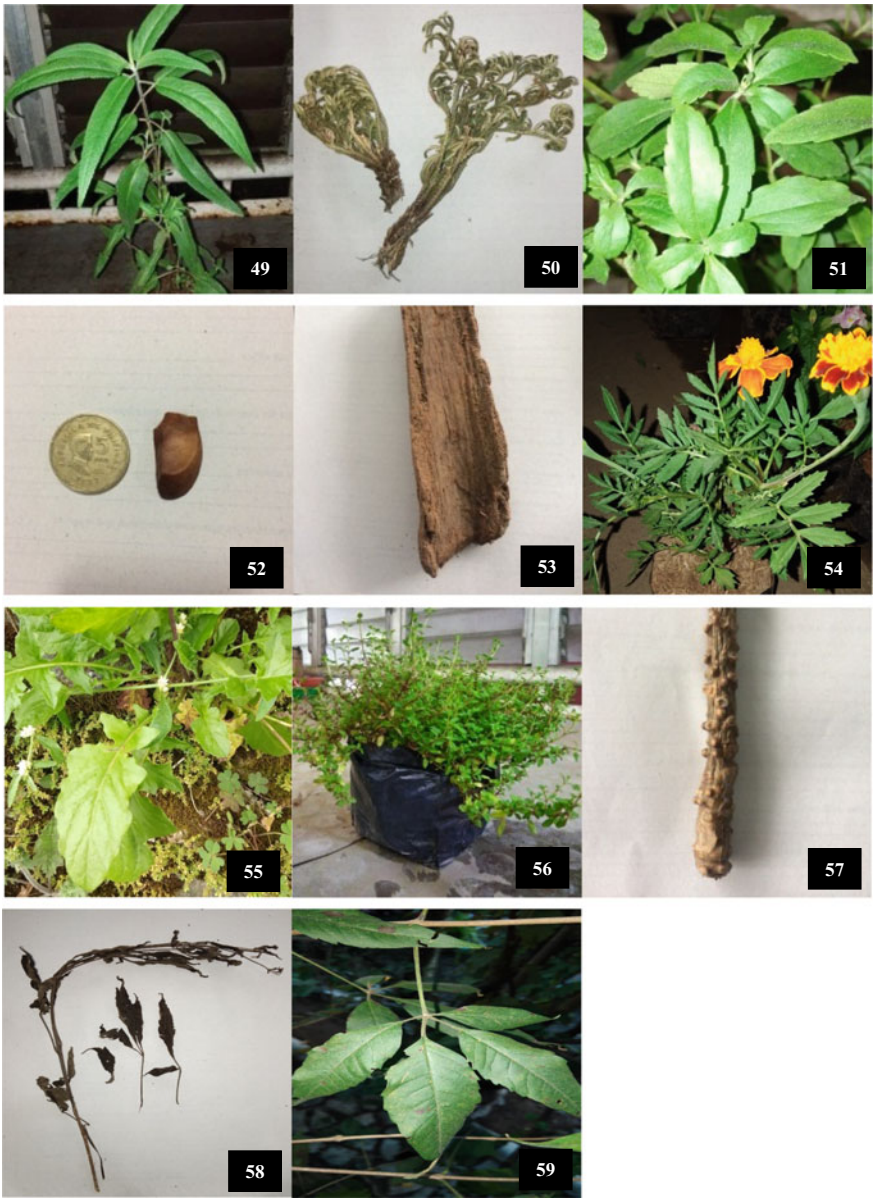

Fig. 6.2 (continued)

6.3.2 Distribution of Medicinal Plants According to Selling Place

The study sites with the highest number of medicinal species sold are Baguio Orchidarium and Harrison Road, with a total of 28 different medicinal species. They are followed by Mabini (19), Mines View (16), Public Market (13), Wright Park (13), and Porta Vaga (12) (Fig. 6.3). Based on the interviews conducted, the vendors from Baguio Orchidarium and Harrison Road acquire their medicinal plant products from various locations (e.g., Pangasinan, La Union, La Trinidad in Benguet, Ifugao, and Mountain Province), where most medicinal plants are cultivated and sold. In contrast, the other sites scour limited or very few sources (1–2 locations) resulting in less variety of medicinal plants sold.

According to Noorhosseini et al. (2017), the number of plants sold in an area is usually influenced by the number of diseases present. Usually, plants that are used to treat common diseases are the ones that are in demand in the market. Other factors that affect the number of medicinal plants sold at a certain place include the following: their availability (seasonal or readily available), price range, and effectiveness. Medicinal plants throughout the ages have not only proven their effectiveness in treating diseases but are also cheaper than medicines found in drugstores. In addition, the limited supply of medicinal plants, poor access to processed medicinal plants, lack of alternatives and spatial limitations, and uncertainty and lack of confidence of the consumers affect the number of medicinal plants sold in a place.

Currently, only ten (10) medicinal plants are approved and recommended by the Department of Health (DOH), namely *Cassia alata* (akapulko), *Momordica charantia* (ampalaya), *Allium sativum* (bawang), *Psidium guajava* (bayabas), *Vitex negundo* (lagundi), *Quisqualis indica* (niyog-niyogan), *Blumea balsamifera* (sambong), *Ehretia microphylla* (tsaang gubat), *Peperomia pellucida* (ulasimang bato or pansit-pansitan), and *Clinopodium douglasii* (yerba buena) (Veterans Regional

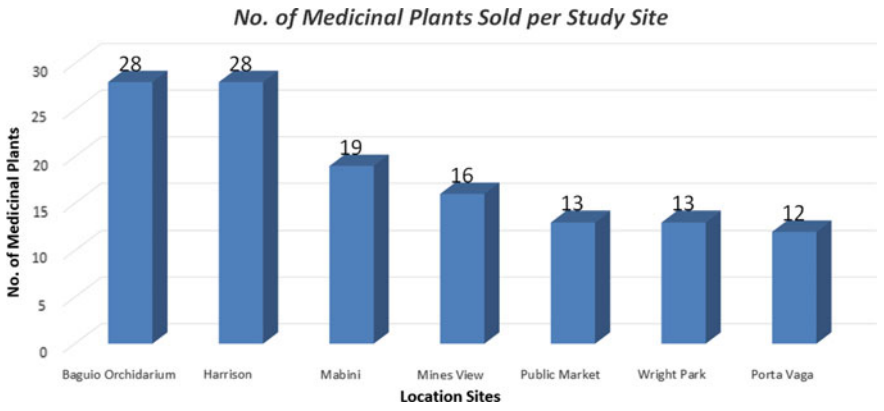

Fig. 6.3 Number of medicinal plants sold per study site

Hospital 2015). Unfortunately, this number contributes to the decline in confidence among consumers and discourages them from using other medicinal plants.

Medicinal plants are highly distributed as products in markets and farming industries in the Philippines (De Vera-Ruiz 2018). One reason behind their high distribution is that the farmers feel motivated to cultivate medicinal plants since they provide cure for illnesses, act as substitute for health remedies, and at the same time generate substantial profit without being labour-intensive (Bolido 2017; PhilStar 2002). People also sell medicinal plants when their medical condition improves after using such plants as remedies for their illnesses (Polonio 2016).

6.3.3 Common Ailments Treated by Medicinal Plants and Their Number

In this study, among the various ailments that the plants are used for, cough is the most common ailment treated (Table 6.3). The Baguio Health Department (2017) lists Upper Respiratory Tract Infection as one of the leading causes of morbidity in Baguio city.

6.3.4 Commonly Used Plant Parts, Mode of Preparation, and Administration

Different parts of a plant, such as the roots, stem, bark, and flowers can be used in treating different ailments, but the leaves appear to be the most commonly used part, with a citation frequency of 76.95% (Fig. 6.4). Findings of this study are similar to several researches done in the Cordillera region (Ammakiw and Odiem 2013; Balangcod and Balangcod 2011, 2015; Doctor and Manuel 2014), wherein the leaves of the plant were also the most widely used part. According to Balangcod and Balangcod (2015), the leaves are always available and easy to gather and prepare. Moreover, active medicinal ingredients are found in leaves that are used for medicinal purposes (United States Department of Agriculture 2011).

The mode of preparation varies with the type of medicinal plant that is used (Fig. 6.5). In this study, decoction (boiling) is the most common method (69.57%). Decoction is considered to be the easiest approach to draw out active constituents. On top of that, it aids in ascertaining the dosage required to design the formula (Dharmananda 2015).

The modes of administration include drinking (80.37%), chewing (6.30%), poultice (5.56%), added to water for bathing (3.70%), eating (2.96%), and inhaling (1.11%) (Fig. 6.6). The dosage differs according to the type of plant that is used but mostly it is taken 3 times a day, as cited by the vendors and based on their experience.

Table 6.3 Total number of medicinal plants used for various health ailments

Health problem	No. of plants	Health problem	No. of plants	Health problem	No. of plants
Allergies	1	Dizziness	1	Insect Bites	1
Anaemia	1	Dysmenorrhea	4	Insomnia	5
Anti-acidic	1	Eczema	1	Kidney Problems	6
Appendicitis	1	Epilepsy	1	Leukaemia	2
Arthritis	7	Fever	6	Lumps	4
Asthma	2	Flu	5	Malaria	1
Bad Breath	2	Food Poisoning	1	Measles	1
Blocked Blood Vessels	2	Gall Stones	2	Memory Loss	4
Boils	1	Gastritis	4	Menstruation	2
Burns	1	Goitre	3	Muscle Spasms	2
Cancer	7	Hairfall	4	Skin Diseases	4
Chickenpox	1	Headache	2	Sprain	1
Colds	4	Heartburn	3	Stomachache	6
Constipation	4	Heart Disease	3	Toothache	4
Cough	16	Haemorrhoids	1	Ulcer	3
Cyst	1	High Blood Pressure	8	UTI	9
Dandruff	1	High Cholesterol	6	Vomiting	2
Dengue	3	Indigestion	5	Varicose Veins	1
Diabetes	8	Infertility (Women)	1	Wounds	3
Diarrhoea	5	Inflammation	6		

6.3.5 *Medicinal Plant Families and Species with Their Corresponding Use Value*

There are 29 families identified in this study (Fig. 6.7). The three major groups are Lamiaceae with 11 plant species, namely: *A. indica*, *L. angustifolia*, *M. officinalis*, *M. arguta*, *M. spicata*, *M. x piperita f. citrata*, *O. basilicum*, *P. amboinicus*, *R. officinalis*, *S. officinalis*, and *T. vulgaris*. They are followed by Asteraceae with 7 species: *A. dracunculus*, *A. vulgaris*, *B. balsifera*, *G. procumbens*, *S. rebaudidiano*, *T. erecta,* and *T. officinale*. The last group is Apiaceae with 5 plant species: *A. graveolens*, *A. keiskei*, *C. sativum*, *C. tussilaginifolia*, and *P. crispum*. This result is similar to studies such

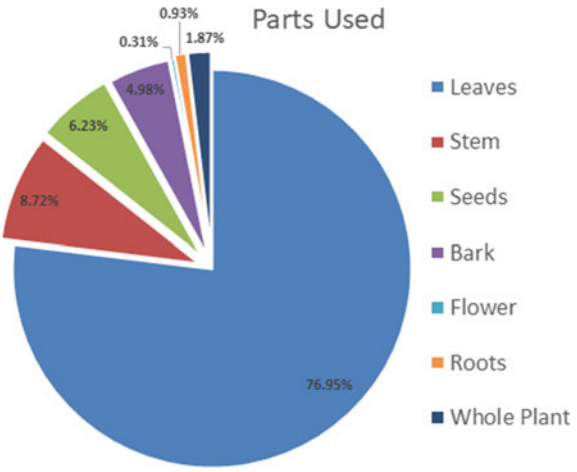

Fig. 6.4 Parts most commonly used

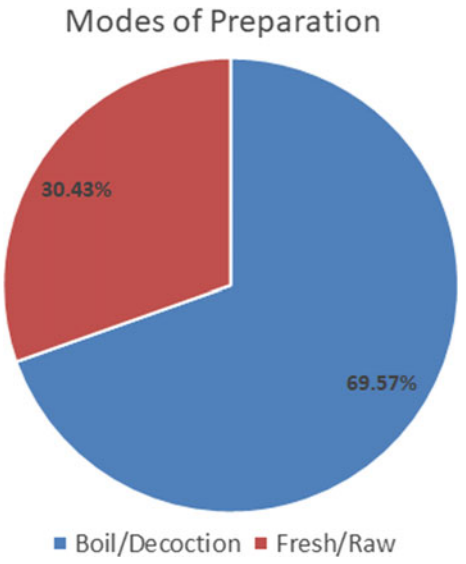

Fig. 6.5 Modes of preparation

as Amjad et al. (2017) in Pakistan, Enyew et al. (2014) in Central Ethiopia, Uniyal et al. (2011), and Kumar et al. (2011a) in India, which have all cited Lamiaceae as the highest family and Asteraceae a close second in terms of their medicinal properties.

Based on the use value of each family (UVf), Lamiaceae is the most dominant family with a citation index of 2.26 followed by Apiaceae/Umbelliferae (1.48) and Asteraceae (1.19) (Fig. 6.8). In an ethnobotanical study conducted by Abalon and Del Prado (2013) in Albay, the Philippines, *Coleus aromaticus* (oregano) was cited to be one of the most commonly used medicinal plant belonging to the Lamiaceae family.

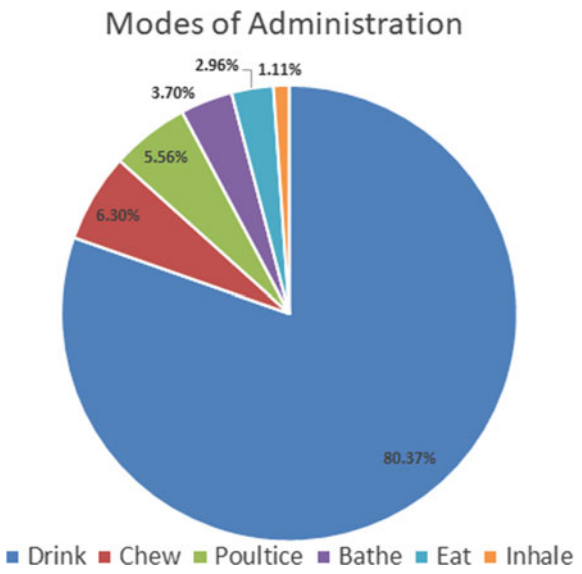

Fig. 6.6 Modes of administration

In descending order, based on use value, the top ten commonly used medicinal plants used to treat different ailments include *Angelica keiskei* (1.05), *Mentha arguta* (0.67), *Rosmarinus officinalis* (0.62), *Stevia rebaudidiana* (0.48), *Swietenia mahogani* (0.43), *Artemisia dracunculus* (0.40), *Tinospora crispa* (0.33), *Lavandula angustifolia* (0.31), *Parameria laevigata* (0.29), and *Aloe vera* (0.29) (see Table 6.2).

A. keiskei, commonly known as Ashitaba, has the highest UVs among the 59 species of medicinal plants. Based on the data, it can be used to treat anaemia, cancer, cough, diabetes, dysmenorrhea, food poisoning, gall stones, heartburn, high blood pressure, high cholesterol, indigestion, and insomnia, among others.

In far-eastern countries, more than 60 species of the genus *Angelica* are commonly used as medicinal plants. It has been used by people for a long time and has become part of their ancient traditional medicine system. It is also used by western countries like Germany, the United States of America, and the United Kingdom. Common examples of the genus *Angelica* that have been used by people for centuries are *A. acutiloba*, *A. japonica,* and *A. glauca* which are used as anti-inflammatory, diuretic, expectorant, remedy for colds, flu, influenza, etc. (Sarker and Nahar 2004).

According to a census conducted by BHD in 2017, the top 10 causes of morbidity in Baguio City are hypertension (Top 1), followed by upper respiratory tract infections, pneumonia, dog bite, acute gastroenteritis or diarrhoea, systematic viral infections, influenza-like illnesses, asthma and dermatitis, diabetes mellitus, and urinary tract infection, in descending order. Plants such as *A. keiskei* (Shimizu et al. 1999), *S. mahogani* (Jawi et al. 2017), *T. crispa* (Praman et al. 2011), and *R. officinalis* (Cunha 2017) may be used to treat hypertension and decrease the rate of morbidity in the

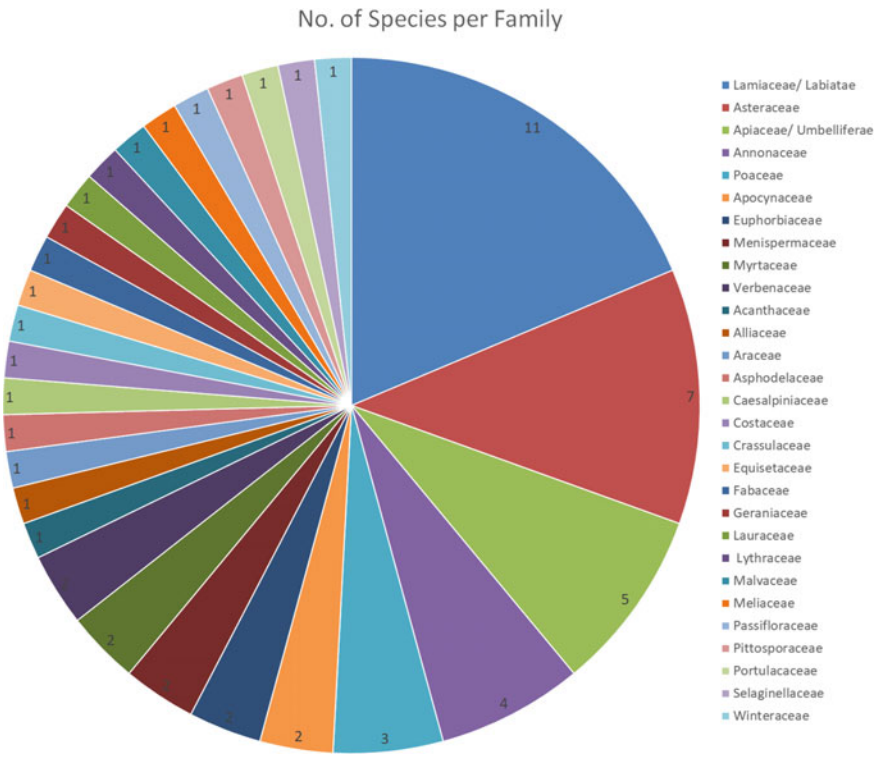

Fig. 6.7 Number of species per family

city. Other plants cited in this study may alleviate other health problems. Thus, these medicinal plants are beneficial in addressing the health problems in the city.

6.4 Conclusion and Recommendations

Despite access to modern medicine, herbal plants are still widely sold by vendors at the streets and markets of Baguio City. The medicinal plants are important in treating 59 health problems. Cough is the most common ailment treated. *Angelica keiskei* (Miq) Koidz is the most important medicinal plant that can treat anaemia, cancer, diabetes, high blood pressure, high cholesterol, among others. A majority of the medicinal plants belong to Lamiaceae, which makes it the most important plant family. Due to their abundance and availability, leaves are the most frequently used plant part, whereas decoction and drinking are the most common modes of preparation and administration respectively.

Findings of this study reveal that the vendors who sell plants are knowledgeable on the part/s used, method of preparation, and mode of use/application of the plants used

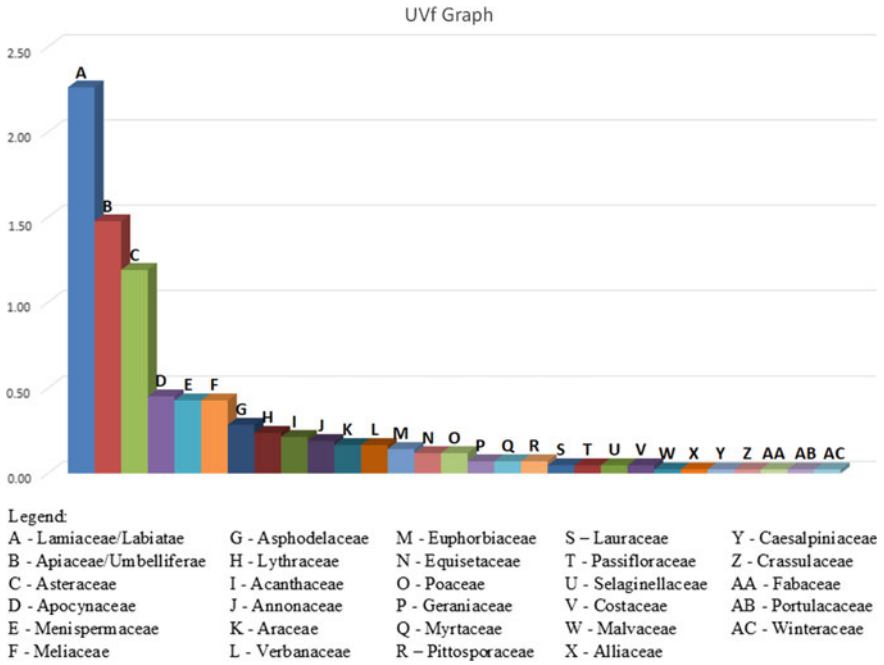

Fig. 6.8 Total ranking value (UVf) for medicinal plant families

in traditional/herbal medicine. Thus, the selling of herbal plants not only promotes the utilisation of such plants in primary health care of the local residents of Baguio City but also provides economic value to the vendors.

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Compliance with Ethical Standards The authors declare that all the procedures performed in this study involving human participants were in accordance with the ethical standards of Saint Louis University—Research Ethics Committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants involved in the study.

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

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Chapter 7
Folk Plant Names Are Condensed Forms of Traditional Knowledge: Case Study with the Urang Kanekes of Banten, Indonesia

Syafitri Hidayati, F. Merlin Franco, and Aznah Suhaimi

Abstract A new wave of research emerging in the last two decades has turned the focus of linguistic ethnobiology on folk names used by local communities to denote biota. Studies have used traditional knowledge or linguistic approaches to unravel the elaborate body of knowledge used to generate folk names and link them to their appropriate denotatum. In this chapter, we present the folk food plant names of the Kanekes community of Banten Indonesia, classifying them into barefaced or cryptic based on apparency of Traditional Knowledge (TK) encoded in them. Barefaced folk names are self-explanatory names where the TK on the salient feature of the respective taxa is apparent. Cryptic names are those with TK either not readily comprehensible, or those containing TK on multiple taxa/entities. We found the 294 food plant names recorded by us encoding traditional knowledge related to morphology (161), ecology (45), utility (39), and quality (49) of the taxa. The majority of the names documented (172 names) are cryptic (111 metaphors, 53 metonyms, and 08 portmanteaus), while the rest are barefaced (122 names). Our study shows that cryptic names possess a remarkable ability to encode traditional knowledge on multiple taxa/entities. When folk names are lost or replaced, the traditional knowledge encoded by them is also lost. Researchers and practitioners working with local communities should therefore consider the potential of folk names as condensed forms of traditional knowledge.

Keywords Folk taxonomy · Ethnotaxonomy · Metonymy · Metaphor · Baduy

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7.1 Introduction

Academic enquiry into the myriad ways in which humankind has made use of plants and animals commenced in the late nineteenth century with the publishing of 'Purposes of Ethnobotany' by Harshberger (1896). The publication also marked the beginning of ethnobotany as an academic discipline. For the next five decades, cataloguing the economically important plants used by various communities formed the bulk of ethnobotanical research. However, as Hunn (2007) points out, these decades were not bereft of intellectual enquiry, as ethnobotanists had begun emphasising the need for conducting a deeper enquiry into the relationship between people and the environment from the emic perspective. In 1954, Conklin published his dissertation on 'The Relation of Hanunoo Culture to the Plant World', the first work fully devoted to the ethnotaxonomy of a community. Conklin's dissertation marked the beginning of 'cognitive ethnobiology', where cognitive psychology and linguistics played an important role in understanding emic perspectives of flora and fauna (Hunn 2007). In 1962, Levi-Strauss highlighted that the ways people named and classified plants and animals have an intellectual basis, and not merely meant to satiate their needs (Levi-Strauss 1966). The turning point in ethnobotany, however, was the towering work of Berlin et al. (1966). Besides leading to the evolution of the concept of linguistic ethnobiology, their works also brought to light the general patterns shared by folk classifications worldwide (Hunn 2007). There has been a resurgence of a new wave of research on linguistic ethnobiology in the last two decades, resulting from the increasing collaborations between linguists, anthropologists, and biologists. However, the new wave of research focuses more on the nomenclatural patterns or the folk/vernacular names that form an inherent component of the larger folk classifications.

Kakudidi (2004) and Franco and Narasimhan (2012) analysed the Traditional Knowledge (TK) that are apparent in the folk names of plants and animals. Such naming strategies are straightforward reflections of the knowledge of salient characteristics of the taxa such as morphology, quality, ecology, utility, etc. Semantic analyses of folk names undertaken by Evans (1997), Turpin (2013), and Zariquiey (2014) show that folk names, however, are the results of complex nomenclatural processes. A single folk name is capable of encoding TK on multiple taxa and the complex cultural relationships between them, as understood by the respective community. Their approach demonstrates that folk names could also be metaphoric or metonymic representations of TK on multiple taxa. A synthesis of these two approaches helps in understanding the elaborate TK encoded in folk names of plants and animals.

Ethnobiologists have recognised the importance of folk names as repositories of TK long ago. Folk names help us understand how communities recognise and utilise plants and animals known to them (Berlin 1992; Franco 2021; Sunderland 2004). They also provide us information on the richness, diversity, phenology, and ecology of taxa, which helps in developing community-specific conservation and management plans (Pinto et al. 2016). The value of folk taxonomies and nomenclatures to

biodiversity conservation and management is higher when the language in question is endemic such as the Kanekes language represented in this study. This is because endemic languages enjoy time-tested information on the taxa in the respective localities, unlike immigrant languages or newly acquired languages (Maffi 2001). In this study, we demonstrate that folk plant names are condensed forms of traditional knowledge. We do this by decoding the traditional knowledge encoded by the folk food plant names of the Urang Kanekes of Banten, Indonesia.

The Kanekes people, popularly known by their etic name 'Baduy' speak the Kanekes language that is etically considered as a sub-dialect of the Sunda language (Garna 1973; Permana 2006; Rahmania 2009). The Kanekes believe that their ancestors had come to the altar of Sasaka Domas to protect its forest, and hence take pride in calling themselves the 'keepers of the forest' (Danasasmita and Djatisunda 1986; Permana 2006; Wessing 1999). Based on the residents' adherence to the communities' culture and customary regulations, the community categorises their territory into two cultural zones: inner and outer zone. The inner zone consists of three hamlets—Cibeo, Cikertawana, and Cikeusik—that serve as the centre of spiritual and cultural activities, while the outer zone has 63 hamlets (*kampong*) with six more *kampong* expected to be added soon. The outer zone acts as a buffer zone for the culturally 'pure' inner zone, shielding it from 'outside' influence. Members of the community in the outer zone are permitted to wear coloured clothes, mostly black compared to the 'white' attire of the people of the inner zone; usage of modern kitchen utensils, motorcycles, and cultivation of 'non- traditional' crops such as *kopi* (*Coffea arabica*), *cokelat* (*Theobroma cacao*), and *dangdeur* (*Manihot esculenta*) are also tolerated in this zone. The community's culture has evolved to accord utmost importance to food security, represented by the traditional rice varieties they cultivate. Therefore, cultural restrictions, totems, folklores all celebrate the importance of food, with a special emphasis on the need for saving grains for a famine that has been foretold longback by the *pu'un* (Shaman and calendar keeper). In addition to the agricultural produces, forest products gathered from the wild also contribute to the food security of the Kanekes. The community's folk classification of food plants and the TK that forms the basis for it help them in the identification and utilisation of such food resources (Franco et al. 2015).

7.2 Materials and Methods

7.2.1 Data Collection

The research was conducted during May–June 2014 in collaboration with the Kanekes community, at the Kanekes Village of Lebak District in the Banten Province of Indonesia (Fig. 7.1). The Kanekes people have a robust traditional system in place to facilitate responsible collaborative research. According to the community's traditional protocol, the researchers should secure informed permission from the *jaro*

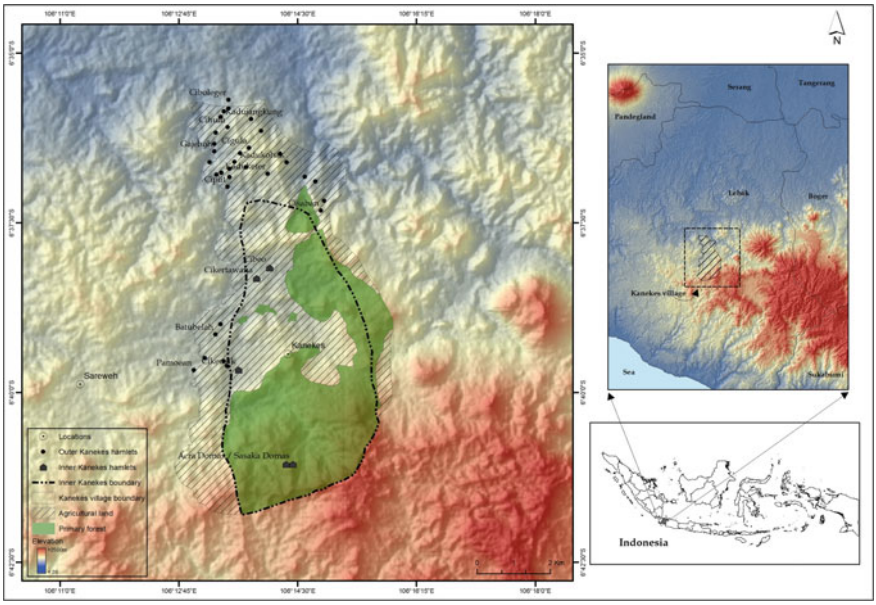

Fig. 7.1 Map showing inner and outer Kanekes

dainah (village head) to conduct research, following which the *jaro dainah* would explain the terms and conditions under which the permission has been granted. The foremost concern of the community is to maintain the sanctity of the inner zone and hence, the use of electronic gadgets and cameras are prohibited in the inner zone. Researchers are also not permitted to wear footwear or stay overnight anywhere in the inner zone.

After securing clearance from the Ethics Committee of Curtin University, Sarawak, Malaysia, we sought the Prior Informed Consent from *jaro dainah* empowered by the community to liaise with researchers. The primary author has been working with the Kanekes people since 2009 which helped her to understand and respect the community's customs and tradition in detail. The personal relationships and trust built over time have benefited this project to a great extent, and the present research builds upon her previous research (Hidayati 2013).

In the present research, we interviewed 60 people from inner and outer Kanekes to retrieve 358 Kenekes food plants' names. We also documented information on medicinal properties, timing, and agricultural techniques associated with the respective taxa. During these interviews, we elicited the meanings of the names from the interview participants. We confirmed the results by consulting key informants recognised by the community as proficient in Kanekes language and TK. Subsequently, we interpreted the names and the underlying nomenclatural mechanisms following the works of Evans (1997), Kakudidi (2004), and Turpin (2013). The lead author conducted the interviews in the Kanekes tongue with the help of Mr. Samin of

Kaduketug village and Mr. Lamri of the outer Panggiwa village who also facilitated the interpretation of plant names. The second author joined her during the final stages of the interviews, for wrapping up. We obtained informed consent from each participant before the interviews. The research conforms to the Code of Ethnobiology (ISE 2006), and the guidelines issued by the Human Research and Ethics Committee of Curtin University (Approval No. CSEA 041,214, dated 4 December 2014).

7.2.2 Analysis of Kanekes Food Plant Names

Our intention is to demonstrate that folk names are condensed forms of traditional knowledge. We do this by bringing out the various kinds of TK encoded in Kanekes food plant names. We classify folk names into two based on the apparency of TK to the Kanekes speakers: (1) barefaced folk names, and (2) cryptic folk names. Barefaced folk names are those names where the TK on the salient feature of the respective taxa is apparent to the speakers of the language. In other words, they are self-explanatory in nature. Such names readily reveal TK related to ecology, morphology, phenology, quality, and utility value of the taxa denoted. Kakudidi's (2004) study on the folk plant classification of local communities near Kibale National Park, Western Uganda is an example of studies that deal with such names. Names of prototypes where a name appended with a suitable identifier such as 'original' denote a taxon and the superordinate taxa encompassing it are also examples of barefaced names (Forth 1995; Zariquiey 2014). However, taxonomic polysemy where a name denotes multiple categories in the taxonomic hierarchy, are cryptic names as the knowledge on the community's folk taxonomy is a prerequisite to decode the name.

Cryptic names are those with TK either not readily comprehensible, or those containing TK on multiple taxa/entities. Understanding the TK encoded in such names requires a relatively greater degree of proficiency in the community's TK and language. Cryptic names are usually metonyms, metaphors, or portmanteaus. Evans (1997), Turpin (2013), and Zariquiey (2014) have reported polysemous names including names that are metaphoric or metonymic in nature. Metaphoric names are coined on the basis of resemblance with other entities (both living and non-living), human expressions, and cultural artefacts. In most cases, metaphors deal with the colour, shape, size, texture, and structure as well as qualities that the association is based on. This is understandable from the following example from Mayali language (Evans 1997).

> *Nakarndekin* (*Capparis* sp.); thorny vine. The name refers to the resemblance of *Capparis* thorns to the dingo's sharp tooth.

Metonymy is a polysemous condition where a name or its root identifies multiple denotata that are culturally related (Evans 1997). The Merriam-Webster dictionary (2020) defines metonymy as 'a figure of speech consisting of the use of the name of one thing for that of another of which it is an attribute or with which it is associated'. Metonyms differ from metaphors in that, they are given based on the perceived

association between the named entities, whereas metaphors are based on resemblance (Charteris-Black 2003; Warren 1999). Both metaphors and metonyms encode TK on multiple denotata. Metaphoric names presented in this study occur in compounds, while metonyms either occur as modifiers in compounds (analysable lexemes) or manifest monolexemically (unanalysable) as in example V below. The third category of cryptic names is portmanteaus which are lexemes coined by blending the sounds and meanings of two or more lexemes (Bauer 1992; Kridalaksana 2001; Pound 1914), a complexity that renders them cryptic.

7.3 Results and Discussion

We present our results beginning with the linguistic morphology of the Kanekes language (Sect. 7.3.1). Following this, we present the outline of the Kanekes folk classification of plants (Sect. 7.3.2). From Sect. 7.3.3 onwards, we discuss the traditional knowledge encoded in the Kanekes folk names used to denote food plants.

7.3.1 Linguistic Morphology of the Kanekes Language

This section provides a brief overview of the linguistic morphology of food plant names in the Kanekes language to give the reader a better understanding of their morphological forms.

7.3.1.1 Compounding

Many of the food plant names go through a process of compounding as in the examples in I (a) to I (d) and these include:

- Noun + Adjective 'N + Adj' (Colour/Size) compound
- Noun + Noun 'N + N' compound
- Noun + Verb 'N + V' compound

Bawang beureum is a noun followed by a colour functioning as an adjective (not unlike 'green beans' in English but with the opposite adjective-noun word order). *Areuy palungpung* is another 'N + Adj' compound made up of a noun followed by an attributive adjective to describe size. *Huwi ramo* is an 'N + N' compound as two nouns combine to form an identifiable food plant name for the Kanekes people. *Awi apus* is a deverbal 'N + V' compound made up of a verb preceded by a noun.

I. (a) *Bawang beureum* 'onion + red' (*Allium cepa* L.)
   (b) *Areuy palungpung* 'vine + big/plump' (*Decalobanthus peltatus* (L.) A.R.Simões & Staples)

(c) *Huwi ramo* 'tuber + hand' (*Dioscorea* sp.)
(d) (d) *Awi apus* 'bamboo + erase' (*Gigantochloa apus* (Schult.f.) Kurz)

7.3.1.2 Derivation

Another name-formation pattern in the Kanekes language is derivational where the food plant name is derived by taking a portion of an existing lexeme in the language to create a new form as shown in example II.

II. *Kukuk* 'fruit with curved shape' (*Lagenaria siceraria* (Molina) Standl.) derived from *lekuk* 'curved'.

7.3.1.3 Locative and Temporal

A common naming procedure for food plants is to include the plant's locative and temporal information by combining a noun with a word expressing *where* the plant grows or *when* it is normally found as exemplified in III (a) and III (b), respectively. *Supa kayang* provides locative information and identifies mushrooms that grow only in the dead trunks of *kayang* (*Lithocarpus korthalsii*) whereas *katulampa* includes temporal information as it names a plant that only blooms in the flowering season of the Kanekes.

III. (a) *Supa kayang* 'mushroom + *kayang'* (*Bertrandia* sp.)
(b) *Katulampa* 'walk together' (*Elaeocarpus glaber* Blume)

7.3.1.4 Onomatopoeia

Another naming process is the incorporation of onomatopoeia into the names of food plants by combining a noun and the sound produced when it is utilised by the Kanekes people. In IV (a), the sound is produced when the plant is cut vertically, while in IV (b) it is the sound produced when children play with the plant's trunk.

IV. (a) *Awi ater* 'bamboo + *ter*' where *ter* is the sound characteristic (*Gigantochloa atter* (Hassk.) Kurz)
(b) *Cau kepok* 'banana + *kepok*' where *kepok* is the sound characteristic (*Musa acuminata* Colla)

7.3.1.5 Polysemy

Some food plant names have a polysemous relationship in that they are related in meaning to another word in the Kanekes language. In example V, *binglu* is a skin disease; the tree that shares the same name is believed to cause the disease if one comes into contact with it.

V. *Binglu* 'a skin disease' (*Mangifera caesia* Jack).

7.3.1.6 Blending

Blending is also used by the Kanekes people to name food plants by a process of combining a word or the first syllable of a word and the second syllable of another word as shown in VI (a) and VI (b).

VI. (a) *Bonteng* 'plant accessible only in swidden field' taken from *kebon* 'swidden forest' + *enteng* 'light' (*Cucumis sativus* L.)
(b) *Kecapi* 'sour fruit that produces a sharp sensation in the mucosa' taken from *kecap* 'speaking' + *pipi* (*Sandoricum koetjape* (Burm.f.) Merr.)

7.3.1.7 Suffixation

Food plant names are also formed by a process of suffixation where the suffix—*an* is added to a verb. This suffixation process then expresses that the particular food plant is consumed via the action of the suffixed verb. So for instance, in VII (a) the suffix—*an* attached to the verb *pisit* (which means 'to rip off') tells us that the fruit must be ripped open to be eaten.

VII. (a) *Pisitan* 'fruit consumed after ripping open fruit' from the verb *pisit* 'to rip off' (*Dysoxylum alliaceum* (Blume) Blume)
(b) *Poh-pohan* 'fruit compressed before eating' from the verb *popoh* 'compress' (*Pilea melastomoides* (Poir.) Wedd.)

7.3.2 Outline of the Kanekes Folk Taxonomy on Plants

The Kanekes people use the terms *tatangkalan* and *sasatoan* as Unique Beginners for plants and animals, respectively. The word *tatangkalan* is derived from the partial reduplication of the word *tangkal* (tree), attached with the suffix 'an'. Similarly, *sasatoan* is derived from *sato*, meaning 'animal'. The terms *tangkal* and *sato* are also used by other Sunda speaking communities (Rigg 1862). The usage of the category 'unique beginners' conforms to the general pattern in ethnotaxonomy (Berlin et al. 1966). However, no term that could be considered as an equivalent to the category 'living beings' was recorded in this study. Three different life forms are presented under the category of *tatangkalan*, viz., (1) *tangkal* (big tree), (2) *jukut* (shrubs, herbs, seedlings, and small trees), and (3) *areuy* (liana or vine). They also recognise two types of mushroom—*supa* and *suum*; *supa* is the mushroom growing on rotten plant materials while *suum* grows on the ground. Both *supa* and *suum* are polysemous terms referring to the categories of life form as well as genus.

Example:

VIII. (a) *Supa koja*: *Phallus indusiatus* Vent.
(b) *Suum pahatu: Hygrocybe acutoconica* (Clem.) Singer.

Such polysemy where a name refers to two taxonomic hierarchy is common in folk classifications. Similar to the life form-genus polysemy seen in the above example, a folk name could also denote both a folk genus as well as a species. In such cases, the species denoted often serves as the 'type species' to name other species included in the genus (Franco and Narasimhan 2012), a phenomenon similar to the concept of 'type species or *species typica*' of the International Code of Zoological Nomenclature (International Code of Zoological Nomenclature 1999). Berlin (1992: 29) refers to such species as 'prototypes'. Our study reveals the existence of such prototypes in Kanekes food plant taxonomy. For instance, *laja* refers to the genus that comprises *Alpinia galangal*, *A. purpurata*, and *A. malaccensis*. However, when the name *laja* is used alone, it exclusively connects to the denotatum *A. galanga*. Prototypical names are not always polysemous. When recollected in a group comprising of multiple taxa of the same category, they are attached with a modifier such as original, genuine, ideal type, wild, etc. (Berlin 1992; Zariquey 2014; 2018). The Kanekes use modifiers such as *biasa* meaning 'original/ordinary', to qualify it as a protoype.

Example:

IX. *Honje biasa* (*Etlingera hemisphaerica* (Blume) R.M.Sm.): prototype of all other taxa included the folk genus *honje*.

7.3.3 TK Encoded in Kanekes Food Plant Names

Our study recorded 358 Kanekes plant taxa that were consumed as food, of which 218 corresponded to the species rank and five to the variety rank as per the formal systems of classification (Table 7.1). Of the 358 folk names, we were successful in decoding the TK held by 294 names. These names encode TK related to morphology (161), ecology (45), utility (39), and quality (49) of the taxa. A majority of these names (172 names) are cryptic (111 metaphors, 53 metonyms, and 08 portmanteaus), while the rest are barefaced (122 names). When they exist in compound forms, barefaced names are either Noun + Adjective (Colour/Size) or Noun + Verb compounds, while cryptic names are either Noun + Noun compounds (metaphors and metonyms) or products of blending (portmanteaus). When they manifest monolexemically, cryptic names are unanalysable lexemes (example V, *binglu*), while barefaced names convey Noun and Verb senses (examples III (b) *katulampa* and VII (a) *pisitan*).

Evans (1997) proposed three major types of metonymy occurring in folk plant and animal names, viz., temporal, spatial, and culturally mediated metonymy. Turpin (2013) proposed ten types of metonymy, viz., salient body part metonymy, spatial metonymy, seasonal metonymy, behavioural metonymy, diet metonymy, sound metonymy, sign metonymy, meaningful call metonymy, human influence metonymy, and kin-based commemorative metonymy. Of these, we encounter spatial, behavioural, diet, sound, and human influence metonymies in our study. We also introduce the categories of introducer metonymy, procedural metonymy, and medicinal metonymy. Introducer metonymy occurs when the name of the person who introduced plant taxa to the community, or the place of origin of the taxa is encoded

Table 7.1 Kanekes food plants and the TK and linguistic mechanisms employed in naming them

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
1	*Alpuket*	*Alpuket*	*Persea americana* Mill	–	–	Bahasa Indonesia
2	*Antanan*	*Antanan*	*Centella asiatica* (L.) Urb	–	–	–
3	*Areuy*	*Areuy amis mata*	*Ficus montana* Burm.f	Sweet fruit as round as eyes	*Areuy*: vine *Amis*: sweet *Mata*: eyes	Morphology & quality [metaphor (shape)]
4		*Areuy canar*	*Smilax leucophylla* Blume	Spiny vine	*Areuy*: vine *Canar*: spine	Morphology
5		*Areuy canar bokor*	*Smilax macrocarpa* Blume	Spiny vine with bowl-shaped leaves	*Areuy*: vine *Canar*: spine *Bokor*: bowl	Morphology [metaphor (shape)]
6		*Areuy kacembang*	*Embelia ribes* Burm.f	*Kacembang* vine	*Areuy*: vine *Kacembang*: name of the plant	–
7		*Areuy ki koneng*	*Arcangelisia flava* (L.) Merr	Liana with yellow coloured wood	*Areuy*: vine *Ki*: woody *Koneng*: yellow	Morphology [metaphor (strength)]
8		*Areuy leuksa*	*Nothocnide repanda* (Blume) Blume	This vine is used in *ngaleuksa* ceremony	*Areuy*: vine *Leuksa*: *ngaleuksa* is a traditional ceremony to prepare the dish *leuksa*, to offer to the government. This ceremony is a part of the *seba* festival	Utility [metonymy (procedural)]
9		*Areuy palungpung*	*Decalobanthus peltatus* (L.) A.R.Simões & Staples	Plump vine	*Areuy*: vine *Palungpung*: plump	Morphology

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
10	*Awi*	*Awi apus*	*Gigantochloa apus* (Schult.) Kurz	Bamboo that can cure a few diseases	*Awi*: bamboo *Apus*: erase	Utility
11		*Awi ater*	*Gigantochloa atter* (Hassk.) Kurz	Bamboo that makes *ter* sound	*Awi*: bamboo *Ater*: sound '*ter*'	Quality [metonymy (sound)]
12		*Awi bitung*	*Dendrocalamus asper* (Schult.) Backer	Big bamboo	*Awi*: bamboo *Bitung*: big	Morphology
13		*Awi gede*	*Gigantochloa verticillata* (Willd.) Munro	Big bamboo	*Awi*: bamboo *Gede*: big	Morphology
14		*Awi hideung*	*Gigantochloa atroviolacea* Widjaja	Black bamboo	*Awi*: bamboo *Hideung*: black	Morphology
15		*Awi mayan*	*Gigantochloa robusta* Kurz	Medium bamboo	*Awi*: bamboo *Mayan*: moderate	Morphology
16	*Balimbing*	*Balimbing*	*Averrhoa carambola L*	–	–	
17		*Balimbing wuluh*	*Averrhoa bilimbi L*	–	*Wuluh*	Bahasa Indonesia
18	*Barahulu*	*Barahulu*	*Amomum maximum* Roxb	Fruits like human heads	*Bara*: few *Hulu*: heads	Morphology [metaphor (structure)]
19	*Bawang*	*Bawang beureum*	*Allium cepa* L	Red allium	*Bawang*: *Allium* sp. *Bereum*: red	Morphology
20		*Bawang bodas*	*Allium sativum* L	White allium	*Bawang*: *Allium* sp. *Bodas*: white	Morphology

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
21	*Beuka*	*Beuka*	*Globba marantina* L	Bloom	*Beuka*: to bloom	Quality
22	*Beungang*	*Beungang*	*Neesia altissima* (Blume) Blume	Loosen	*Beungang*: loosen	Morphology
23	*Beunying*	*Beunying*	*Ficus fistulosa* Reinw. ex Blume	–	–	–
24	*Biksir*	*Biksir*	*Durio zibethinus* L	–	–	–
25	*Binglu*	*Binglu*	*Mangifera caesia* Jack	The latex could treat *binglu*	*Binglu*: name of a disease similar to urticaria	Utility [metonymy (human influence)]
26	*Bintatoet*	*Bintatoet*	*Canthium horridum* Blume	Prickly plant	*Toed*: impulsive sound made when people feel pain	Morphology [metaphor (sound)]
27	*Boled*	*Boled*	*Trichosanthes scabra* Lour	Long, big fruits	*Boled*: long and big	Morphology
28	*Bonteng*	*Bonteng*	*Cucumis sativus* L	Easily accessible	*Bon—kebon*: garden *Teng—enteng*: light	Ecology [portmanteau]
29	*Buncis*	*Buncis*	*Phaseolus vulgaris* L	–	–	Bahasa Indonesia
30	*Cabe*	*Cabe rawit*	*Capsicum annuum* L	Chilli with bumpy surface, just like fingers	*Cabe*: chilli *Rawit*: bumpy finger	Morphology [metaphor (texture)]
31	*Caliket*	*Caliket*	*Donella lanceolata* (Blume) Aubrév	The fruit is sticky	*Liket*: sticky	Quality

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
32	*Calogor*	*Calogor*	*Nephelium juglandifolium* Blume	The fruit is collected by clearing the canopy and let the fruits tumble down	*Logor*: baggy	Utility [metonymy (procedural)]
33	*Cangkuang*	*Cangkuang*	*Pandanus furcatus* Roxb	–	–	–
34	*Cangkudu*	*Cangkudu*	*Morinda citrifolia* L	Bad taste, yet edible	*Kudu*: undesirable	Quality
35	*Cariang*	*Cariang*	*Homalomena pendula* (Blume) Bakh.f	–	–	
36	*Cau*	*Cau abu*	*Musa paradisiaca* L	Banana with leaves covered by ash	*Cau*: banana *Abu*: ash	Morphology [metonymy (texture)]
37		*Cau ambon*	*Musa* x *paradisiaca* L	Banana from Ambon	*Cau*: banana *Ambon*: an island in Indonesia	Ecology [metonymy (introducer)]
38		*Cau anggasa*	*Musa* x *paradisiaca* L	Banana fruits resembling those of *Amomum dealbatum*	*Cau*: banana *Anggasa*: *Amomum dealbatum*	Morphology [metaphor (shape)]
39		*Cau apu*	*Musa* x *paradisiaca* L	Bananas as white as limestone	*Cau*: banana *Apu*: limestone	Morphology [metaphor (colour)]
40		*Cau badak*	*Musa* x *paradisiaca* L	Bananas shaped like rhinoceroses' horn	*Cau*: banana *Badak*: rhinoceros	Morphology [metaphor (shape)]
41		*Cau bangkunang*	*Musa* x *paradisiaca* L	*Bangkunang* banana	*Cau*: banana *Bangkunang*: *bangkunang*	–

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
42		*Cau beleum*	*Musa* x *paradisiaca* L	This banana fruit is nice to be roasted	*Cau*: banana *Beleum*: roasted	Utility
43		*Cau beusi*	*Musa* x *paradisiaca* L	This banana is hard	*Cau*: banana *Beusi*: iron	Morphology [metaphor (strength)]
44		*Cau bogo*	*Musa* x *paradisiaca* L	A banana whose leaves could be used for wrapping fishes	*Cau*: banana *Bogo*: *Channa gachua*	Utility [metonymy (procedural)]
45		*Cau bogo jangkung*	*Musa* x *paradisiaca* L	A banana plant taller than *cau bogo* and its leaves could be used for wrapping fishes	*Cau*: banana *Bogo*: *Channa gachua* *Jangkung*: tall	Morphology & utility [Metonymy (procedural)]
46		*Cau emas*	*Musa* x *paradisiaca* L	Banana with golden coloured flesh	*Cau*: banana *Emas*: gold	Morphology [metaphor (colour)]
47		*Cau tanduk*	*Musa* x *paradisiaca* L	Horn shaped banana	*Cau*: banana *Tanduk*: horn	Morphology [metaphor (shape)]
48		*Cau gejloh*	*Musa* x *paradisiaca* L	Big banana	*Cau*: banana *Gejloh*: big	Morphology
49		*Cau gembor*	*Musa* x *paradisiaca* L	Big banana	*Cau*: banana *Gembor*: spread story	Morphology
50		*Cau haseum*	*Musa* x *paradisiaca* L	Banana with a sour taste	*Cau*: banana *Haseum*: sour	Quality

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
51		*Cau haseup*	*Musa* x *paradisiaca* L	Reddish banana	*Cau*: banana *Haseup*: smoke	Morphology [metaphor (colour)]
52		*Cau hoe*	*Musa* x *paradisiaca* L	Banana fruits long like rattan	*Cau*: banana *Hoe*: rattan (*Calamus* sp.)	Morphology [metaphor (size)]
53		*Cau hurang*	*Musa* x *paradisiaca* L	Banana as red as prawns	*Cau*: banana *Hurang*: prawn	Morphology [metaphor (colour)]
54		*Cau janten*	*Musa* x *paradisiaca* L	Janten banana	*Cau*: banana *Janten*: name of an individual	Ecology [metonymy (introducer)]
55		*Cau jarum*	*Musa* x *paradisiaca* L	Banana as small as needles	*Cau*: banana *Jarum*: needle	Morphology [metaphor (size)]
56		*Cau jebug*	*Musa* x *paradisiaca* L	Banana that looks like an old betel nut tree trunk	*Cau*: banana *Jebug*: *Areca catechu*	Morphology [metaphor (shape)]
57		*Cau kepok*	*Musa acuminata* Colla	Kanekes children whip the trunk in the air to create *pok pok* sound	*Cau*: banana *Kepok*: sound '*pok pok*'	Utility [metonymy (sound)]
58		*Cau ketan*	*Musa* x *paradisiaca* L	Sticky banana	*Cau*: banana *Ketan*: sticky rice	Quality [metaphor (texture)]
59		*Cau kulutuk*	*Musa balbisiana* var. *brachycarpa* (Backer) Häkkinen	This banana is eaten by eagles	*Cau*: banana *Kulutuk*: eagle	Ecology [diet metonymy]

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
60		*Cau lagadai*	*Musa* x *paradisiaca* L	*Lagadai* banana	*Cau*: banana *Lagadai*: noun; name of the banana	–
61		*Cau lampeneng*	*Musa* x *paradisiaca* L	Banana fruits as long as a handkerchief	*Cau*: banana *Lampeneng*: handkerchief	Morphology [metaphor (size)]
62		*Cau lubang*	*Musa* x *paradisiaca* L	Banana fruits that emerge from a hole in the trunk	*Cau*: banana *Lubang*: hole	Morphology [metonymy (behavioural)]
63		*Cau manjangan*	*Musa* x *paradisiaca* L	Banana bunches look like antlers of *Cervus timorensis*	*Cau*: banana *Manjangan*: *Cervus timorensis*	Morphology [metaphor (shape)]
64		*Cau masakijo*	*Musa* x *paradisiaca* L	Banana that looks green even when ripe	*Cau*: banana *Masakijo*: green when ripe	Morphology
65		*Cau muli*	*Musa* x *paradisiaca* L	*Muli* banSmells like jackfruit ana	*Cau*: banana *Muli*: name of banana	–
66		*Cau nangka*	*Musa* x *paradisiaca* L		*Cau*: banana *Nangka*: jackfruit	Quality [metaphor (smell)]
67		*Cau nipah*	*Musa* x *paradisiaca* L	The leaves of this banana resemble that of nipah palm (*Nypa fruticans* Wurmb)	*Cau*: banana *Nipah*: *Nypa fruticans* Wurmb	Morphology [metaphor (structure)]
68		*Cau papan*	*Musa* x *paradisiaca* L	Banana that cracks like beaten planks, when cooked	*Cau*: banana *Papan*: board/plank	Morphology [metaphor (texture)]

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
69		*Cau raja bulu*	*Musa* x *paradisiaca* L	Very delicious banana with hairy skin	*Cau*: banana *Raja*: king *Bulu*: feather	Morphology & quality [metaphor (taste & texture)]
70		*Cau raja sereh*	*Musa* x *paradisiaca* L	Very delicious banana fruit with surface like *Piper betle* L. leaves	*Cau*: banana *Raja*: king *Sereh*: *Piper betle* L	Morphology & quality [metaphor (taste & structure)]
71		*Cau raja*	*Musa* x *paradisiaca* L	Very delicious banana	*Cau*: banana *Raja*: king	Quality [metaphor (taste)]
72		*Cau rejang*	*Musa* x *paradisiaca* L	Banana as small as *Microhyla achatina* (narrow-mouthed frog) endemic to Java	*Cau*: banana *Rejang*: *Microhyla achatina*	Morphology [metaphor (size)]
73		*Cau sabulan*	*Musa* x *paradisiaca* L	Banana that ripens in one month	*Cau*: banana *Sabulan*: a month	Phenology
74		*Cau selendang*	*Musa* x *paradisiaca* L	Bananas large as shawls	*Cau*: banana *Selendang*: large shawl	Morphology [metaphor (size)]
75		*Cau sepet*	*Musa* x *paradisiaca* L	Bananas with skin like coconut fibre	*Cau*: banana *Sepet*: coconut fibre	Morphology [metaphor (texture)]
76		*Cau serebu*	*Musa* x *paradisiaca* L	Numerous bananas in a bunch	*Cau*: banana *Serebu*: a thousand	Morphology

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
77		*Cau sisir*	*Musa* x *paradisiaca* L	Comb-like fruits	*Cau*: banana *Sisir*: comb	Morphology [Metaphor (structure)]
78		*Cau susuh*	*Musa* x *paradisiaca* L	Bananas shaped like breasts	*Cau*: banana *Susu*: breast	Morphology [metaphor (shape)]
79		*Cau tarali*	*Musa* x *paradisiaca* L	Bananas large in size like the Australians (Caucasians)	*Cau*: banana *Tarali*: Australia	Morphology [metaphor (size)]
80	*Cecendet*	*Cecendet*	*Physalis angulata* L	This plant can cause *cecendetan* disease	*Cecendet*: swelling of the penis due to infection and scar, usually noticed after circumcision	Utility [metonymy (human influence)]
81	*Cereme*	*Cereme*	*Phyllanthus acidus* (L.) Skeels	–	–	–
82	*Ceuri*	*Ceuri*	*Garcinia dioica* Blume	Fruits very sour; children cry if they consume these fruits in large quantities	*Ceuri—ceurik*: crying	Quality
83	*Cikur*	*Cikur*	*Kaempferia galanga* L	A plant that is always stunted	*Cik*: stunted	Morphology
84	*Coklat*	*Coklat*	*Theobroma cacao* L	Brown	*Cokelat*: brown	Bahasa Indonesia
85	*Cokrom*	*Cokrom kupa*	*Solanum virginianum* L	Eggplant with fruits rounded as *Syzygium polycephalum* (Miq.) Merr. & L.M.Perry and can be eaten raw	*Cokrom*: eaten raw *Kupa*: *Syzygium polycephalum* (Miq.) Merr. & L.M.Perry	Utility & morphology [metaphor (shape)]

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
86		*Cokrom ungu*	*Solanum virginianum* L	Purple eggplant fruit that can be eaten raw	*Cokrom*: eaten raw *Ungu*: purple	Morphology and utility
87		*Cokrom hejo*	*Solanum violaceum* Ortega	Green eggplant fruits that can be eaten raw	*Cokrom*: eaten raw *Hejo*: green	Morphology and utility
88	*Dahu*	*Dahu*	*Dracontomelon dao* (Blanco) Merr. & Rolfe	–	–	–
89	*Dangdeur*	*Dangdeur apu*	*Manihot esculenta* Crantz	The tuber is white, hard and resembles limestone	*Dangdeur*: cassave *Apu*: limestone	Morphology [metaphor (colour)]
90		*Dangdeur cangkudu*	*Manihot esculenta* Crantz	Tuber resembling fruits of *Morinda citrifolia* L	*Dangdeur*: cassava *Cangkudu*: *Morinda citrifolia* L	Morphology [metaphor (shape)]
91		*Dangdeur karet*	*Manihot carthagenensis* (Jacq.) Müll.Arg	Cassava that produces copious latex	*Dangdeur*: cassava *Karet*: *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg	Quality [metaphor (behavioural)]
92		*Dangdeur ketan*	*Manihot esculenta* Crantz	This cassava tuber is sticky when cooked	*Dangdeur*: cassava *Ketan*: sticky rice	Morphology [metaphor (texture)]
93		*Dangdeur koneng*	*Manihot esculenta* Crantz	This cassava tuber is yellow	*Dangdeur*: cassava *Koneng*: yellow	Morphology
94		*Dangdeur lampeneng*	*Manihot esculenta* Crantz	Handkerchief shaped cassava	*Dangdeur*: cassava *Lampeneng*: handkerchief	Morphology [metaphor (size)]
95		*Dangdeur mentega*	*Manihot esculenta* Crantz	This tuber is smooth as butter	*Dangdeur*: cassava *Mentega*: butter	Quality [metaphor (texture)]

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
96		*Dangdeur nangka*	*Manihot esculenta* Crantz	Cassava tubers as yellow as *Artocarpus heterophyllus* Lam	*Dangdeur*: cassava *Nangka*: *Artocarpus heterophyllus* Lam	Morphology [metaphor (colour)]
97		*Dangdeur roti*	*Manihot esculenta* Crantz	Tubers when cooked will have air pockets like bread	*Dangdeur*: cassava *Roti*: bread	Morphology [metaphor (structure)]
98	*Dukuh*	*Dukuh*	*Lansium domesticum* Corrêa	Fruit that forms bunches	*Dukuh*: assemble	Morphology
99	*Gamas*	*Gamas*	*Sicyos edulis* Jacq	–		–
100	*Gamet*	*Gamet*	*Celosia argentea* L	Fruits that are collected by snatching	*Gamet—jambret*: snatch	Utility
101	*Gedang*	*Gedang*	*Carica papaya* L	Fruits collected by shaking	*Gedang—gedag*: shake	Utility
102	*Gelam*	*Gelam*	*Melaleuca cajuputi* Maton & Sm. ex R.Powell	Fruits taste rough and can induce choking	*Gelam—kabehelan*: choking	Quality
103	*Gempol*	*Gempol*	*Nauclea orientalis* (L.) L	–	–	–
104	*Gintung*	*Gintung*	*Bischofia javanica* Blume	Fruits that can turn teeth black if consumed	*Gintung*: black teeth	Quality [metonymy (human influence)]
105	*Hajeli*	*Hajeli*	*Coix lacryma-jobi* L	The procedure to plant this plant is by using the big toe finger, instead of stalks	*Hajeli* is derived from the word *jelel* meaning piston	Utility [metonymy (procedural)]

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
106	*Hanggasa*	*Hanggasa*	*Amomum maximum* Roxb	–	–	–
107	*Hantap*	*Hantap*	*Sterculia rubiginosa* Vent	–	–	–
108		*Hantap heulang*	*Sterculia macrophylla* Vent	Fruits preferred by eagles	*Heulang*: eagle	Ecology [diet metonymy]
109		*Hantap manuk*	*Sterculia* sp.	Fruit that is eaten by birds	*Manuk*: bird	Ecology [diet metonymy]
110	*Harendong*	*Harendong leuweung*	*Bellucia pentamera* Naudin	Plant found in the forest	*Harendong*: *Bellucia* sp. *Leuweung*: forest	Ecology [spatial metonymy]
111		*Hareundang*	*Miconia crenata* (Vahl) Michelang	–	–	–
112	*Hawuan*	*Hawuan*	*Elaeocarpus floribundus* Blume	–	–	–
113	*Hiris*	*Hiris*	*Cajanus cajan* (L.) Huth	–	–	–
114	*Honje*	*Honje bereum*	*Etlingera solaris* (Blume) R.M.Sm	Red *etlingera*	*Bereum*: red	Morphology
115		*Honje*; *honje biasa*	*Etlingera hemisphaerica* (Blume) R.M.Sm	Ordinary *etlingera* (prototype of *honje*)	*Biasa*: ordinary	Ecology & Taxonomy
116	*Huwi*	*Huwi bangban*	*Ipomoea batatas* (L.) Lam	Leaves resemble those of the *Donax canniformis*	*Huwi*: tuber *Bangban*: *Donax canniformis*	Morphology [metaphor (shape)]

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
117		*Huwi bodas*	*Ipomoea batatas* (L.) Lam	White tuber	*Huwi*: tuber *Bodas*: white	Morphology
118		*Huwi curuk*	*Ipomoea batatas* (L.) Lam	This tuber is long like the index finger	*Huwi*: tuber *Curuk*: index finger	Morphology [metaphor (shape)]
119		*Huwi dahong*	*Ipomoea batatas* (L.) Lam	Plant that grows on fissured land	*Huwi*: tuber *Dahong—rahong*: fissured land	Ecology [metonymy (ecological/ spatial)
120		*Huwi doro*	*Ipomoea batatas* (L.) Lam	Tubers that are long and cylindrical	*Huwi*: tuber *Doro*: long and cylindrical	Morphology
121		*Huwi endog*	*Ipomoea batatas* (L.) Lam	Tuber is rounded and resembles an egg yolk	*Huwi*: tuber *Endog*: egg	Morphology [metaphor (shape)]
122		*Huwi gadung*	*Dioscorea hispida* Dennst	This tuber requires special effort for neutralising the toxins before consumption	*Huwi*: tuber *Gadung—badung*: stubborn	Utility
123		*Huwi hideung*	*Ipomoea batatas* (L.) Lam	Black tuber	*Huwi*: tuber *Hideung*: black	Morphology
124		*Huwi kalapa*	*Dioscorea alata* L	Tuber tastes good when cooked with coconut	*Huwi*: tuber *Kelapa*: coconut	Utility [metonymy (Procedural)]
125		*Huwi ketan*	*Ipomoea batatas* (L.) Lam	Tuber turns sticky when cooked	*Huwi*: tuber *Ketan*: sticky rice	Quality [metaphor (texture)]

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
126		*Huwi kiara*	*Ipomoea batatas* (L.) Lam	Vine that creeps like *Ficus benjamina*	*Huwi*: tuber *Kiara*: *Ficus benjamina* L	Morphology [metaphor]
127		*Huwi ki hiyang*	*Ipomoea batatas* (L.) Lam	Tubers as hard as *Clbizia procera*	*Huwi*: tuber *Ki hiyang*: *Albizia procera*	Quality [metaphor (strength)]
128		*Huwi kumbili*	*Plectranthus rotundifolius* (Poir.) Spreng	Tuber is small, rounded and aggregate	*Huwi*: tuber *Kumbili*: small, round, uniform and aggregate	Morphology
129		*Huwi manis*	*Ipomoea batatas* (L.) Lam	Sweet tuber	*Huwi*: tuber *Manis*: sweet	Quality
130		*Huwi manjangan*		Tubers resembling the antlers of *Cervus timorensis*	*Huwi*: tuber *Manjangan*: *Cervus timorensis*	Morphology [metaphor (shape)]
131		*Huwi mantang bodas*	*Ipomoea batatas* (L.) Lam	White tuber that can be collected and eaten on days when rice grains are not culturally permitted to be retrieved from the granary	*Huwi*: tuber *Mantang*: prohibition *Bodas*: white	Utility & morphology
132		*Huwi mantang bulawok*	*Ipomoea batatas* (L.) Lam	Blue tuber that can be collected and eaten even on taboo days	*Huwi*: tuber *Mantang*: prohibition *Bulawok*: look blue	Utility & morphology
133		*Huwi mantang dangdeur*	*Ipomoea batatas* (L.) Lam	Cassava-like tubers; can be collected and eaten even on taboo days	*Huwi*: tuber *Mantang*: prohibition *Dangdeur*: cassava	Utility & morphology [metaphor (shape)]

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
134		*Huwi mantang kalapa*	*Ipomoea batatas* (L.) Lam	Tuber tastes good when cooked with coconut; collected and eaten even on taboo days	*Huwi*: tuber *Mantang*: prohibition *Kalapa*: coconut	Utility [metonymy (procedural)]
135		*Huwi mantang waluh*	*Ipomoea batatas* (L.) Lam	Gourd-shaped tuber; collected and eaten even on taboo days	*Huwi*: tuber *Mantang*: prohibition *Waluh*: gourd	Utility & morphology [metaphor (shape)]
136		*Huwi nangka*	*Ipomoea batatas* (L.) Lam	Jackfruit shaped tuber	*Huwi*: tuber *Nangka*: jackfruit	Morphology [metaphor (shape)]
137		*Huwi patat*	*Maranta arundinacea* L	Leaves of this tuber resemble those of *patat*	*Huwi*: tuber *Patat*: *Phrynium pubinerve*	Morphology [metaphor (shape)]
138		*Huwi ramo*	*Dioscorea* sp	Finger-like tuber	*Huwi*: tuber *Ramo*: fingers	Morphology [metaphor (shape)]
139		*Huwi sawut*	*Dioscorea pentaphylla* L	Hairy tuber	*Huwi*: tuber *Sawut*: hairy	Morphology
140	*Jaat*	*Jaat*	*Psophocarpus tetragonolobus* (L.) DC	Wicked plant that climbs over rice plants	*Jaat*—jahat: wicked	Ecology
141	*Jagong*	*Jagong*	*Zea mays* L	Corn	*Jagong*: corn	–
142		*Jagong amis*	*Zea mays* L	Sweet corn	*Jagong*: corn *Amis*: sweet	Quality

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
143	*Jahe*	*Jahe*	*Zingiber officinale* Roscoe	–	–	–
144	*Jambu*	*Jambu aer*	*Syzygium aqueum* (Burm.f.) Alston	Juicy guava	*Jambu*: guava *Aer*: water	Quality [metaphor (texture)]
145		*Jambu batu*	*Psidium guajava* L	Stone guava	*Jambu*: guava *Batu*: stone	Quality [metaphor (texture)]
146		*Jambu bool*	*Syzygium malaccense* (L.) Merr. & L.M.Perry	Guava resembling human buttocks	*Jambu*: guava *Bool*: buttock	Morphology [metaphor (shape)]
147		*Jambu cingcalok*	*Syzygium aqueum* (Burm.f.) Alston	This guava grows in ditches	*Jambu*: guava *Cingcalok—cicing di legok* *Cicing*: stay *Legok*: ditches	Ecology [portmanteau]
148		*Jambu mede*	*Anacardium occidentale* L	Guavas planted by southpaws	*Jambu*: guava *Mede—kede*: southpaw	Ecology [metonymy (human influence)]
149		*Jambu samarang*	*Syzygium samarangense* (Blume) Merr. & L.M.Perry	Guava from Samarang	*Jambu*: guava *Samarang*: Samarang city	Ecology [metonymy (introducer)]
150	*Jatake*	*Jatake*	*Bouea macrophylla* Griff	–	–	–

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
151	*Jengkol*	*Jengkol*	*Archidendron jiringa* (Jack) I.C.Nielsen	–	–	–
152	*Jeruk*	*Jeruk bali*	*Citrus maxima* (Burm.) Merr	*Citrus maxima Merr*	*Jeruk*: orange *Bali*: Bali province	Ecology [metonymy (introducer)]
153		*Jeruk garut*	*Citrus aurantium* L		*Jeruk*: orange *Garut*: Garut city	Ecology [metonymy (introducer)]
154		*Jeruk gede*	*Citrus maxima* (Burm.) Merr	Big orange	*Jeruk*: orange *Gede*: big	Morphology
155		*Jeruk nipis*	*Citrus aurantiifolia* (Christm.) Swingle	Thin orange	*Jeruk*: orange *Nipis—ipis*: thin	Morphology
156	*Kacang*	*Kacang hejo*	*Vigna radiata* (L.) R.Wilczek	Green bean	*Kacang*: bean *Hejo*: green	Morphology
157		*Kacang panjang*	*Vigna unguiculata* (L.) Walp	Long bean	*Kacang*: bean *Panjang*: long	Morphology
158		*Kacang suuk*	*Arachis hypogaea* L	Beans collected by digging the ground	*Kacang*: bean *Suuk*: digging	Ecology
159		*Kacang tempe*	*Glycine max* (L.) Merr	Nuts used to make *tempeh*	*Kacang*: bean *Tempe*: *tempeh*	Utility [metonymy (procedural)]
160	*Kadongdong*	*Kadongdong leuweung*	*Spondias pinnata* (L. f.) Kurz	Wild *Spondias* sp.	*Kadondong*: *Spondias* sp. *Leuweung*: forest	Ecology

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
161	*Kadu*	*Kadu*	*Durio zibethinus* L	This fruit is too tasty that one would regret if never tasted	*Kadu—kaduhung*: regret	Quality
162	*Kalapa*	*Kalapa ading*	*Cocos nucifera* L	Coconut as red as the fruits of *huru ading* (*Tetranthera angulata* (Blume) Nees)	*Kalapa*: coconut *Ading*: reddish	Morphology [metaphor (colour)]
163		*Kalapa balida*	*Cocos nucifera* L	Balinese coconut	*Kalapa*: coconut *Bali*: Bali province	Ecology [metonymy (introducer)]
164		*Kalapa beureum*	*Cocos nucifera* L	Red coconut	*Kalapa*: coconut *Bereum*: red	Morphology
165		*Kalapa caruluk*	*Cocos nucifera* L	Coconut fruits that look like those of *Arenga pinnata*	*Kalapa*: coconut *Caruluk*: *Arenga pinnata*	Morphology [metaphor (structure)]
166		*Kalapa genjah*	*Cocos nucifera* L	Short coconut	*Kalapa*: coconut *Genjah*: short	Morphology
167		*Kalapa hejo*	*Cocos nucifera* L	Green coconut	*Kalapa*: coconut *Hejo*: green	Morphology
168		*Kalapa koneng*	*Cocos nucifera* L	Yellow coconut	*Kalapa*: coconut *Koneng*: yellow	Morphology
169		*Kalapa puyuh*	*Cocos nucifera* L	This coconut is small like *Coturnix coturnix*	*Kalapa*: coconut *Puyuh*: *Coturnix coturnix*	Morphology [metaphor (size)]
170		*Kalapa tawa*	*Cocos nucifera* L	Coconut that is used in traditional ceremonies	*Kalapa*: coconut *Tawa*: prayer	Utility

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
171	*Kalimborot*	*Kalimborot*	*Lithocarpus* sp.	Fruits can cause stomachache when consumed a lot	'*brot*': sound	Utility [metonymy (sound)]
172	*Kanas*	*Kanas beureum*	*Ananas comosus* (L.) Merr	Red pineapple	*Kanas*: pineapple *Bereum*: red	Morphology
173		*Kanas buaya*	*Ananas comosus* (L.) Merr	Crocodile pineapple	*Kanas*: pineapple *Buaya*: crocodile	Morphology [metaphor (texture)]
174		*Kanas hejo*	*Ananas comosus* (L.) Merr	Green pineapple	*Kanas*: pineapple *Hejo*: green	Morphology
175	*Kangkung*	*Kangkung air*	*Ipomoea aquatica* Forssk	*Ipomoea repens* that is found in water	*Kangkung*: *Ipomoea repens* Lam *Aer*: water	Ecology [metonymy (ecological/ spatial)]
176	*Kapundung*	*Kapundung*	*Baccaurea* sp.	Fruits as red as an angry face	*Kapundung—pundung*: anger	Morphology [metaphor (colour)]
177	*Katulampa*	*Katulampa*	*Elaeocarpus glaber* Blume	Plant that blooms in the flowering season, but produces belated fruits	*Katulampa*: walking together	Phenology
178	*Kaweni*	*Kaweni*	*Mangifera odorata* Griff	–		–
179	*Kawung*	*Kawung*	*Arenga pinnata* (Wurmb) Merr	–	–	–

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
180	*Kecapi*	*Kecapi*	*Sandoricum koetjape* (Burm.f.) Merr	This fruit is very sour and sharp on the mucosa	*Kecapi—kecap kana pipi* *Kecap*: speaking *kana*: in *Pipi*: cheek	Quality [portmanteau]
181	*Kembang*	*Kembang sarengenge*	*Helianthus annuus* L	Sunflower	*Kembang*: flower *Sarangenge*: sun	Morphology [metaphor (shape and colour)]
182	*Keras*	*Keras tulang*	*Chloranthus elatior* Link	Bone tonic	*Keras*: strength *Tulang*: bone	Utility [metonymy (medicinal)]
183	*Ki*	*Ki hiyang*	*Albizia procera* (Roxb.) Benth	Favourite timber	*Ki*: grand father *Hiyang—hayang*: desire	Quality [metaphor (strength]
184		*Ki lauk*	*Acalypha caturus* Blume	Leaves can be used to wrap fish	*Ki*: grandfather *Lauk*: fish	Quality & utility [metaphor (strength); metonymy (procedural)]
185	*Kiara*	*Kiara bunut*	*Ficus virens* Aiton	Latex can be used to trap birds	*Kiara*: *Ficus benjamina* *Bunut*: latex	Utility [metonymy (procedural)]
186	*Koas*	*Koas*	*Canavalia ensiformis* (L.) DC	–	–	
187	*Kokosan*	*Kokosan*	*Dysoxylum parasiticum* (Osbeck) Kosterm	This fruit is consumed by sucking	*Kokos*: suck	Utility

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
188	*Kondang*	*Kondang*	*Ficus variegata* Blume	Latex can be used to cure stomachache; should be examined carefully to differentiate from other latex	*Kondang—dikoko laju dipandang* *Dikoko*: hold on *Laju*: then *Dipandang*: looked at	Utility [portmanteau]
189	*Koneng*	*Koneng*	*Curcuma longa* L	Yellow tuber	*Koneng*: yellow	Morphology
190	*Kopi*	*Kopi*	*Coffea arabica* L	Bahasa Indonesia term for coffee		
191	*Kowang*	*Kowang areuy*	*Canavalia* sp.	Climber *Canavallia* sp.	*Kowang*: *Canavallia* sp. *Areuy*: vine	Morphology
192		*Kowang dungkuk*	*Canavalia gladiata* (Jacq.) DC	Creeper *Canavalia* sp.	*Kowang*: *Canavallia* sp. *Dungkuk*: handicapped	Morphology [metonymy (behavioural)]
193	*Kucai*	*Kucai*	*Allium ramosum* L	–	–	–
194	*Kukuk*	*Kukuk*	*Lagenaria siceraria* (Molina) Standl	Curved fruit	*Kukuk—ngalekuk*: curved	Morphology
195	*Kundur*	*Kundur*	*Benincasa hispida* (Thunb.) Cogn	–	–	–
196	*Kupa*	*Kupa*	*Syzygium polycephalum* (Miq.) Merr. & L.M.Perry	Fruits supposed to be opened by fathers	*Kupa—dikuku ku bapa* *Dikuku*: opened *Ku*: by *Bapa*: father	Utility [portmanteau]
197	*Laja*	*Laja*	*Alpinia galanga* (L.) Willd	Galangale	–	–

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
198		*Laja bereum*	*Alpinia purpurata* (Vieill.) K.Schum	Red galangale	*Laja*: galangale *Bereum*: red	Morphology
199		*Laja goah*	*Alpinia malaccensis* (Burm.f.) Roscoe	Cave galangale	*Laja*: galangale *Goah*: cave	Ecology [metonymy (ecological/ spatial)]
200	*Lampeni*	*Lampeni*	*Ardisia humilis* Vahl	–	–	–
201	*Langkodeh*	*Langkodeh*	*Stenochlaena palustris* (Burm. f.) Bedd	–	–	–
202	*Lempuyang*	*Lempuyang*	*Zingiber zerumbet* subsp. zerumbet	–	–	–
203	*Leunca*	*Leunca*	*Solanum americanum* Mill	–	–	–
204	*Leungsir*	*Leungsir*	*Pometia pinnata* J.R.Forst. & G.Forst	–	–	–
205	*Limus*	*Limus*	*Mangifera foetida* Lour	–	–	–
206	*Lingsuh*	*Lingsuh*	*Baccaurea lanceolata* (Miq.) Müll.Arg	Fruits that can cause a sharp pain	*Lingsuh*: pain	Quality [metonymy (human influence)]
207	*Lopang*	*Lopang*	*Cucumis melo* L	–	–	–
208	*Mangga*	*Mangga darmayu*	*Mangifera indica* L	Indramayu mango	*Mangga*: mango *Darmayu*: Indramayu city	Ecology [metonymy (introducer)]

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
209		*Mangga golek*	*Mangifera indica* L	This mango fruit is curved like a puppet nose	*Mangga*: mango *Golek*: puppet	Morphology [metaphor (shape)]
210	*Manggu*	*Manggu leuweung*	*Garcinia lateriflora* Blume	Wild mangosteen	*Manggu*: mangosteen *Leuweung*: forest	Ecology [spatial metonymy]
211		*Manggu*	*Garcinia* × *mangostana* L	Mangosteen; prototype for the folk genus *manggu*	–	Taxonomy
212	*Markisah*	*Markisah*	*Passiflora edulis* Sims	–	–	–
213	*Mayasih*	*Mayasih*	*Erechtites valerianifolius* (Link ex Spreng.) DC	–	–	–
214	*Menteng*	*Menteng*	*Baccaurea racemosa* (Reinw) Müll.Arg	–	–	–
215	*Moris*	*Moris*	*Spondias dulcis* Parkinson	–	–	–
216	*Muncang*	*Muncang*	*Aleurites moluccana* (L.) Willd	–	–	–
217	*Nangka*	*Nangka*	*Artocarpus heterophyllus* Lam	–	–	–
218		*Nangka beurit*	*Artocarpus integer* (Thunb.) Merr	Jackfruit as small as mice	*Nangka*: jackfruit *Beurit*: mouse	Morphology [metaphor (size)]

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
219		*Nangka bubur*	*Artocarpus* sp.	Jackfruit with flesh mashed up like porridge	*Nangka*: jackfruit *Bubur*: porridge	Morphology [metaphor (texture)]
220		*Nangka walanda*	*Annona muricata* L	Dutch jackfruit	*Nangka*: jackfruit *Walanda*: Dutch	Morphology [metaphor (colour)]
221	*Onyam*	*Onyam*	*Antidesma ghaesembilla* Gaertn	–	–	–
222	*Oyong*	*Oyong*	*Luffa acutangula* (L.) Roxb	Favourite fruit	*Oyong—hoyong*: desire	Quality
223	*Paku*	*Paku hurang*	*Stenochlaena palustris* (Burm. f.) Bedd	Prawn fern	*Paku*: fern *Hurang*: prawn	Morphology [metaphor (colour)]
224		*Paku kapal*	*Tectaria repanda* (Willd.) Holttum	Fern that looks like the sails of a ship	*Paku*: fern *Kapal*: sail	Morphology [metaphor (shape)]
225	*Pandan*	*Pandan*	*Pandanus amaryllifolius* Roxb. ex Lindl	–	–	–
226	*Parasi*	*Parasi*	*Curculigo latifolia* Dryand. ex W.T.Aiton	–	–	–
227	*Pare*	*Pare abu ganti*	*Oryza sativa* L	Abu ganti paddy	*Pare*: paddy *Abu ganti*: name of a person	Ecology [metonymy (introducer)]
228		*Pare alean*	*Oryza sativa* L	Good quality paddy that is chosen	*Pare*: paddy *Alean*: chosen	Quality

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
229		*Pare bangban*	*Oryza sativa* L	The paddy roots resemble *Donax canniformis*	*Pare*: paddy *Bangban*: *donax canniformis*	Morphology [metaphor (shape)]
230		*Pare beuntik*	*Oryza sativa* L	Small rice grains with curved apex	*Pare*: paddy *Beuntik*: curve on the top	Morphology
231		*Pare cangkudu*	*Oryza sativa* L	Rice grains as white as *Morinda citrifolia* fruits	*Pare*: paddy *Cangkudu*: *Morinda citrifolia*	Morphology [metaphor (colour)]
232		*Pare cao*	*Oryza sativa* L	Paddy that loves to grow near banana trunks	*Pare*: paddy *Cao—cau*: banana	Ecology [metonymy (ecological/ spatial)]
233		*Pare cokrom*	*Oryza sativa* L	Rice grains big and rounded like brinjal	*Pare*: paddy *Cokrom*: brinjal	Morphology [metaphor (shape)]
234		*Pare hawara*	*Oryza sativa* L	Short-term paddy	*Pare*: paddy *Hawara*: quick	Phenology
235		*Pare hawara benteur*	*Oryza sativa* L	Short-term paddy; rice resembles fish scales	*Pare*: paddy *Hawara*: quick *Benteur*: *Barbodes binotatus*	Phenology & morphology [metaphor (pattern)]
236		*Pare hideung*	*Oryza sativa* L	Black rice	*Pare*: paddy *Hideung*: black	Morphology
237		*Pare janah*	*Oryza sativa* L	Janah paddy	*Pare*: paddy *Janah*: name of a person	Ecology [metonymy (introducer)]

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
238		*Pare jeruk*	*Oryza sativa* L	Round rice like orange fruit	*Pare*: paddy *Jeruk*: orange	Morphology [metaphor (shape)]
239		*Pare karang*	*Oryza sativa* L	Rice with bran as brown as corals	*Pare*: paddy *Karang*: coral	Morphology [metaphor (colour)]
240		*Pare kasumba*	*Oryza sativa* L	*Kasumba* paddy	*Pare*: paddy *Kasumba*: outside area	Ecology [metonymy (introducer)]
241		*Pare ketan areuy*	*Oryza sativa* L	Sticky rice paddy that grows like a vine	*Pare*: paddy *Ketan*: sticky *Areuy*: vine	Quality and morphology
242		*Pare ketan hideung*	*Oryza sativa* L	Black sticky rice	*Pare*: paddy *Ketan*: sticky *Hideung*: black	Quality and morphology
243		*Pare ketan keong*	*Oryza sativa* L	The rice straw is curved like a snail	*Pare*: paddy *Ketan*: sticky *Keong*: snail	Quality & morphology [metaphor (shape)]
244		*Pare ketan keuyeup*	*Oryza sativa* L	Sticky rice with brans reddish like crabs	*Pare*: paddy *Ketan*: sticky *Keuyeup*: crab	Quality & morphology [metaphor (colour)]
245		*Pare ketan langgasari*	*Oryza sativa* L	Langgasari sticky rice	*Pare*: paddy *Ketan*: sticky *Langgasari*: name of an individual	Quality & ecology [metonymy (introducer)]

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
246		*Pare ketan putri*	*Oryza sativa* L	This sticky rice is planted in limited quantitites	*Pare*: paddy *Ketan*: sticky *Putri*: princess	Quality [metaphor]
247		*Pare ketan siang*	*Oryza sativa* L	Sticky rice with bran yellowish like the afternoon	*Pare*: paddy *Ketan*: sticky *Siang*: afternoon	Quality & morphology [metaphor (colour)
248		*Pare kiara*	*Oryza sativa* L	Paddy that clumps like *Ficus benjamina*	*Pare*: paddy *Kiara*: *Ficus benjamina* l	Morphology/ ecology [metaphor (behavioural)]
249		*Pare kolelet*	*Oryza sativa* L	Paddy introduced from Kolelet	*Pare*: paddy *Kolelet*: Kolelet region	Ecology [metonymy (introducer)]
250		*Pare koneng*	*Oryza sativa* L	Yellow bran rice	*Pare*: paddy *Koneng*: yellow	Morphology
251		*Pare konyal*	*Oryza sativa* L	Rubbery paddy	*Pare*: paddy *Konyal*: rubbery	Quality
252		*Pare kowas*	*Oryza sativa* L	Rice grains as long as *Canavalia ensiformis* (l.) Dc.) fruits	*Pare*: paddy *Kowas*: *Canavalia ensiformis* (l.) Dc	Morphology [metaphor (shape)]
253		*Pare limar*	*Oryza sativa* L	Paddy that can be grown even in limited areas	*Pare*: paddy *Limar—angar*: insufficient	Ecology
254		*Pare lulut*	*Oryza sativa* L	Soft rice	*Pare*: paddy *Lulut*: soft	Quality

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
255		*Pare menteng*	*Oryza sativa* L	This paddy stem resembles *Baccaurea racemosa*	*Pare*: paddy *Menteng*: *Baccaurea racemosa*	Morphology [metaphor (shape)]
256		*Pare menyan*	*Oryza sativa* L	Fragrant paddy	*Pare*: paddy *Menyan*: incense	Quality [metaphor (smell)]
257		*Pare menyan hideung*	*Oryza sativa* L	Black fragrant rice	*Pare*: paddy *Menyan*: incense *Hideung*: black	Quality [metaphor (smell)] & morphology
258		*Pare menyan bodas*	*Oryza sativa* L	White fragrant rice	*Pare*: paddy *Menyan*: incense *Bodas*: white	Quality [metaphor (smell)] & morphology
259		*Pare nangsi*	*Oryza sativa* L	Paddy that grows well near the *nangsi* plant	*Pare*: paddy *Nangsi*: *Oreocnide rubescens* (Blume) Miq	Ecology [metonymy (ecological/ spatial)]
260		*Pare pendok*	*Oryza sativa* L	Grains curved like *kris*	*Pare*: paddy *Keris*: *kris*	Morphology [metaphor (shape)]
261		*Pare rabeg*	*Oryza sativa* L	Long and hairy paddy	*Pare*: paddy *Rabeg*: long and hairy	Morphology
262		*Pare racik*	*Oryza sativa* L	Paddy grains that detach one after the other from the stalk	*Pare*: paddy *Racik*: one by one	Quality

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
263		*Pare rumbai*	*Oryza sativa* L	Hairy paddy	*Pare*: paddy *Rumbai*: hairy	Morphology
264		*Pare sampai*	*Oryza sativa* L	Paddy that is dried in *sampaian*	*Pare*: paddy *Sampaian*: hanger for drying paddy	Utility [metonymy (procedural)]
265		*Pare sereh*	*Oryza sativa* L	Paddy with leaves resembling those of lemongrass	*Pare*: paddy *Sereh*: lemongrass	Morphology [metaphor (shape)]
266		*Pare seungkeu*	*Oryza sativa* L	The paddy has a short stem	*Pare*: paddy *Sengkeu*: neckless	Morphology
267		*Pare seuti*	*Oryza sativa* L	Paddy with leaves similar to *Calamus ornatus* leaves	*Pare*: paddy *Seuti*: *Calamus ornatus*	Morphology [metaphor (shape)]
268		*Pare siang*	*Oryza sativa* L	Rice with bran as yellow as the afternoon light	*Pare*: paddy *Siang*: afternoon	Morphology [metaphor (colour)]
269		*Pare singgul*	*Oryza sativa* L	Falls down easily if touched	*Pare*: paddy *Singgul*: touch	Quality
270		*Pare sireupeun*	*Oryza sativa* L	Paddy as small as *apis* sp.	*Pare*: paddy *Sireupeun*: *Apis* sp.	Morphology [metaphor (size)]
271		*Pare tapos*	*Oryza sativa* L	Rice grains round as *Elateriospermum tapos* fruit	Pare: paddy *Tapos*: *Elateriospermum tapos* blume	Morphology [metaphor (shape)]

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
272		*Pare tembaga*	*Oryza sativa* L	Copper paddy	*Pare*: paddy *Tembaga*: copper	Morphology [metaphor (colour)]
273	*Pari*	*Pari*	*Mangifera similis* Blume	–	–	–
274	*Paria*	*Paria*	*Momordica charantia* L	–	–	–
275	*Pedes*	*Pedes*	*Piper nigrum* L	–	–	–
276	*Peusar*	*Peusar*	*Artocarpus rigidus* Blume	–	–	–
277	*Peutag*	*Peutag*	*Eugenia lineata* (Sw.) DC	–	–	–
278	*Peuteuy*	*Peuteuy*	*Parkia speciosa* Hassk	–	–	–
279	*Picung*	*Picung*	*Pangium edule* Reinw	(Poisonous) fruits that are to be soaked in water and detoxified before cooking	*Picung—cung-cung*: soaked in water	Utility
280	*Pisitan*	*Pisitan*	*Dysoxylum alliaceum* (Blume) Blume	Fruits consumed after ripping open the fruit	*Pisit or peset*: to rip off	Utility
281	*Poh-pohan*	*Poh-pohan*	*Pilea melastomoides* (Poir.) Wedd	Fruit that is compressed before eating	*Poh-pohan—popoh*: compressed	Utility
282	*Purut*	*Purut*	*Parartocarpus venenosa* (Zoll. & Moritzi) Becc	–	–	–
283	*Putat*	*Putat*	*Planchonia valida* (Blume) Blume	–	–	–

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
284	*Rampai*	*Rampai*	*Solanum lycopersicum* L	Fruit plant that climbs on other	*Rampai*: weak stemmed plant	Morphology
285	*Rane*	*Rane*	*Selaginella willdenowii* (Desv) Baker	–	–	–
286	*Ranji*	*Ranji*	*Dialium indum* L	Seeds will loosen when the fruit ripens	*Renggang*: loosen *Biji*: seed	Quality [portmanteau]
287	*Rendeu*	*Rendeu*	*Staurogyne elongata* Kuntze	–	–	–
288	*Roway*	*Roway*	*Phaseolus lunatus* L	–	–	–
289	*Rukem*	*Rukem*	*Flacourtia rukam* Zoll. & Moritzi	Fruits with spiny pericarp	*Rukem*: spine	Morphology
290	*Salak*	*Salak*	*Salacca zalacca* (Gaertn.) Voss	–	–	–
291	*Salam*	*Salam leuweung*	*Syzygium nervosum* A.Cunn. ex DC	*Syzygium nervosum* found in forests	*Salam*: *Syzygium nervosum* A.Cunn. ex DC *Leuweung*: forest	Ecology
292	*Salempat*	*Salempat*	*Schismatoglottis calyptrata* (Roxb.) Zoll. & Moritzi	This plant can grow anywhere	*Salempat*: anywhere	Ecology
293	*Saninten*	*Saninten*	*Castanopsis javanica* (Blume) A.DC	–	–	–
294	*Sasawi*	*Sasawi*	*Brassica juncea* (L.) Czern	Resembles cabbage	*Sawi*: cabbage *Sa*: replication	Morphology [metaphor (shape)]

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
295	*Sawi lobak*	*Sawi lobak*	*Brassica rapa* L	Cabbage with leaves resembling those of *Raphanus raphanistrum* subsp. *sativus*	*Sawi*: cabbage *Lobak*: *Raphanus raphanistrum* subsp. *sativus*	Morphology [metaphor (shape)]
296	*Semangka*	*Semangka*	*Citrullus lanatus* (Thunb.) Matsum. & Nakai	–	–	–
297	*Sempur*	*Sempur*	*Dillenia aurea* Sm	Protype of the folk genus *Sempur*	–	–
298		*Sempur gunung*	*Dillenia indica* L	*Dillenia* sp. found in mountains	*Sempur*: *Dillenia aurea* Sm *Gunung*: mountain	Ecology [metonymy (ecological/ spatial)]
299	*Senggang*	*Senggang*	*Amaranthus blitum subsp. oleraceus* (L.) Costea	–	–	
300	*Sentul*	*Sentul*	*Sandoricum koetjape* (Burm.f.) Merr	–	–	–
301	*Sereh*	*Sereh*	*Cymbopogon nardus* (L.) Rendle	Fast-growing plant	–	–
302	*Seeur*	*Seeur*	*Antidesma tetrandrum* Blume	Plant that is abundant	*Seeur*: plenty	Ecology
303	*Seuhang*	*Seuhang*	*Ficus grossularioides* Burm.f	–	–	–

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
304	*Seureuh*	*Seureuh*	*Piper betle* L	–	–	–
305	*Supa*	*Supa akar*	*Clitocybe* sp.	This mushroom grows on the roots of other plants	*Supa*: mushroom *Akar*: root	Ecology
306		*Supa amis*	*Mycena* sp.	Sweet mushroom	*Supa*: mushroom *Amis*: sweet	Quality
307		*Supa baseuh*	*Campanella* sp.	Wet mushroom	*Supa*: mushroom *Baseuh*: wet	Quality
308		*Supa beas*	*Irpex lacteus*	White mushroom resembling rice	*Supa*: mushroom *Beas*: rice	Morphology [metaphor (colour)]
309		*Supa bejog*	*Pleurotus* sp.	Use a cleaver to harvest this mushroom	*Supa*: mushroom *Bejog*: cleaver (big knife)	Utility [metonymy (procedural)]
310		*Supa kayang*	*Bertrandia* sp.	Mushroom that grows on dead *Lithocarpus korthalsii* tree	*Supa*: mushroom *Kayang*: *Lithocarpus korthalsii* (Endl.) Soepadmo	Ecology [metonymy (ecological/ spatial)
311		*Supa koja*	*Phallus indusiatus*	Mushroom that looks like *koja*	*Supa*: mushroom *Koja*: traditional kanekes bag	Metaphor (shape)
312		*Supa lember aceh*	*Auricularia auricula-judae*	Human-ear shaped mushroom, easy to peel like *tundun aceh*	*Supa*: mushroom *Lember*: ear *Aceh—tundun aceh*: *Nephelium lappaceum* L	Morphology [metaphor (shape)]

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Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
313		*Supa lember lutung*	*Auricularia polytricha*	Human-ear shaped black mushroom resembling *Trachypithecus auratus* ssp. *mauritius*	*Supa*: mushroom *Lember*: ear *Lutung*: *Trachypithecus auratus* ssp. *mauritius*	Morphology [Metaphor (shape & colour)]
314		*Supa nyeruan*	*Favolus tenuiculus*	Mushroom with gills resembling *apis cerana* hive	*Supa*: mushroom *Nyeruan*: *Apis cerana*	Morphology [metaphor (shape)]
315		*Supa padali*	*Paxillus involutus*	Ground mushroom that grows near *Radermachera*	*Supa*: mushroom *Padali*: *Radermachera gigantea*	Ecology [metonymy (ecological/ spatial)]
316		*Supa patukul*	*Boletus* sp.	Mushroom resembling a hammer	*Supa*: mushroom *Patukul*: hammer	Morphology [metaphor (shape)]
317		*Supa teropong*	*Coprinellus disseminatus*	Cylindrical mushroom resembling a binocular	*Supa*: mushroom *Teropong*: binocular	Morphology [metaphor (shape)]
318		*Supa tikukur*	*Parasola plicatilis*	Assembling mushroom	*Supa*: mushroom *Tikukur*: assembly	Morphology
319	*Suum*	*Suum bulan*	*Gymnopus* sp.	Ground mushroom resembling the moon	*Suum*: ground mushroom *Bulan*: moon	Morphology [metaphor (shape)]

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
320		*Suum pahatu*	*Hygrocybe acutoconica*	Ground mushroom, solitary (orphaned)	*Suum*: ground mushroom *Pahatu*: orphan	Ecology [metonymy (ecological/ spatial)]
321		*Suum rampak*	*Marasmiellus candidus*	Ground mushrooms that spread around	*Suum*: ground mushroom *Rampak*: spread	Morphology
322		*Suum uncal*	*Hygrocybe* sp.	Ground mushroom that grows near *Reinwardtiodendron humile*	*Suum*: ground mushroom *Uncal*: *Reinwardtiodendron humile*	Ecology [metonymy (ecological/ spatial)]
323	*Takokak*	*Takokak*	*Solanum torvum* Sw	–	–	–
324	*Taleus*	*Taleus balitung*	*Alocasia macrorrhizos* (L.) G.Don	Yam that resembles salted fish	*Taleus*: yam *Balitung*: salted fish	Morphology [metaphor (shape)]
325		*Taleus bogor*	*Leucocasia gigantea* (Blume) Schott	Yam from Bogor	*Taleus*: yam *Bogor*: Bogor city	Ecology [metonymy (introducer)]
326		*Taleus colat*	*Colocasia esculenta* (L.) Schott	Striped yam	*Taleus*: yam *Colat*: stripe	Morphology
327		*Taleus endog*	*Colocasia esculenta* (L.) Schott	Rounded yam that resembles an egg	*Taleus*: yam *Endog*: egg	Morphology [metaphor (shape)]
328		*Taleus hejo*	*Colocasia esculenta* (L.) Schott	Green yam	*Taleus*: yam *Hejo*: green	Morphology

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
329		*Taleus hideung*	*Colocasia esculenta* (L.) Schott	Black yam	*Taleus*: yam *Hideung*: black	Morphology
330		*Taleus honje*	*Colocasia esculenta* (L.) Schott	Yam that is shaped like *honje* (*Etlingera solaris* (Blume) R.M.Sm.)	*Taleus*: yam *Honje*: *Etlingera solaris* (Blume) R.M.Sm	Morphology [metaphor (shape)]
331		*Taleus ketan*	*Colocasia esculenta* (L.) Schott	Sticky yam	*Taleus*: yam *Ketan*: sticky	Quality
332		*Taleus landak*	*Colocasia esculenta* (L.) Schott	This tuber resembles a porcupine	*Taleus*: yam *Landak*: porcupine	Morphology [metaphor (shape)]
333		*Taleus loma*	*Colocasia esculenta* (L.) Schott	Yam found in swidden rice field	*Taleus*: yam *Loma—loba di huma* *Loba*: plenty *Huma*: swidden rice field	Ecology
334		*Taleus lunglum*	*Colocasia esculenta* (L.) Schott	Yam with skin peelable like *Arenga pinnata*	*Taleus*: yam *Lunglum*: *Aarenga pinnata* (Wurmb) Merr. skin	Morphology [metaphor (texture)]
335		*Taleus ronyok*	*Colocasia esculenta* (L.) Schott	Aggregate yam	*Taleus*: yam *Ronyok*: aggregate	Morphology
336		*Taleus ruyung*	*Colocasia esculenta* (L.) Schott	Yam with a trunk as hard as that of *Arenga pinnata*	*Taleus*: yam *Ruyung*: *Arenga pinnata* trunk	Morphology [metaphor]
337		*Taleus susun*	*Colocasia esculenta* (L.) Schott	Yam with neatly arranged leaves	*Taleus*: yam *Susun*: arrangement	Morphology
338	*Tangkalak*	*Tangkalak*	*Litsea robusta* Blume	–	–	–

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
339	*Tangkil*	*Tangkil*	*Gnetum gnemon* L	–	–	–
340	*Tapos*	*Tapos*	*Elateriospermum tapos* Blume	Fruits burst when burned	–	–
341	*Teong*	*Teong*	*Solanum quitoense* Lam	–	–	–
342	*Tepus*	*Tepus*	*Etlingera coccinea* (Blume) S.Sakai & Nagam	–	–	–
343	*Teureup*	*Teureup*	*Artocarpus elasticus Reinw.* ex Blume	–	–	–
344	*Tewu*	*Tewu landu*	*Artocarpus glaucus* Blume	–	–	–
345	*Tiwu*	*Tiwu*	*Saccharum officinarum* L	–	–	–
346		*Tiwu endog*	*Saccharum spontaneum* L	Edible unopened inflorescences look like an egg	*Tiwu*: sugar cane *Endog*: egg	Morphology [metaphor (shape)]
347		*Tiwu koneng*	*Saccharum officinarum* L	Yellow sugar cane	*Tiwu*: sugar cane *Koneng*: yellow	Morphology
348	*Tokbray*	*Tokbray*	*Blumeodendron tokbrai* (Blume) Kurz	Fruits that have to be opened by pounding	*Tokbray—diketok ngegebray* *Diketok*: pounded *Ngegebray*: smashed	Utility [portmanteau]
349	*Tomat*	*Tomat*	*Solanum lycopersicum* L	–	–	–

(continued)

Table 7.1 (continued)

Sl. No	Folk taxa		Scientific Name	Meaning		TK Encoded
	Genus	Species/ subspecies				
350	*Tundun*	*Tundun aceh*	*Nephelium lappaceum* L	*Nephelium lappaceum* has pulp that is easy to peel from the seed	*Tundun*: *Nephelium lappaceum* L *Aceh*: easy to peel	Quality
351		*Tundun biasa*	*Nephelium lappaceum* L	Ordinary *Nephelium lappaceum* L	*Tundun*: *Nephelium lappaceum* L *Biasa*: ordinary	Taxonomy [prototype of *tundun*] & Ecology
352	*Walang*	*Walang biasa*	*Etlingera walang* (Blume) R.M.Sm	Ordinary *Etlingera walang*	*Walang*: *Etlingera walang biasa*: ordinary	Taxonomy [protoype of *walang*] & Ecology
353		*Walang cina*	*Eryngium foetidum* L	*Etlingera walang* from China	*Walang*: *Etlingera walang cina*: China	Ecology [metonymy (introducer)]
354	*Waluh*	*Waluh*	*Cucurbita pepo* L	Fruits reserved for guests; prototype for *Cucurbita* spp.	*Waluh—wawuh jadi sedulur*: *Wawuh*: know *Jadi:* become *Sedulur:* relative	Utility [Portmanteau]
355		*Waluh bodas*	*Cucurbita moschata* Duchesne	White *Cucurbita pepo*	*Waluh*: *Cucurbita pepo* *Bodas*: white	Morphology
356		*Waluh hideung*	*Cucurbita* sp.	Black *Cucurbita pepo*	*Waluh*: *Cucurbita pepo* *Hideung*: black	Morphology
357	*Watu*	*Watu*	*Sesamum indicum* L	Use stone to pound this while preparing *sambal*	*Watu*: stone	Utility [metonymy (procedural)]
358	*Wuni*	*Wuni*	*Antidesma bunius* (L.) Spreng	–	–	–

in the folk name. Unlike human influence metonymy, it is the history that is encoded in the name of species, serving as a folk intellectual property protection measure (Mekbib 2007). In procedural metonymy, the name encodes procedures such as the specific method of use of the plant. Likewise, in medicinal metonymy, the name encodes the medicinal use attributed to the plant.

The general notion in linguistics is that metaphors require great cognitive effort to decode the meaning, unlike metonyms (Charteris-Black 2003). However, when it comes to folk names, metonyms could also have an equal, or greater degree of complexity, especially when they exist in unanalysable forms. This is because of the complex cultural relationships recognised by the community between the different taxa or entities denoted by the name. The TK contained in metonyms is also vulnerable to loss as it depends on the TK and linguistic proficiency of the speaker and listener to uncover the knowledge. When the speaker loses proficiency in TK and language, the ability to decode the information is also lost. There is also a possibility of the information evading documentation if the researcher fails to comprehend the complex body of knowledge that connects the denoted entities. In such cases, the names could be mistaken for homonyms (Evans 1997).

A notable feature of Kanekes food plant names is the prevalence of portmanteaus. Indonesians in general love to use portmanteaus in their cultural life (Wandelt 2009), not only for social interaction but also in formal uses (De Vries 1970; Pratiwi 2008). The Sundanese term for portmanteau is '*kirata*' which itself is a portmanteau of *dikira-kira tapi nyata* meaning 'approximated but obvious'. In Kanekes food plant names, most portmanteaus denote folk genera, which at the first instance appear as unanalysable primary lexemes. It is important that researchers working with the ethnotaxonomies of Southeast Asia look into the possibility of the occurrence of portmanteaus denoting folk genera categories.

The following section provides a detailed explanation of the various kinds of TK encoded in Kanekes food plant names.

7.3.3.1 Utility

Plants named according to their utility value bear testimony to the Kanekes traditional knowledge and biodiversity management practices. Various researchers agree that Kanekes people have impressively managed their ecosystem through their traditional management practices (Garna 1987, 1993; Iskandar and Ellen 1999; Senoaji 2012). Their emphasis on sustainability also extends to food management, which is also reflected in certain food plant names that point to the management practices associated with it. Rice is the most important food crop for the Kanekes; Kanekes believe that Nyi Pohaci, the Rice Goddess showers her kindness and blessings on her people in the form of rice. Thus, farming is one of the *rukun* or *pikukuh* (customary mandate) to be undertaken by every Kanekes individual (Danasasmita and Djatisunda 1986; Senoaji 2012). They save rice grains for up to 100 years in their sacred bamboo granaries called *leuit,* to ensure food security during famines, and are customarily permitted to retrieve it only on *senen* (Monday), *salasa* (Tuesday), and *jumaah*

(Friday). This limitation has ensured food sustainability and diversification, as the community resorts to diversify its food bases by cultivating non-rice crops including yams and tubers. The plant names often encode such information.

X. (a) *Huwi mantang* 'tuber that can be eaten on taboo days' (*Ipomoea batatas* (L.) Lam.); barefaced name

The barefaced name in example X (a) conveys the information that the Kanekes could depend on this tuber on those days when it is restricted to consume rice.

Some names also indicate timing and access to the resource.

X. (b) *Kacang suuk* 'beans collected from underground' *(Arachis hypogaea* L.*)*; barefaced name

(c) *Gedang* (*Carica papaya* L.), derived from *gedag-gedag,* meaning 'to shake'; barefaced name

Kacang is a Bahasa Indonesia term applied to 'beans'. All other folk species of *kacang* such as '*kacang panjang*' (*Vigna unguiculata* (L.) Walp.) or '*kacang hejo*' (*Vigna radiate* (L.) R.Wilczek) known to Kanekes people grow above the ground. The mechanism of naming *kacang suuk* encodes TK on access to the plant, differentiating it from the other folk species of *kacang*.

Recipes or specific ways to consume a plant are also conveyed through names.

X. (d) *Huwi kalapa* 'tuber cooked with coconut' (*Dioscorea alata* L.); cryptic name (procedural metonymy)

(e) *Picung* (*Pangium edule* Reinw.), from *cung-cung*, meaning 'submerged in water for a long time'; barefaced name

(f) *Kokosan* (*Dysoxylum parasiticum* (Osbeck) Kosterm.), from *kokos* meaning 'remove the skin by mouth, or suck'; barefaced name

Huwi kalapa refers to a tuber that is cooked with coconut. Without coconut, the tuber will be rough, dry, and unpleasant to consume. In X (e), the name encodes specialised TK on the detoxification method to be undertaken before cooking. Detoxification of crops is a strategy in maximising food security that requires extensive traditional knowledge (Chiwona-Karltun et al. 1998). Names such as *kokosan* X (f) also encode information on the specific method to consume. Example X (g) is a folk name that encodes the information that the plant is used in the preparation of the dish leuksa that will be presented to government representatives as a part of the *seba* ceremony.

X. (g) *Areuy leuksa* 'leuksa vine' (*Nothocnide repanda* (Blume) Blume); cryptic name (procedural metonymy)

We found four food plant names that encode traditional medicinal knowledge:

X. (h) viz., *Awi apus* 'bamboo that erases diseases' (*Gigantochloa apus*); barefaced name

(i) *Keras tulang* 'bone tonic' (*Chloranthus elatior* Link); cryptic name (medicinal metonymy)
(j) *Binglu* (*Mangifera caesia*); cryptic name (human influence metonymy)
(k) *Cecendet* (*Physalis angulate* L.); cryptic name (human influence metonymy)

Awi apus is a bamboo that is believed to have the property of removing diseases (*apus* = erase). The usage of *G. apus* for medicinal purposes has also been reported before from Bali (Sujarwo et al. 2010). As indicated in its name, *keras tulang* (*keras* = hard, *tulang* = bone) is used as a bone tonic, a knowledge that has also been reported from other Sundanese cultures (Aritonang 1999; Purnawan 2006). The name could be mistaken for a metaphor when the medicinal knowledge is lost or unknown to the speaker. *Binglu* is the name of a plant as well as the name of a disease involving dermatic rashes; it is believed that people will be infected by this disease when they happen to pass by the *binglu* tree. However, the stem of the same tree also provides the remedial medicine when used along with a magic spell. Similarly, *cecendet* is the name of a disease as well as a plant. *Cecendet* is the swelling of the penis corona due to infection and scar; males who have just undergone circumcision are prohibited from consuming *cecendet*, as it can lead/aggravate the *cecendet* disease.

X. (l) *Cau kepok* (*Musa acuminata* Colla); cryptic name (sound metonymy).

Cau kepok is an example of sound metonymy. The name refers to the sound that is produced when Kanekes kids play with the pseudostem. The banana trunk is split by children and whipped in the air to create the *kepok* sound. The winner is the one who can produce the loudest sound. The name signifies that this banana trunk produces a louder sound than others. Turpin (2013) proposed sound metonymy, to refer to metonyms related through sounds. Unlike animals that possess distinctive body parts to produce and transmit sound, plants generally do not produce sounds by themselves, and it is the human cultural element of the utilisation of plant and plant materials that produce sound.

7.3.3.2 Ecology

The ecological information encoded in names is mostly on historical ecology—the source or plant origin, habitat of the plant, or ecological characteristics of the plant. Information on the historical ecology of the plant such as the names of places from where the taxa/variety has been introduced, or the name of the introducer is often used to name crop varieties/taxa. Mekbib (2007) points out that, such naming processes could be an informal mechanism to recognise the Intellectual Property Rights of the introducer or for the place of origin.

XI. (a) *Cau ambon* 'banana from Ambon' (*Musa* x *paradisiaca* L.); cryptic name (introducer metonymy)
(b) *Jambu samarang* 'guava from Semarang' (*Syzygium samarangense* (Blume) Merr. & L.M.Perry); cryptic name (introducer metonymy)

(c) *Jeruk bali* 'citrus from Bali' (*Citrus maxima* (Burm.) Merr.); cryptic name (introducer metonymy)
(d) *Walang cina* '*Eryngium* from China' (*Eryngium foetidum* L.); cryptic name (introducer metonymy)

The above names indicate that the plants were introduced from Ambon, Semarang (central Java), Bali, and China, respectively. Farming communities have an extensive network for sharing germplasm (Nettle 1998; Renfrew 1991) and the names clearly provide direct clues to the place from where the germplasm was procured from.

There are also names encoding the information on the specific individual who introduced the germplasm to the community.

XI. (e) *Pare abu ganti* (*Oryza sativa* L.); cryptic name (introducer metonymy)
(f) *Pare janah* (*Oryza sativa* L.); cryptic name (introducer metonymy)

Pare abu ganti (*pare* = rice, *abu ganti* = name of the introducer) is a cultivar of rice that is named after Abu Ganti, its introducer. Likewise, *pare janah* (*pare* = rice, *janah* = individual) indicates that the cultivar was introduced by Janah. These plant names quickly transmit the historical knowledge that Abu Ganti and Janah had handed over the respective landraces to them a long time back. This pattern of naming has also been reported from Ethiopia, where the name of the introducer as well as the place of origin, have been used to mark the infra-specific folk taxonomy of sorghum (Mekbib 2007).

Generally, Kanekes people classify their land as *leuweung* (forest), *huma* (swidden field), *kampong* (hamlet and close by), *reuma* (secondary forest), *jami* (swidden field fallowed for 2–3 years), and *pipir cai* (wetland) (Iskandar and Ellen 1999; Marlina 2012). The traditional knowledge that *leuweung*, being the primary forest, serves as a source of edible plants is encoded in names.

XI. (g) *Harendong leuweung* 'harendong from the forest' (*Bellucia pentamera* Naudin); cryptic name (ecological/spatial metonymy)
(h) *Manggu leuweung* 'mangosteen from the forest' (*Garcinia lateriflora* Blume); cryptic name (spatial metonymy)

Some names narrow down further to the specific habitat requirements. In example XI (i), the specific condition of the habitat is encoded in the name. The folk name in XI (j) encodes the TK that *supa kayang* is an obligatory saprophyte of *L. korthalsii*. In XI (k), the specific epithet is a portmanteau of *cing* (*cicing* = stay), *dina* (at), and *calok* (*legok* = ditch). The name conveys the TK that the guava grows in low-lying areas.

XI. (i) *Huwi dahong* 'tuberous plant growing in dryland' (*Ipomoea batatas*), *dahong* from *rahong* meaning fissured land; cryptic name (ecological or spatial metonymy)
(j) *Supa kayang* '*Lithocarpus korthalsii* (Endl.) Soepadmo mushroom' (*Bertrandia* sp.); cryptic name (ecological/ spatial metonymy)

(k) *Jambu cingcalok* (*Syzygium aqueum* (Burm.f.) Alston); cryptic name (portmanteau)

Plants found in abundance or commonly available without habitat specificity are also marked accordingly.

XI. (l) *Seeur* 'abundant plant' (*Antidesma tetrandrum* Blume); barefaced name
(m) *Tundun biasa* 'ordinary *tundun'* (*Nephelium lappaceum* L.); barefaced name
(n) *Bonteng* 'swidden forest light' (*Cucumis sativus* L.); cryptic name (portmanteau)

Seeur refers to 'excess of supply', indicating that the plant is abundant. Examples IX (*honje biasa*; *Etlingera hemisphaerica*) and XI (m) consist of two epithets, the first indicating the folk genera, and the second indicating its commonly available nature (*biasa* = common). The epithet *biasa* serves a dual purpose—to indicate the commonly available nature of the taxon, as well as its status as a prototype for all plants under the folk genus *honje* and *tundun.* Example XI (m) is a portmanteau resulting from the blending of *bon* (*kebon* = swidden forest) and *teng* (*enteng* = light). The name conveys the TK that this plant is easily accessible in swidden fields.

Folk plant names could also portray TK knowledge on the food chain. Our study records three names that are diet metonyms. Diet metonymy is usually represented by animal behaviour on its prey such as other animal or plant (Turpin 2013). In the Kanekes food plant name corpus, diet metonymies are applied to represent the relationship between plants and their consumers such as birds. In the following examples, plant names encode information on their consumers.

XI. (o) *Cau kulutuk* 'eagle banana' (*Musa balbisiana* var. *brachycarpa* (Backer) Häkkinen); cryptic name (diet metonymy)
(p) *Hantap heulang* 'eagle sterculia' (*Sterculia macrophylla* Vent.); cryptic name (diet metonymy)
(q) *Hantap manuk* 'bird sterculia' (*Sterculia* sp.); cryptic name (diet metonymy)

7.3.3.3 Phenology

Kanekes folk plant names can encode information on the phenology of plants. The folk specific epithets in examples XII (a) and (b) indicate the crop duration/cycle.

XII. (a) *Cau sabulan* 'banana that ripens in one month' (*Musa* x *paradisiaca* L.); barefaced name
(b) *Pare hawara* 'paddy that matures quickly' (*Oryza sativa* L.); barefaced name

7.3.3.4 Quality

Quality is an unquantifiable character, where the taste, smell, and preference of a community form the basis for naming a plant. In such cases, it is usual for one of the epithets to encode the salient quality such as sweet, sour, bitter, etc.

XIII. (a) *Huwi manis* 'sweet tuber' (*Ipomoea batatas*); barefaced name
(b) *Cau haseum* 'sour banana' (*Musa* x *paradisiaca*); barefaced name
(c) *Lingsuh* 'fruit that causes pain' (*Baccaurea lanceolate* (Miq.) Müll.Arg.); cryptic name (human influence metonymy)
(d) *Pare menyan* 'incense paddy' (*Oryza sativa*); cryptic name (metaphor: quality)
(e) *Cau nangka* (*Musa* x *paradisiaca*); cryptic name (metaphor: quality)

In examples XIII (a) and (b), the names encode the quality of taste. In XIII (c), *lingsuh* refers to the sour taste that inflicts a sharp pain in the teeth. The name indicates the consequence of humans consuming the plant. Likewise, smells are also indicated in the names of plants such as *pare menyan* (*Oryza sativa*) and *cau nangka* (*Musa* x *paradisiaca*). The name *pare menyan* encodes the information that its smell is as desirable as that of incense. Although the name implies that the rice smells like incense, *menyan* is used to drive home the point that the rice gives a desirable odour when cooked; the odour however is not similar to that of incense. Psychophysically, aromas such as 'incense' that are normally considered as pleasant are repulsive when emanating from food and the food environment. A banana that smells like incense has little chances to be selected by the community for cultivation. In the larger Sundanese culture, preference is usually indicated by the term *hoyong/hayang* meaning 'desire'. This term is also used to highlight the qualities of *ki hiyang (Albizia procera*) and *oyong* (*Luffa acutangula)* that were culturally selected by the community for their desirable traits of strength and taste, respectively.

XIII. (g) *Areuy ki koneng* 'yellow grandfather tuber' *(Arcangelisia flava* (L.) Merr.*)*; cryptic name (metaphor: strength)
(h) *Huwi ki hiyang* 'desirable grandfather tuber' *(Ipomoea batatas)*; cryptic name (metaphor: strength)
(i) *Ki lauk* 'grandfather fish' *(Acalypha caturus* Blume*)*; cryptic name (metaphor: strength)

In the above examples, the term *ki* which is derived from *aki* (a grandfather) is used to highlight the strength of the plant. The strength of the stem or tuber is compared to the superior wisdom of grandfather.

7.3.3.5 Morphology

Morphological traits such as size, colour, shapes, pattern, texture, and patterns are encoded in Kanekes food plant names. The metaphors employed by the community to encode such TK are collectively referred to as 'visual metaphors' by Turpin (2013, p. 500). Colour is the most commonly used morphological trait to differentiate plants

at the species level, as well as cultivars/varieties. According to Rahmanadia (2012), Kanekes have eight basic colour terms: *putih* (white), *hideung* (black), *beureum* (red), *hejo* (green), *kolenyer* (yellow), *paul* (blue), *coklat* (brown), and *abu-abu* (grey). In addition to these, our study also recorded terms such as *bodas* (white), *koneng* (yellow), and *bulawok* used by the Kenekes to denote colours. Of these eight colours, they have used at least six basic colour terms to name their food plants. Examples are: *bawang bodas* (*Allium sativum*), *bawang bereum* (*Allium cepa*), *honje bereum* (*Etlingera solaris* (Blume) R.M.Sm.), *laja bereum* (*Alpinia purpurata*), *kacang hejo* (*Vigna radiata*), *kalapa hejo* (*Cocos nucifera* L.), *taleus hejo* (*Colocasia esculenta*), *areuy ki koneng* (*Arcangelisia flava* (L.) Merr.), *koneng* (*Curcuma longa* L.), *pare koneng* (*Oryza sativa*), *huwi mantang bulawok* (*Ipomoea batatas*), *coklat* (*Theobroma cacao* L.), etc. However, the Kanekes lack equivalent terms for pink (*kayas*) and purple (*bungur*) which other Sunda communities possess.

In addition to these barefaced names, they also use metaphors to highlight the salient colour of the plant.

XIV. (a) *Cau apu* 'limepaste banana' (*Musa x paradisiaca* L.); cryptic name (metaphor: colour)
(b) *Pare siang* 'rice with bran as yellow as the afternoon light' (*Oryza sativa* L.); cryptic name (metaphor: colour)
(c) *Pare ketan keuyeup* 'stickyrice with brans as reddish as crabs' (*Oryza sativa* L.); cryptic name (metaphor: colour)
(d) *Cau hurang* 'banana as red as prawns' (*Musa x paradisiaca* L.); cryptic name (metaphor: colour)
(e) *Kapundung* 'fruits as red as angry face' (*Baccaurea* sp.); cryptic name (metaphor: colour)
(f) *Cau haseup* 'smoky banana' (*Musa x paradisiaca* L.); cryptic name (metaphor: colour)
(g) *Supa lember lutung* 'human-ear shaped Javan langur mushroom' (*Auricularia polytricha* (Mont.) Sacc.); cryptic name (metaphor: shape and colour)

The above names are cryptic due to the delicate sense of resemblance encoded in them. For instance, *cau haseup* (smoky banana) employs the word 'smoke' to highlight the red colour of the banana skin. Both the fire and firewood appear bright red while burning, and smoke is a by-product of fire. As shown in XIV (g), there could be a single folk name encoding information on resemblance to multiple entities (1. Human ear, 2. *Trachypithecus auratus* ssp. *mauritius*).

The Kanekes use terms such as *gede*, *bitung*, *gejloh*, and *gembor* to denote the size 'big'. However, these words are highly specific, with hidden preferences attached to them. *Awi gede* (*Gigantochloa verticillata* (Willd.) Munro) and *awi bitung* (*Dendrocalamus asper* (Schult.f.) Backer) are both 'big' kinds of big bamboo. However, the term *gede* is used more frequently in Kanekes than *bitung*. According to our informants, these terms indicate the frequency of use, where *G. verticillata* is preferred and used more frequently, especially for construction purposes. *Areuy palungpung* (*Decalobanthus peltatus* (L.) A.R.Simões & Staples) is a type of creeper with a big,

plump vine. The name carries the information that the plant is an *areuy* (vine/liana) that is *palungpung* (big and plump).

Morphological features such as shape, size, structure, pattern, and texture are commonly related to other living and non-living entities.

XIV. (h) *Cau badak* 'rhinoceros banana' (*Musa* x *paradisiaca*); cryptic name (metaphor: shape)
(i) *Huwi ramo* 'hand tuber' (*Dioscorea* sp); cryptic name (metaphor: shape)
(j) *Cau rejang* 'narrow-mouthed frog fruits' (*Musa* x *paradisiaca*); cryptic name (metaphor: size)
(k) *Supa nyeruan* 'asian honey bee mushroom'; cryptic name (metaphor: structure)
(l) *Pare hawara benteur* 'spotted barb paddy'; cryptic name (metaphor: pattern)
(m) *Nangka bubur* 'porridge jack' (*Artocarpus* sp.); cryptic name (metaphor: texture)

The beauty of folk names listed above lies in their ability to encode TK on the denoted taxa, as well as the taxa to which they bear a resemblance. Except for *huwi ramo* which is a tuber shaped like human hand, all these names possess TK on two taxa. *Cau badak* (rhinoceros banana) uses the shape of rhinoceros horn to draw attention to the shape of the banana fruit. *Cau rejang* yields fruits that are smaller in size like the narrow-mouthed frog (*Microhyla achatina*) which is one of the smallest frogs in Java (Snout-vent length of males = 20 mm; females = 25 mm). The gills of the mushroom *Favolus tenuiculus* (Fr.) Fr. resembles the hive of *Apis cerana. Pare hawara benteur* is a short-term paddy with patterns on the surface of its grains resembling fish scales. Here, we see folk infra-specific taxa named using animal body and colouring patterns. In example XIV (m), the softness of porridge is used to explain the softness of *nangka bubur.* The pericarp of this landrace is soft that it is impossible to distinguish the individual fruits, just like the rice porridge where the individual rice grains are inseparable.

Kanekes people also use their unique cultural artefacts to relate to the shape of plants.

XIV. (n) *Mangga golek* 'puppet mango' (*Mangifera indica* L.); cryptic name (metaphor: shape)
(o) *Supa koja* 'bag mushroom' (*Phallus indusiatus.*); cryptic name (metaphor: shape and pattern)

Mangga golek is a mango curved like the nose of a puppet. *Wayang golek* is the Sundanese puppetry, where wooden puppets are used to narrate stories accompanied by *gamelan* (traditional music instruments) (Buurman 1991). The wooden puppets are designed with exaggerated physical traits such as a large nose to highlight the personality of the character they stand for. Hence, puppet figures that portray negative characters in mythology such as Kumbakarna, Suratimantra, and Prabu Arimba have noses that resemble *pelokan* (mango seeds). Here, the morphology of mango seed is

used to connect the viewers with a particular personality. *Phallus indusiatus* Vent. is a tropical mushroom from the family *Phallaceae.* The veil-like indusium of the mushroom resembles the plaits of the traditional *koja* bag of Kanekes, made from the bark of *teureup* (*Artocarpus elasticus* Reinw. ex Blume). Such names encode information on the shape of the plant part, as well as the cultural artefact.

Example XIV (p) is a metaphor that encodes TK on the prickly nature of the plant. The plant is identified with the 'toet' sound. However, 'toet' does not correspond to the sound produced when one steps on the spine, but refers to 'toet', the traditional trumpet that in turn produces the loud sound.

XIV. (p) *Bintatoet* (*Canthium horridum* Blume); cryptic name (metaphor: sound).

7.4 Conclusion

Our study documents 358 food plant names that encode TK related to morphology (161), ecology (45), utility (39), and quality (49) of the taxa. Majority of these names (172 names) are cryptic (111 metaphors, 53 metonyms, and 08 portmanteaus), while the rest are barefaced (122 names). Barefaced names contain TK exclusively on the denoted taxa, while cryptic names often hold knowledge on multiple taxa/entities. When these folk names are lost or replaced by borrowed names, the TK encoded in these names are also lost. The loss is further amplified in the case of cryptic names due to the complexity of TK encoded. Such losses are anticipated when the autochthonous language of the community is lost or eroded. Likewise, the complex TK encoded in cryptic names could also evade documentation, when overlooked by researchers and practitioners. Beyond serving as condensed forms of TK, folk plant names also bear testimony to the linguistic and TK prowesses of the Kanekes community. We, therefore, call upon ethnobiologists, environmental anthropologists, and linguists working with local communities to consider the potential of folk names as condensed forms of traditional knowledge.

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Compliance with Ethical Standards

Conflict of Interest The authors declare no conflict of interest.

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Chapter 8
Folk Fish Names Are Condensed Forms of Traditional Knowledge: Case Study with the Vaie People of Sarawak, Malaysia

Syafitri Hidayati, F. Merlin Franco, Bibi Aminah Abdul Ghani, Beena Giridharan, and Mohd Zafri Hassan

Abstract Folk names that form the backbone of folk biological classifications are coined using traditional knowledge and linguistic mechanisms. In the process, traditional knowledge on the salient characteristics of the denoted taxa gets encoded in their respective names. In this chapter, we present 132 folk names used by the Vaie community of Sarawak, Malaysia to denote the fish known to them. Based on the apparency of traditional knowledge encoded by these names, we classify them into barefaced and cryptic. We found 61 Vaie fish names encoding traditional knowledge related to ecology, morphology, quality, and utility values of the respective taxa. Of these, 21 names were found to be cryptic (metaphors—11; metonyms—10), and the rest barefaced. Cryptic names such as metonyms and metaphors often encode traditional knowledge that spans beyond the taxon denoted. Folk names encoding traditional knowledge are indicative of the larger body of traditional knowledge held by local communities.

Keywords Vernacular names · Ethnotaxonomy · Indigenous languages · Folk classification

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8.1 Introduction

Languages are not only just a medium of communication but also repositories of traditional knowledge (Wehi et al. 2009). The relationship between people and the environment leads to the development of a set of rules and concepts expressed as vocabularies (Evans and Levinson 2009). These vocabularies are the building blocks of language as well as folk classification systems. A comprehensive framework to understand the folk biological classification and the associated nomenclatural systems has been provided by Berlin et al. (1966, 1973). Connoisseurs of folk taxonomy often see folk taxonomies as products of perceived morphological differences between various taxa. Such premises overlook the multiple mechanisms such as morphology, ecology, experience, and utility used by communities to classify their biota (Newmaster et al. 2007). Folk nomenclature that forms the backbone of folk classification system utilises multiple traditional knowledge (TK), and linguistic mechanisms to generate names for flora and fauna (Evans 1997; Kakudidi 2004; Turpin 2013). In the process, the salient TK related to flora and fauna get encoded in the resulting names. It is possible to understand the characteristics of the taxa such as morphology, ecology, utility etc. by analysing folk names (Franco and Narasimhan 2009; Kakudidi 2004).

The names accorded to plants and animals by various cultures could have profound meanings beyond the identification of a particular taxon. For the Māori of New Zealand, the naming and classification of folk species are based on the philosophy of *whakapapa* (genealogy), where all organisms possess both spiritual and material qualities (Roberts et al. 2004). For the Kodi people of Indonesia, folk names could denote transtaxa that flow fluidly between various categories. For instance, Biri Koni denotes a human who later transformed into a spirit. Biri Koni also represents all domesticated crops known to the community such as Job's tears, maize, leafy greens, sorghum, rice, and cassava (Fowler 2016). Folk names could also encode TK on multiple taxa or entities sharing a cultural connection. In the Dalabon language of Australia, the word *yawok* refers to two taxa—cheeky yam (*Dioscorea bulbifera*), and green grasshopper (*Caedicia* spp.). For the Dalabon speakers, the mating call of the grasshopper signals that the yam is ready for harvest (Cutfield 2016). In this example of metonymy, a single folk name encodes TK on two different taxa, and culturally perceived relationship between them. Decoding the TK contained in folk names and the appended narratives through rewarding require elaborate knowledge of the respective culture and language (Whaanga et al. 2013). In this chapter, we provide an understanding of the TK encoded by the folk names used by the Vaie community of Bintulu, Sarawak to name the fish taxa known to them, following Hidayati et al. (2022).

8.2 Materials and Methods

8.2.1 Study Area

Sarawak is a Malaysian state on the island of Borneo, known for its rich biocultural diversity. The study was conducted with the Vaie people of Bintulu town in Sarawak, Malaysia. Bintulu town is the capital of Bintulu district, lying around 200 km south of Miri. It is located at the junction where River Kemena meets the South China Sea. Bintulu was essentially a fishing town until 1969 when oil and gas were discovered offshore (Bintulu Development Authority 2020). By 1993, Bintulu town and the neighbouring suburb of Kidurong had emerged as a major hub for local administration offices, retail and commercial activities, port, and gas and fertiliser industries (Morrison 1993).

8.2.2 The Vaie Community

Sarawak state is home to more than 30 ethnic groups who closely interact with each other. Determining the exact number of ethnic communities in Sarawak, however, is cumbersome due to the diversity of names and classifications (King 1982; Langub 1987). In addition, the prevalence of exonyms and 'externally imposed' ethnic classification further complicates the process (Jehom 1999). Kroeger (1998) placed ethnic communities of Sarawak in eight broad families that include the Melanau (also see: Morris 1989). Blust (1974) and Omar (1983) classified Melanau into Bintulu, Balingian, Mukah, Dalat, Matu, and Serikei. Employing an emic perspective, Zaini (1989) categorised Melanau into Kuala Rajang, Seduan (Sibu, Kanowit, and Tanjong), Matu-Daro, Mukah Dalat, Belingian, and Bintulu. Drawing from Blust (1974) and Zaini (1989), Abdul Ghani (1992, 2006) takes the view that Bintulu is a language distinct from Melanau.

From the emic perspective, the Bintulu language is referred to as Vaie, a term that is retained in this study (Hidayati et al. 2018). Currently, Vaie is spoken only in Kampung Masjid, Kampung Sinong, Kampung Sibiew, Kampung Datuk, Kampung Baru, Kampung Jepak, Kampung Sebuan, and Kampung Batu Sepuluh of Bintulu town. Due to the industrialisation of Bintulu town, the Vaie who previously practised traditional fishing have experienced lifestyle changes, occupational shift, and language shift. A study undertaken by the authors previously shows that these factors have begun eroding the traditional knowledge and language of the community (Hidayati et al. 2018).

The Vaie people are known for their traditional *panaw* method of fishing. *Panaw* is essentially a freediving technique performed in groups of 8–9. It is a complex activity that commences with the preparation of a lure made from *nipah* (*Nypa fruticans* Wurmb) leaves, ropes, a load, and a float (Fig. 8.1). Fishes that are attracted to the shade created by the submerged lure are then netted by the free divers (Richards

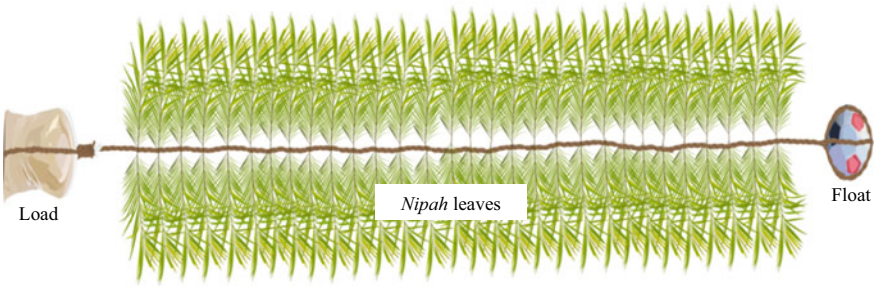

Fig. 8.1 Rendering of the contemporary *panaw* lure. Photo Syafitri Hidayati

1967). Fish such as *Atule mate*, *Carangoides praeustus*, *Carangoides armatus*, and *Carangoides coeruleopinnatus* are trapped using this technique (Hidayati 2017).

8.2.3 Methodology

We collaborated with 16 Vaie elders (8 male and 8 female) recommended by the Vaie community during December 2014–February 2015. The lead author interviewed the knowledge keepers using open-ended interviews and knowledge keeper observation. In addition to the 16 elders, two key collaborators of mixed ethnic descent, Encik Bolhassan bin Ismail and Encik Mat bin Suai played an important role as interpreters of the data, which, in turn, helped us to outline the Vaie ethnotaxonomy of fish.

The general principles of folk taxonomy proposed by Berlin et al. (1973) were used as the framework to understand Vaie folk classification of fishes. Vaie fish names were then interpreted to reveal the traditional knowledge encoded in them. The names were accordingly classified into barefaced, or cryptic following Hidayati et al. (2022). Barefaced folk names are self-explanatory names where the encoded TK on ecology, morphology, phenology, quality, utility, etc. is readily comprehensible. Cryptic names, on the other hand, are names whose encoded TK is not apparent, or those encoding TK on more than one taxa/entities. Cryptic names are usually metaphors, metonyms or portmanteaus. We use the work of Kakudidi (2004) to analyse barefaced names, and those of Evans (1997), Turpin (2013) and Zariquiey (2014) to analyse cryptic names.

In the following sections, we present the results and begin by discussing the 'unique beginner' category. Following that, we discuss the TK encoded in Vaie fish names.

Table 8.1 Traditional knowledge encoded in Vaie fish names

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
1	*qeret ba'em*	*qəRet baʔem*	*Nebrius ferrugineus*	*qəRet*: shark *baʔəm*: meaning unknown	–
2	*qeret jalour mapu'*	*qəRet ʤalour mapʊʔ*	*Carcharhinus amblyrhynchos*	*qəRet*: shark *jalour*: stripe *mapʊʔ*: white	Morphology
3	*qeret karang*	*qəRet kaRaŋ*	*Atelomycterus marmoratus*	*qəRet*: shark *kaRaŋ*: coral	Ecology [metonymy (ecological/spatial)]
4	*qeret mapu'*	*qəRet mapʊʔ*	*Carcharhinus dussumieri*	*qəRet*: shark *mapʊʔ*: white	Morphology
5	*qeret ta'del*	*qəRet taʔdəl*	*Sphyrna lewini*	*qəRet*: shark *taʔdəl*: flat head	Morphology [metaphor (shape)]
6	*qeret tete' asang mapu'*	*qəRet tətəq asaŋ mapʊʔ*	*Chiloscyllium punctatum*	*qəRet*: shark *tətəq*: lizard *asaŋ*: gills *mapʊʔ*: white	Morphology [metaphor (shape)]
7	*njen aqed*	*ndʒen aqəd*	*Saurida tumbil*	*ndʒen*: fish *aqəd*: attached to something	Ecology
8	*njen alu'- alu'*	*ndʒen alʊʔ- alʊʔ*	*Sphyraena barracuda*	*ndʒen*: fish *alʊʔ- alʊʔ*: traditional pounder	Morphology [metaphor (shape)]
9	*njen bageng*	*ndʒen bagəŋ*	*Arius maculatus*	*ndʒen*: fish *bagəŋ*: meaning unknown	–
10	*njen baled*	*ndʒen baled*	*Scomberoides tala*	*ndʒen*: fish *baled*: meaning unknown	–

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
11	*njen basong*	*ndʒen basoŋ*	*Selar crumenophthalmus*	*ndʒen*: fish *basoŋ*: meaning unknown	–
12	*njen beligu'*	*ndʒen bəligʊʔ*	*Leptobarbus hoevenii*	*ndʒen*: fish *bəligʊ*: meaning unknown	–
13	*njen belujɑw*	*ndʒen bəlʊdʒɑw*	*Decapterus kurroides*	*ndʒen*: fish *bəlʊdʒɑw*: meaning unknown	–
14	*njen bengetot*	*ndʒen bəŋətot*	*Ilisha pristigastroides*	*ndʒen*: fish *bəŋətot*: 'tot' sound	Quality [metonymy (sound)]
15	*njen berirɑ*	*ndʒen bəRiRɑ*	*Chitala borneensis*	*ndʒen*: fish *bəRiRɑ*: meaning unknown	–
16	*njen bibeq*	*ndʒen bibɛq*	*Pampus argenteus*	*ndʒen*: fish *bibɛq*: meaning unknown	–
17	*njen bu'eng*	*ndʒen bʊʔəŋ*	*Channa striata*	*ndʒen*: fish *bʊʔəŋ*: meaning unknown	–
18	*njen bulan*	*ndʒen bʊlan*	*Megalops cyprinoides*	*ndʒen*: fish *bʊlan*: moon	Morphology [metaphor (colour)]
19	*njen bulan sungai*	*ndʒen bʊlan sungaj*	*Tenualosa macrura*	*ndʒen*: fish *bʊlan*: moon *sungai*: river	Morphology [metaphor (colour); Ecology [metonymy (ecological/spatial)]
20	*njen buleng*	*ndʒen bʊlɛŋ*	*Nemapteryx macronotacantha*	*ndʒen*: fish *bʊlɛŋ*: meaning unknown	–

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
21	*njen bulong*	*ndʒen bʊloŋ*	*Polynemus melanochir melanochir*	*ndʒen*: fish *bʊloŋ*: feather	Morphology [metaphor (shape)]
22	*njen gagog*	*ndʒen gagog*	*Arius* sp.	*ndʒen*: fish *gagog*: meaning unknown	–
23	*njen gelunggong*	*ndʒen gəlʊŋgoŋ*	*Megalaspis cordyla*	*ndʒen*: fish *gəlʊŋgoŋ*: meaning unknown	–
24	*njen gerot- gerot*	*ndʒen gəRot- gəRot*	*Pomadasys argenteus*	*ndʒen*: fish *gəRot-gəRot*: meaning unknown	–
25	*njen giilɑw*	*ndʒen gi:lɑw*	*Clarias nieuhofii*	*ndʒen*: fish *gi:lɑw*: meaning unknown	–
26	*njen ipot bɑ'*	*ndʒen ipot bɑʔ*	*Toxotes jaculatrix*	*ndʒen*: fish *ipot*: blow *bɑʔ:* water	Quality [metonymy (behavioural)]
27	*njen iron*	*ndʒen iRɔn*	*Pomadasys* sp.	*ndʒen*: fish *iRɔn*: meaning unknown	–
28	*njen iron milɑ*	*ndʒen iRɔn milɑ*	*Lutjanus argentimaculatus*	*ndʒen*: fish *iRɔn*: meaning unknown *milɑ*: red	Morphology
29	*njen jɑmɑh beluqo (1)*	*ndʒen dʒɑmɑh bəlʊqo (1)*	*Carangoides hedlandensis*	*ndʒen*: fish *jamah*: carangidae *bəlʊqo*: curve	Morphology

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
30	*njen jamah beluqo (2)*	*ndʒen dʒamah bəlʊqo (2)*	*Carangoides malabaricus*	*ndʒen*: fish *dʒamah*: carangidae *bəlʊqo*: curve	–
31	*njen jamah iqoy qunieng*	*ndʒen dʒamah iqoɪ qʊnieŋ*	*Carangoides praeustus*	*ndʒen*: fish *dʒamah*: Carangidae fish *iqoɪ*: tail *qʊnieŋ*: yellow	Morphology
32	*njen jamah qape'*	*ndʒen dʒamah qapəʔ*	*Alectis indica*	*ndʒen*: fish *dʒamah*: Carangidae fish *qapəʔ*: axe	Morphology [metaphor (shape)]
33	*njen jamah luleng*	*ndʒen dʒamah lʊləŋ*	*Carangoides coeruleopinnatus*	*ndʒen*: fish *dʒamah*: Carangidae fish *lʊləŋ*: meaning unknown	–
34	*njen jamah mapu'*	*ndʒen dʒamah mapʊʔ*	*Carangoides armatus*	*ndʒen*: fish *dʒamah*: Carangidae fish *mapʊʔ*: white	Morphology
35	*njen jamah panaw*	*ndʒen dʒamah panaw*	*Atule mate*	*ndʒen*: fish *dʒamah*: Carangidae fish *panaw*: traditional fishing technique	Utility [metonymy (procedural)]
36	*njen jamah selidɑy*	*ndʒen dʒamah selidɑj*	*Atule* sp.	*ndʒen*: fish *dʒamah*: Carangidae fish *selidɑy*: meaning unknown	–

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
37	*njen jɑmɑh sew*	*ndʒen dʒɑmɑh sew*	*Caranx sexfasciatus*	*ndʒen*: fish *dʒɑmɑh*: carangidae *sew*: meaning unknown	–
38	*njen jayong*	*ndʒen dʒajoŋ*	*Coilia macrognathus*	*ndʒen*: fish *dʒayoŋ*: meaning unknown	–
39	*njen julong*	*ndʒen dʒʊloŋ*	*Strongylura strongylura*	*ndʒen*: fish *dʒʊloŋ*: long and cylindrical	Morphology
40	*njen qɑci*	*ndʒen qɑʧi*	*Diagramma pictum*	*ndʒen*: fish *qɑʧi*: meaning unknown	–
41	*njen qaloy*	*ndʒen qaloj*	*Osphronemus goramy*	*ndʒen*: fish *qaloy*: meaning unknown	–
42	*njen qejiqen (1)*	*ndʒen qedʒiqən (1)*	*Hemibagrus nemurus*	*ndʒen*: fish *qedʒiqən*: meaning unknown	–
43	*njen qejiqen (2)*	*ndʒen qədʒiqən (2)*	*Mystus gulio*	*ndʒen*: fish *qedʒiqən*: meaning unknown	–
44	*njen qelɑpɑ'*	*ndʒen qəlɑpɑʔ*	*Lactarius lactarius*	*ndʒen*: fish *qəlɑpɑʔ*: coconut	Morphology [metaphor (colour)]
45	*njen kepbura'*	*ndʒen kəɓuRaʔ*	*Liza vaigensis*	*ndʒen*: fish *kəɓuRaʔ*: meaning unknown	–
46	*njen qerisi (1)*	*ndʒen qəRisiʔ (1)*	*Pristipomoides multidens*	*ndʒen*: fish *qeRisiʔ*: meaning unknown	–

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
47	*njen qerisi' (2)*	*ndʒen qəRisiʔ (2)*	*Pristipomoides typus*	*ndʒen*: fish *qeRisiʔ*: meaning unknown	–
48	*njen qerisi' (3)*	*ndʒen qəRisiʔ (3)*	*Pentapodus setosus*	*ndʒen*: fish *qeRisiʔ*: meaning unknown	–
49	*njen lɑtɑ'*	*ndʒen lɑtɑʔ*	*Lobotes surinamensis*	*ndʒen*: fish *lɑtɑʔ*: meaning unknown	–
50	*njen lu'ey/da'ie*	*ndʒen lʊʔəj/daʔie*	*Kryptopterus kryptopterus*	*ndʒen*: fish *lʊʔəy*: meaning unknown *daʔie*: faeces	Quality [metonymy (diet)]
	njen lu'ey/da'ie	*ndʒen lʊʔəj/daʔie*	*Pseudolais micronemus*	*ndʒen*: fish *lʊʔəy*: meaning unknown *daʔie*: faeces	Quality [metonymy (diet)]
51	*njen luped*	*ndʒen lʊpɛd*	*Aluterus monoceros*	*ndʒen*: fish *lʊpɛd:* meaning unknown	–
52	*njen mapʊ'*	*ndʒen mapʊʔ*	*Piaractus* sp.	*ndʒen*: fish *mapʊʔ*: white	Morphology
53	*njen mila*	*ndʒen mila*	*Lutjanus gibbus*	*ndʒen*: fish *mila*: red	Morphology
54	*njen mila ɑzeng mɑtɑ*	*ndʒen mila ɑzəŋ mɑtɑ*	*Priacanthus macracanthus*	*ndʒen*: fish *mila*: red *ɑzəŋ*: big *mɑtɑ*: eyes	Morphology

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
55	*njen ngeraam*	*ndʒen ŋeRaːm*	*Setipinna melanochir*	*ndʒen*: fish *ŋeRaːm*: meaning unknown	–
56	*njen nyaqet*	*ndʒen n̲aqet*	*Oxyeleotris* sp.	*ndʒen*: fish *n̲aqet*: attach to something	Ecology
57	*njen nyaqet rat*	*ndʒen n̲aqet Rat*	*Platycephalus indicus*	*ndʒen*: fish *n̲aqet*: attach to something *Rat*: sea	Ecology [metonymy (ecological/spatial)]
58	*njen nyipa*	*ndʒen n̲ipa*	*Muraenesox cinereus*	*ndʒen*: fish *n̲ipa*: snake	Morphology [metaphor (shape)]
59	*njen pay bediraʼ*	*ndʒen paj bədiRaʔ*	*Pastinachus stellurostris*	*ndʒen*: fish *pay*: rays *bədiRaʔ*: flag	Morphology [metaphor (shape)]
60	*njen pay qepbaʼbeg*	*ndʒen paj qəɓ aʔbəq*	*Gymnura poecilura*	*ndʒen*: fish *pay*: rays *qəɓ aʔbəq*: butterfly	Morphology [metaphor (shape)]
61	*njen pay manoq*	*ndʒen paj manoq*	*Rhinoptera javanica*	*ndʒen*: fish *pay*: rays *manoq*: bird	Quality [metaphor (behaviour)]
62	*njen pay manoq titeʼ*	*ndʒen paj manoq titeyʔ*	*Aetobatus ocellatus*	*ndʒen*: fish *pay*: rays *manoq*: bird *titeyʔ*: dot	Quality [metaphor (behaviour)]; Morphology

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
63	*njen pɑy minya'*	*ndʒen pɑj miɲ̲aq*	*Dasyatis zugei*	*ndʒen*: fish *pay*: rays *miɲ̲aq q*: oil	Morphology
64	*njen pɑy sure'*	*ndʒen pɑj sʊReq*	*Himantura gerrardi*	*ndʒen*: fish *pay*: rays *sʊReq*: stripes	Morphology
65	*njen pɑy tunggol*	*ndʒen pɑj tuŋgʊl*	*Himantura uarnacoides*	*ndʒen*: fish *pay*: rays *tuŋgʊl*: stump	–
66	*njen pay (1)*	*ndʒen paj (1)*	*Neotrygon kuhlii*	*ndʒen*: fish *pay*: rays	–
67	*njen pay (2)*	*ndʒen paj (2)*	*Himantura lobistoma*	*ndʒen*: fish *pay*: rays	–
68	*njen papap (1)*	*ndʒen papap (1)*	*Psettodes erumei*	*ndʒen*: fish *papap*: meaning unknown	–
69	*njen papap (2)*	*ndʒen papap (2)*	*Cynoglossus arel*	*ndʒen*: fish *papap*: meaning unknown	–
70	*njen pɑten*	*ndʒen pɑtɛn*	*Pangasius hypophthalmus*	*ndʒen*: fish *pɑtɛn*: meaning unknown	–
71	*njen perɑmbɑng*	*ndʒen pəRɑmbɑŋ*	*Ilisha elongata*	*ndʒen*: fish *peRɑmbɑŋ*: meaning unknown	–

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
72	*njen perangiaŋ*	*ndʒen pəRaŋiaŋ*	*Chirocentrus dorab*	*ndʒen*: fish *peRaŋiaŋ*: meaning unknown	–
73	*njen perencong*	*ndʒen pəRentʃoŋ*	*Proteracanthus sarissophorus*	*ndʒen*: fish *pəRentʃoŋ*: meaning unknown	–
74	*njen piiras*	*ndʒen pi:Ras*	*Setipinna breviceps*	*ndʒen*: fish *pi:Ras*: meaning unknown	–
75	*njen pisang-pisang*	*ndʒen pisaŋ- pisaŋ*	*Lutjanus madras*	*ndʒen*: fish *pisaŋ-pisaŋ*: meaning unknown	–
76	*njen piten*	*ndʒen pitɛn*	*Equulites leuciscus*	*ndʒen*: fish *pitɛn*: meaning unknown	–
77	*njen pu'aw*	*ndʒen pʊʔaw*	*Leiocassis micropogon*	*ndʒen*: fish *pʊʔaw*: meaning unknown	–
78	*njen puqo'*	*ndʒen pʊqoq*	*Otolithoides biauritus*	*ndʒen*: fish *pʊqoq*: meaning unknown	–
79	*njen puqo' bab*	*ndʒen pʊqoq bab*	*Panna perarmatus*	*ndʒen*: fish *pʊqoq*: meaning unknown *bab*: rounded	Morphology
80	*njen puqo' buloh*	*ndʒen pʊqoq bʊloh*	*Panna microdon*	*ndʒen*: fish *pʊqoq*: meaning unknown *bʊloh*: bamboo	Morphology [metaphor (size)]

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
81	*njen puqo' jarang gigi*	*ndʒen pʊqoq dʒaRaŋ gigi*	*Chrysochir aureus*	*ndʒen*: fish *pʊqoq*: meaning unknown *dʒaRaŋ*: loosen *gigi*: teeth	Morphology
82	*njen puqo' mitem*	*ndʒen pʊqoq mitəm*	*Dendrophysa russelii*	*ndʒen*: fish *pʊqoq*: meaning unknown *mitəm*: black	Morphology
83	*njen puran*	*ndʒen puRan*	*Platax orbicularis*	*ndʒen*: fish *puRan*: meaning unknown	–
84	*njen qapaw*	*ndʒen qapaw*	*Epinephelus sexfasciatus*	*ndʒen*: fish *qapaw*: meaning unknown	–
85	*njen qapaw*	*ndʒen qapaw*	*Cephalopholis boenak*	*ndʒen*: fish *qapaw*: meaning unknown	–
86	*njen qapaw*	*ndʒen qapaw*	*Epinephelus areolatus*	*ndʒen*: fish *qapaw*: meaning unknown	–
87	*njen qitang*	*ndʒen qitaŋ*	*Scatophagus argus*	*ndʒen*: fish *qitaŋ*: meaning unknown	–
88	*njen qitang manay*	*ndʒen qitaŋ manaj*	*Drepane punctata*	*ndʒen*: fish *qitaŋ*: meaning unknown *manay*: male	Morphology [metaphor (shape and size)]

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
89	*njen qitang re'du*	*ndʒen qitaŋ Reʔdʊ*	*Ephippus orbis*	*ndʒen*: fish *qitaŋ*: meaning unknown *Reʔdʊ*: female	Morphology [metaphor (shape and size)]
90	*njen quasi'*	*ndʒen qʊasiʔ*	*Anodontostoma chacunda*	*ndʒen*: fish *qʊasiʔ*: meaning unknown	–
91	*njen reman manay*	*ndʒen Rəman manaj*	*Rastrelliger kanagurta*	*ndʒen*: fish *Rəman*: meaning unknown *manay*: male	Morphology [metaphor (shape and size)]
92	*njen reman re'du*	*ndʒen Rəman Rəʔdʊ*	*Rastrelliger brachysoma*	*ndʒen*: fish *Rəman*: meaning unknown *Rəʔdʊ*: female	Morphology [metaphor (shape and size)]
93	*njen ruai*	*ndʒen Rʊaj*	*Parastromateus niger*	*ndʒen*: fish *Rʊay*: meaning unknown	–
	njen buros	*ndʒen bʊRos*	*Parastromateus nige*	*ndʒen*: fish *bʊRos*: meaning unknown	–
	njen pelapi'	*ndʒen pəlapiʔ*	*Parastromateus niger*	*ndʒen*: fish *pelapiʔ*: meaning unknown	–
94	*njen ruay mapu'*	*ndʒen Rʊay mapʊʔ*	*Pampus chinensis*	*ndʒen*: fish *Rʊay*: *Parastromateus niger* *mapʊʔ*: white	Morphology

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
95	*njen sebeled (1)*	*ndʒen səbələd (1)*	*Rasbora* sp. 1	*ndʒen*: fish *səbələd*: meaning unknown	–
	njen sebeled (2)	*ndʒen səbələd (2)*	*Rasbora* sp. 2	*ndʒen*: fish *səbələd*: meaning unknown	–
96	*njen selɑyɑr*	*ndʒen səlɑyɑR*	*Istiophorus platypterus*	*ndʒen*: fish *səlɑyɑR*: sail	Morphology [metaphor (shape)]
97	*njen selelong*	*ndʒen sələləɔŋ*	*Ambassia vachellii*	*ndʒen*: fish *selelɔŋ*: meaning unknown	–
98	*njen seleped*	*ndʒen sələped*	*Ambassis nalua*	*ndʒen*: fish *sələped*: meaning unknown	–
99	*njen selusong rat*	*ndʒen səlʊsoŋ Rat*	*Lates calcarifer*	*ndʒen*: fish *səlʊsoŋ*: meaning unknown *Rat*: sea	Ecology [metonymy (ecological/spatial)]
100	*njen senɑngin*	*ndʒen sənɑŋin*	*Eleutheronema tetradactylum*	*ndʒen*: fish *sənɑŋin*: -	–
101	*njen senɑngin tɑndɑ*	*ndʒen sənɑŋin tɑndɑ*	*Polydactylus sextarius*	*ndʒen*: fish *sənɑŋin*: meaning unknown *tɑndɑ*: mark	Morphology
102	*njen sepelu'*	*ndʒen səpəlʊʔ*	*Harpadon nehereus*	*ndʒen*: fish *səpəlʊʔ*: meaning unknown	–
103	*njen seperet*	*ndʒen səpəRɛt*	*Tenualosa macrura x*	*ndʒen*: fish *səpəRɛt*: meaning unknown	–
104	*njen sepet*	*ndʒen səpət*	*Trichopodus pectoralis*	*ndʒen*: fish *səpət*: meaning unknown	–

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
105	*njen seqael*	*ndʒen səqael*	*Plotosus canius*	*ndʒen*: fish *səqael*: meaning unknown	–
106	*njen seruɑy*	*ndʒen səRʊɑj*	*Barbonymus gonionotus*	*ndʒen*: fish *səRʊɑy*: meaning unknown	–
107	*njen sezɑw rɑt*	*ndʒen səzɑw Rɑt*	*Abalistes stellaris*	*ndʒen*: fish *səzɑw*: fowl *Rɑt*: sea	Morphology [metaphor (shape)]; Ecology [metonymy (spatial/ecological)]
108	*njen sulat qunieng*	*ndʒen sʊlat qʊnieŋ*	*Caesio cuning*	*ndʒen*: fish *sʊlat*: meaning unknown *qʊnieŋ*: yellow	Morphology
109	*njen sulat mila*	*ndʒen sʊlat mila*	*Pterocaesio chrysozona*	*ndʒen*: fish *sʊlat:* meaning unknown *mila*: red	Morphology
110	*njen sultan*	*ndʒen sʊltan*	*Leptobarbus hoevenii*	*ndʒen*: fish *sʊltan*: meaning unknown	–
111	*njen supɑ'*	*ndʒen sʊpɑʔ*	*Kryptopterus parvanalis*	*ndʒen*: fish *sʊpɑʔ*: meaning unknown	–
	njen selesi'	*ndʒen sələsiʔ*	*Juvenile of Kryptopterus parvanalis*	*ndʒen*: fish *sələsiʔ*: meaning unknown	–
112	*njen taao'*	*ndʒen ta:oʔ*	*Osteogeneiosus militaris*	*ndʒen*: fish *ta:oʔ*: meaning unknown	–

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
113	*njen tavei*	*ndʒen tavej*	*Wallago leerii*	*ndʒen*: fish *tavey*: meaning unknown	–
114	*njen tebengor*	*ndʒen təbəŋor*	*Oxyeleotris marmorata*	*ndʒen*: fish *təbəŋor*: meaning unknown	–
115	*njen tenges*	*ndʒen təŋəs*	*Barbonymus schwanenfeldii*	*ndʒen*: fish *təŋəs*: meaning unknown	–
116	*njen tenggiri' batang*	*ndʒen təŋgiRiʔ bataŋ*	*Scomberomorus commerson*	*ndʒen*: fish *teŋiRiʔ*: meaning unknown *bataŋ*: log	Morphology [metaphor (shape)]
117	*njen tenggiri' papan*	*ndʒen tənggiRiʔ papan*	*Scomberomorus guttatus*	*ndʒen*: fish *teŋiRiʔ*: meaning unknown *papan*: board	Morphology [metaphor (shape)]
118	*njen terupbok*	*ndʒen təRʊɓ oʔ*	*Tenualosa toli*	*ndʒen*: fish *təRʊɓ oʔ*: meaning unknown	–
119	*njen tilan*	*ndʒen tilan*	*Mastacembelus erythrotaenia*	*ndʒen*: fish *tilan*: meaning unknown	–
120	*njen telapia mila*	*ndʒen tələpia mila*	*Oreochromis* sp.	*ndʒen*: fish *tələpia*: meaning unknown *mila*: red	Morphology
121	*njen telapia mitem*	*ndʒen tələpia mitəm*	*Oreochromis mossambicus*	*ndʒen*: fish *tələpia*: meaning unknown *mitəm*: black	Morphology

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
122	*njen timɑh mɑpu'*	*ndʒen timɑh mɑpʊʔ*	*Lepturacanthus savala*	*ndʒen*: fish *timah*: meaning unknown *mɑpʊʔ*: white	Morphology
123	*njen timɑh qunieng*	*ndʒen timɑh qʊnieŋ*	*Trichiurus lepturus*	*ndʒen*: fish *timah*: meaning unknown *qʊnieŋ*: yellow	Morphology
124	*njen tiqɑs*	*ndʒen tiqɑs*	*Seriolina nigrofasciata*	*ndʒen*: fish *tiqɑs:* meaning unknown	–
125	*njen tuqol*	*ndʒen tʊqol*	*Euthynnus affinis*	*ndʒen*: fish *tʊqol*: meaning unknown	–
126	*njen tuqol mitem*	*ndʒen tʊqol mitəm*	*Euthynnus* sp.	*ndʒen*: fish *tʊqol*: meaning unknown *mitəm*: black	Morphology
127	*njen tuqol selɑseh*	*ndʒen tʊqol səlɑsɛh*	*Auxis thazard*	*ndʒen*: fish *tʊqol*: meaning unknown *selɑsɛh*: basil	Morphology [metaphor (pattern)]
128	*njen tuqol sise'*	*ndʒen tʊqol siseʔ*	*Thunnus tonggol*	*ndʒen*: fish *tʊqol*: meaning unknown *siseʔ*: scales	Morphology
129	*njen tuted qunieng*	*ndʒen tʊted qʊnieŋ*	*Xenopterus naritus*	*ndʒen*: fish *tʊted*: meaning unknown *qʊnieŋ*: yellow	Morphology

(continued)

Table 8.1 (continued)

No.	Vernacular name		Scientific name	Meaning	TK encoded
	English spelling	IPA symbol			
130	*njen udun*	*ndʒen ʊdʊn*	*Rachycentron canadum*	*ndʒen*: fish *ʊdʊn*: meaning unknown	–
131	*njen pakong kepala'*	*ndʒen pakɔŋ kepalaʔ*	*Datnioides polota*	*ndʒen*: fish *pakɔŋ*: knock *kepalaʔ*: head	Morphology
132	*njen uweng batu*	*ndʒen ʊweŋ batʊ*	*Terapon theraps*	*ndʒen*: fish *ʊweŋ*: meaning unknown *batʊ*: stone	Ecology
133	*njen X1*	*ndʒen X1*	*Piaractus brachypomus*	–	–
134	*njen X2*	*ndʒen X2*	*Helostoma temminckii*	–	–
135	*njen X3*	*ndʒen X3*	*Parambassis* sp.	–	–
136	*njen X4*	*ndʒen X4*	*Cyclocheilichthys apagon*	–	–
137	*njen X5*	*ndʒen X5*	*Osteochilus microcephalus*	–	–
138	*njen X6*	*ndʒen X6*	*Lutjanus* sp.	–	–
139	*njen X7*	*ndʒen X7*	*Myripristis hexagona*	–	–
140	*njen X8*	*ndʒen X8*	*Upeneus tragula*	–	–
141	*njen X9*	*ndʒen X9*	*Siganus canaliculatus*	–	–

8.3 Results and Discussion

We documented 141 fish taxa (Table 8.1), of which nine were unnamed. According to our knowledge keepers, these species never had a Vaie name. Such unnamed taxa are commonly encountered in folk taxonomies, of which they form an integral component (Berlin et al. 1968). Of the 132 named folk fish taxa recorded, two were infra-specific taxa. We could not interpret the TK contained in 97 epithets. This could be considered as an indicator of loss of TK and language proficiency on the part of our knowledge keepers (Franco et al. 2015). Alternatively, it is also possible that these names are just blank names in the context of TK encoded by them, i.e., they are just nouns denoting the taxa without any other interpretable meanings. Names such as *njen telapia mitem* (*Oreochromis mossambicus*), and *njen pay* (*Neotrygon kuhlii*) are instances where we could conclusively determine that the folk generic epithet is a noun with no other meaning than to denote the particular fish (Table 8.1). On the other hand, there are also names such as *qeret ta'del* (*Sphyrna lewini*) where the generic epithet is a noun possessing other meanings beyond denoting the particular fish (*ta'del* = flat head). However, of the 46 specific folk taxa recorded, our knowledge keepers could successfully decode the TK encoded by 44 specific epithets. The specific epithets in *njen jamah seliday* (*Atule* sp.) and *njen jamah sew* (*Caranx sexfasciatus*) are the only two instances where we could clearly identify the inability on the part of our knowledge keepers to decode the TK contained in the names. The analysis of specific epithets supports our previously published findings that the TK and language proficiency of the Vaie people could be considered safe (Hidayati et al. 2018). However, we suggest further linguistic studies be carried out on the generic names to determine if their meanings have been lost, or they are just nouns denoting the respective taxa. We request the readers to consider our study in the context of this limitation.

8.3.1 Outline of Vaie Fish Taxonomy

Our understanding of Vaie fish taxonomy provided below does not provide a complete picture as we had limited our study to edible fishes alone. However, we provide an outline to the best of our understanding so that readers could situate the rest of our findings in the context of Vaie fish ethnotaxonomy. Generally, the taxa recognised by communities are included under broad categories called 'unique beginner' (Brown 2009). Unique beginners are often the equivalents of the English terms 'plants' and 'animals'. The Vaie people include their folk taxa under two broad unique beginners—*te'dai* (plants) and *semezap* (animals). The word *te'dai* refers to plants (noun) as well as grow (verb). Members of the younger generation confuse between both applications of the word *te'dai* and have begun using the term *te'dai mene'dai* as the plural form of plants, which is a direct translation of the Malay term *tumbuh-tumbuhan* (a group of plants). Since reduplication of names is rarely encountered

in Vaie, it is possible that *te'dai mene'dai* imitates reduplication in standard Malay, which uses the mechanism to convey plurality (Nadarajan 2006).

Documenting the term *semezap* (animal) required significant efforts. Both elders and youngsters named taxa included under the animal kingdom as *haiwan*, another Malay term. Also, most of the knowledge keepers could recall the names of individual animal taxa, but not the term for unique beginners. Towards the end of the fieldwork, the lead author secured an interview with Encik Kapeh bin Hosen, an 81-year-old elder from Bintulu, of Bruneian-Vaie parentage. He was adept with Vaie folklores and history. His knowledge about Vaie is uncontested although he is of mixed parentage. We could record the Vaie term *semezap* referring to this unique category from Encik Kapeh bin Hosen alone. The role of elders such as Encik Kapeh bin Hosen as custodians of TK and language has been widely recognised (Battiste 2000). It can be said that these elders are the living lexicons for indigenous languages, and the example of *semezap* only underlines the importance of investing in transmitting the TK and language from elders to members of the younger generation.

As seen in Table 8.1, the documented fish grouped under *qeret* and *njen qeret* include all shark species, while *njen* encompasses all other fish documented in this study. The genera of *qeret* are likely to be a conceptually unaffiliated category. According to Berlin (1992: 24), such unaffiliated folk generics are either morphologically unique or economically important. Our data indicate that *njen* is a lifeform category. When mentioned alone, *njen* refers to fish in general. However, the names of folk generics included under this category are always recollected along with the lifeform epithet *njen.*

8.3.2 TK Encoded by Vaie Fish Names

Of the 61 folk fish names we decoded, 21 were cryptic (metaphors—11; metonyms—10). This included two names that encode TK using both metaphors and metonymy. We could not come across any portmanteaus. The TK encoded by Vaie fish names relate to the following:

1. Ecology (names that reflect the habitat, distribution and abundance)
2. Morphology (texture, structure, forms, colours, and shape)
3. Quality (inherent features that are difficult to explain, such as taste, sound, etc.), and
4. Utility (use value of the taxa for humans).

We found 10 names encoding TK metonymically. They can be categorised as procedural, ecological or spatial, behavioural, sound and diet metonymy. Metonyms names differ from homonyms in that there is a cultural connection between these names. As pointed out by Evans (1997), when knowledge regarding cultural connection is lost, the names could be mistaken for homonyms. Consider the example of *njen bulan sungai* (*Tenualosa macrura*), a riverine species belonging to the *bulan* folk genus. *Bulan* refers to the moon and *sungai* refers to river. It is possible that the name

is a calendrical metonymy, where the community once saw a connection between the moon, the river and the fish over temporal scales. The moon is an important element in the lunar calendars of fishing communities (Cordell 1974). Lunar phases have a decisive influence on the reproductive cycles of fish (Ohta and Ebisawa 2015). The Vaie people once used a traditional lunar calendar for fishing, and we believe that the community had lost the knowledge on the metonymical connection along with their lunar calendar.

8.3.2.1 Ecology

The Vaie classify their aquatic ecosystem into *sungai* (river), *uut* (upstream of river), *paya* (estuarine), *rat* (sea) and *laot dalam* (ocean). They also recognise *karang* (coral) and *batu* (reef) as habitats within *rat*. Naming folk taxa on the basis of ecology showcases the traditional ecological knowledge encoded in the names (Silvano et al. 2000). In example I (a), the folk name encodes TK on the specific habitat of the coral cat shark. The prevalence of such names can be considered as an indicator of the TK held by the community on the species. The International Union for Conservation of Nature (IUCN) Red List places *Atelomycterus marmoratus* under the 'Near Threatened' category and lists its population status as 'unknown' (White 2003). Our knowledge of such species could be augmented considerably by incorporating the TK held by local communities (Begossi et al. 2008).

We found eight fish names encoding TK based on the habitat where they are found:

I. (a) *qeret karang* 'shark found among corals' (*Atelomycterus marmoratus*); cryptic name; (ecological/spatial metonymy)
   (b) *njen aqed* 'fish found attached to substratum' (*Saurida tumbil*); barefaced name
   (c) *njen nyaqed* 'fish found attached to something' (*Oxyeleotris* sp.); barefaced name
   (d) *njen nyaqed rat* 'marine *nyaqed* found attached to something' (*Platycephalus indicus*); cryptic name [metonymy (ecological/spatial)]
   (e) *njen bulan sungai* 'fish with the colour of the moon, found in rivers' (*Tenualosa macrura*); cryptic name [metaphor (colour) and metonymy (ecological/spatial)]. In this example, the generic epithet encodes TK on morphology metaphorically, while the specific epithet metonymically encodes the TK that it is a freshwater fish (habitat).
   (f) *njen selusong rat* 'marine *njen selusong'* (*Lates calcarifer*); cryptic name [metonymy (ecological/spatial)]
   (g) *njen sezaw rat* 'marine fowl' (*Abalistes stellaris*); cryptic name [metaphor (shape) and metonymy (spatial/ecological)]. The generic epithet metaphorically encodes the TK that the mouth of the fish resembles a fowl (morphology), while the specific epithet metonymically encodes the TK that it is a marine fish (habitat).

8.3.2.2 Morphology

Folk taxonomies use salient features of the taxa such as colour, shape, size etc. to distinguish one taxon from another (Hunn 1982). In the process, the TK gets encoded in the name. Brazilian fishing communities are known to make use of these characteristics to distinguish species of *Mugilidae*, *Serranidae*, *Pomatomidae*, *Scombridae*, and *Scianidae* (Begossi et al. 2008). Similarly, Vaie people use morphological features to generate names for their fish. Sixteen barefaced folk names contain information on the colour of the respective taxa (Table 8.2): *mila* for red; *mitem* for black; *qunieng* for yellow, and *mɑpu'* for white.

In addition to the barefaced names listed in Table 8.2, there are three cryptic names metaphorically encoding TK related to colour.

II. (a) *njen bulan* 'fish as white as the moon' (*Megalops cyprinoides*); cryptic name; morphology [metaphor (colour)]
(b) *njen bulan sungai* 'freshwater fish as white as moon' (*Tenualosa macrura*); cryptic name; morphology [metaphor (colour)]; ecology [metonymy (ecological/spatial)]. The generic epithet is a metaphor, while the specific epithet is a metonym.
(c) *njen qelɑpɑ'* 'fish as white as coconut flesh' (*Lactarius lactarius*); cryptic name [metaphor (colour)].

Apart from colour, Vaie fish names metaphorically encode TK on salient cultural artefacts, or other living taxa to highlight the morphological characters of the denoted fish.

Examples:

III. (a) *qeret tɑ'del* 'flat headed shark' (*Sphyrna lewini*); cryptic name [metaphor (shape)].

tɑ'del is a unique aspect of Vaie, and the larger Melanau culture (Saad 1971). It refers to the flat head of young girls. Traditionally, the Vaie considered girls with a flat forehead as pretty. Therefore, to artificially achieve a flathead, people tied pieces of hardwood or smooth stones with soft paddings to the forehead and back of infant girls (Mally 2017). This cultural practice is known as 'intentional head shaping', and the board is called cradleboard. Although this culture is not practised anymore, the information related to it is metaphorically encoded in the name. *Qeret tɑ'del* thus encodes TK on the shape of the shark head, as well as the cultural importance of 'flat head' among Vaie and Melanau communities (Fig. 8.2).

(b) *njen nyipɑ* 'snake fish' (*Muraenesox cinereus*); cryptic name [metaphor (shape)]
(c) *njen selɑyɑr* 'sail fish' [*Istiophorus platypterus*]; cryptic name [metaphor (shape)].
(d) *qeret tete' ɑsɑng mɑpu'* 'white gilled lizard shark' (*Chiloscyllium punctatum*); cryptic name [metaphor (shape)].

Table 8.2 Barefaced folk names encoding TK on colours of the respective taxa

Colour	Taxa	Scientific name	Description
mila (red)	*njen mila*	*Lutjanus gibbus*	*njen* = fish *mila* = red
	njen mila ɑzeng mɑtɑ	*Priacanthus macracanthus*	*njen* = fish *mila* = red *ɑzeng* = big *mɑtɑ* = eyes
	njen sulat mila	*Pterocaesio chrysozona*	*njen* = fish *sulat* = meaning unknown *mila* = red
	njen telɑpiɑ mila	*Oreochromis* sp.	*njen* = fish *telɑpiɑ* = meaning unknown *mila* = red
mitem (black)	*njen puqo' mitem*	*Dendrophysa russelii*	*njen* = fish *puqo'* = meaning unknown *mitəm* = black
	njen telɑpiɑ mitem	*Oreochromis mossambicus*	*njen* = fish *təlɑpiɑ* = meaning unknown *mitem* = black
	njen tuqol mitem	*Euthynnus* sp.	*njen* = fish *tuqol* = meaning unknown *mitem* = black
qunieng (yellow)	*njen jɑmɑh iqoy qunieng*	*Carangoides praeustus*	*njen* = fish *jamah* = Carangidae fish *iqoy* = tail *qunieng* = yellow
	njen sulat qunieng	*Caesio cuning*	*njen* = fish *sulat* = meaning unknown *qunieng* = yellow
	njen timɑh qunieng	*Trichiurus lepturus*	*njen* = fish *timah* = meaning unknown *qunieng* = yellow
	njen tuted qunieng	*Xenopterus naritus*	*njen* = fish *tuted* = meaning unknown *qunieng* = yellow

(continued)

Table 8.2 (continued)

Colour	Taxa	Scientific name	Description
mapu' (white)	*qeret jalour mɑpu'*	*Carcharhinus amblyrhynchos*	*qeret* = shark *jalour* = stripe *mɑpu'* = white
	qeret mɑpu'	*Carcharhinus dussumieri*	*qeret* = shark *mɑpu'* = white
	qeret tete' ɑsɑng mɑpu'	*Chiloscyllium punctatum*	*qeret* = shark *tete'* = lizard *ɑsɑŋ* = gills *mɑpu'* = white
	njen ruɑy mɑpu'	*Pampus chinensis*	*njen* = fish *ruay* = *Parastromateus niger* *mɑpu'* = white
	njen timɑh mɑpu'	*Lepturacanthus savala*	*njen* = fish *timah* = meaning unknown *mɑpu'* = white

Fig. 8.2 **a** Line drawing of a lady with flattened head (*tɑ'del*) by Jessica Choo Kuiin Yiih, and **b** *qeret tɑ'del* (*Sphyrna lewini*). Photo Syafitri Hidayati

(e) *njen pay qepba'beg* 'fish that resembles a butterfly' (*Gymnura poecilura*); cryptic name [metaphor (shape)].
(f) *njen sezɑw rɑt* 'marine fish with a mouth resembling that of fowl' (*Abalistes stellaris*); cryptic name [metaphor (shape) and metonymy (spatial/ecological)]. See: example I(g).
(g) *njen ɑlu'- ɑlu'* 'pestle shaped fish' (*Sphyraena barracuda*); cryptic name [metaphor (shape)].
(h) *njen jamah qɑpe'* 'axe fish' (*Alectis indica*); cryptic name [metaphor (shape)]
(i) *njen tenggiri' bɑtɑng* 'log-shaped fish' (*Scomberomorus commerson*); cryptic name; morphology [metaphor (shape)].

(j) *njen tenggiri' papan* 'fish compressed like a board' (*Scomberomorus guttatus*); cryptic name [metaphor (shape)].
(k) *njen pay bedira'* 'flag fish' (*Pastinachus stellurostris*); the dorsal fins resemble maritime flags; cryptic name [metaphor (shape)].

Cryptic names could also encode TK on the sizes of taxa. For example,

IV. *njen puqo' buloh* 'bamboo fish' (*Panna microdon*); cryptic name; [metaphor (size)]

Male and Female Taxa

Vaie people attribute gender forms to taxa that are similar in appearance. Such cryptic names are metaphors that encode TK on the shape and size of the fish. *Re'du* (female) fish are 'big round shape' while *manai* (male) have an oval and sturdy profile. For example, *njen reman re'du* (*Rastrelliger brachysoma*) and *njen reman manay* (*Rastrelliger kanagurta*); *njen qitang re'du* (*Ephippus orbis*) and *njen qitang manay* (*Drepane punctata*) (Fig. 8.3).

The attribution of gender to various taxa is a curious phenomenon in folk taxonomy. In the Maltese pharmacopoeia, the taxa of *xpakkapietra* refers to six unrelated species (Tabone 2010). Tabone observed no generalisable pattern and concluded that the premise for classifying taxa into male and female could not be understood as the relevant TK has been lost. The recognition of male and female species has

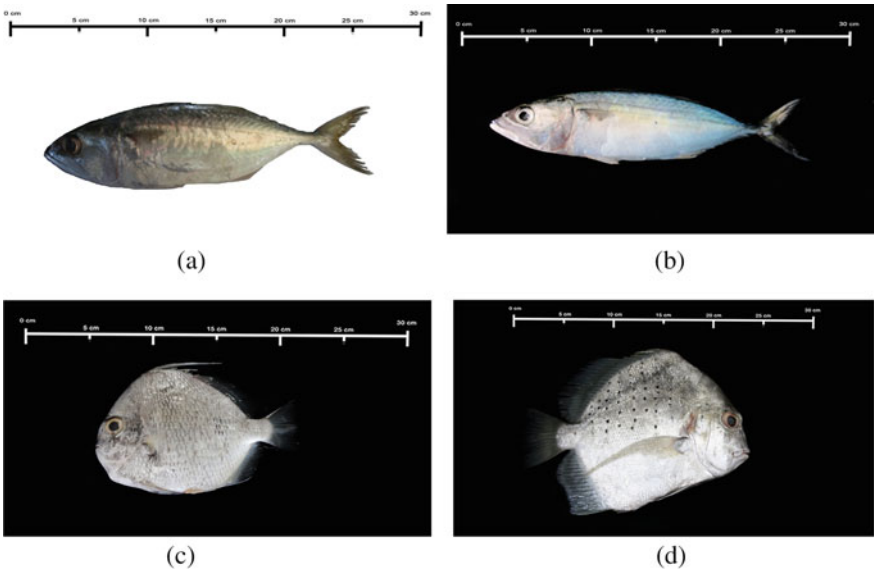

Fig. 8.3 **a** *njen reman re'du* (*Rastrelliger brachysoma*); **b** *njen reman manay* (*Rastrelliger kanagurta*); **c** *njen qitang re'du* (*Ephippus orbis*); and **d** *njen qitang manay* (*Drepane punctata*). Photo Syafitri Hidayati

also been reported from the Dusuns of Brunei Darussalam who attribute gender to *Lygodium microphyllum* and *Lygodium circinnatum* (Voeks and Nyawa 2006). The leaves of male plants were larger, wider, paler green-coloured, with less venation than female leaves. Ghimire and Aumeeruddy-Thomas (2009) recorded a similar naming pattern from the high altitude agro-pastoralists of Nepal who classify *Tetrataenium nepalense* into male, female, and neutral. Here too, male species have larger leaves and flowers than their female counterparts. However, Kamsani et al. (2020) did not find any consistent pattern behind gender attribution. The attribution of gender to folk taxa is believed to indicate higher cultural importance accorded to such taxa (Descola and Pálson 2004; Ellen 2004), and the names indicate such cultural importance.

8.3.2.3 Quality

Sound, habit, swimming style, and diet are 'quality' attributes of fish used to generate names. We found six fish taxa named using quality mechanism. Although diet could be considered as a separate category of TK mechanism, we include it under quality, as dietary behaviours encoded in names indirectly point to the quality of fish. In the case of *njen lu'ey* or *njen da'ie* (*Pseudolais micronemus*), it is named after its 'faecal' eating behaviour, which is an 'inferior' quality.

V. (a) *njen bengetot* (*Ilisha pristigastroides*).
njen = fish; *bengetot* = 'tot' sound
(b) *njen ipot bɑ'* (*Toxotes jaculatrix*)
njen = fish; *ipot* = blow; *bɑ'*= water
(c) *njen pɑy tunggol* (*Himantura uarnacoides*)
njen = fish; *pay* = rays; *tunggol* = stump
(d) *njen lu'ey* or *njen da'ie* (*Pseudolais micronemus*)
njen = fish; *lu'ey* = unanalysable; *da'ie* = faeces
(e) *njen pɑy mɑnoq* (*Rhinoptera javanica*)
njen = fish, *pay* = rays, *manoq* = bird
The fish has a swimming style resembling a bird in flight.
(f) *njen pɑy mɑnoq tite'* (*Aetobatus ocellatus*)
njen = fish, *pay* = rays, *manoq* = bird, *tite'* = dot)
The dotted fish has a swimming style like a bird in flight.

In the example of *Ilisha pristigastroides*, one could hear the 'tot' sound only when the fish is freshly caught using a hook or traditional net. However, nowadays fishermen use bottom trawlers, which are dragged on the seafloor for several days to catch the species. Thus, *Ilisha pristigastroides* is retrieved in dead condition, and the 'tot' sound cannot be heard. This shows that traditional practices and traditional knowledge are closely related to each other. In the case of Vaie, it has already been recognised that abandoning traditional forms of fishing have led to the decline of TK and language (Hidayati et al. 2018).

8.3.2.4 Utility

The cryptic name *njen jamah panaw* (*Atule mate*) was the only one found to encode TK related to utility of the species. The procedural metonym refers to 'fish of the genus *jamah* caught by *panaw* technique'. Culturally, fish caught by *panaw* technique fetches higher prices in the market, due to their fresh nature.

8.4 Conclusion

Our study shows that folk names could contain vital TK related to the taxa. In the case of cryptic names such as metonyms and metaphors, the encoded TK spans beyond the taxon denoted. Names encoding TK are indicative of the larger TK on the respective taxa accumulated by the community. Such TK held by communities could provide valuable insights in understanding the ecology and population status of understudied species (Begossi et al. 2008; Franco and Minggu 2019). Folk names are also products of linguistic processes specific to the community's language. Thus, it is possible to understand the vitality status of a community's language and TK, by analysing its folk names (see Franco et al. 2015; Hidayati 2017; Hidayati et al. 2017, 2018). Researchers should, therefore, consider the potential use of folk names of flora and fauna as indicators of vitality of traditional knowledge and language.

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