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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