School of Engineering and Science

The Relationship Between Indigenous Languages, Traditional Knowledge and Biodiversity: A case study with the Ba'ie Segan people of Sarawak, Malaysia

Syafitri Hidayati

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number CSEA 041214.

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Abstract

The concept of Biocultural Diversity is based on the idea that language, culture, traditional knowledge and biodiversity are linked to each other, and the loss of one entity would naturally lead to the loss of the others. Biodiversity rich regions of the world are also rich in ethnic and linguistic diversity, pointing to the possible existence of a strong realworld linkage between these two entities. Languages and species share many common traits, with fewer speakers disappearing faster than those spoken by relatively larger communities. Likewise, the drivers responsible for loss of biodiversity are also the ones known to lead to the loss of languages. It is understood that in ecosystems managed by indigenous communities, the traditional knowledge encoded in their languages are primarily responsible for facilitating ecosystem management which in turn results in biodiversity management. This underlines the need for conserving both languages and traditional knowledge (TK), for effective biodiversity conservation. To salvage what exists, it is imperative to know what exists; this has prompted various researchers to develop methods to assess the vitality of indigenous languages and traditional knowledge. Using a novel methodology, the study argues in support of the hypothesis: "the traditional knowledge and language vitality of a community related to biodiversity is reflected in the community's taxonomic and nomenclatural systems." The following three objectives were conceived so as to support the hypothesis: (1) to document the ethnobiological knowledge of the Ba'ie Segan people on fishes, (2) to elucidate the Ba'ie Segan ethnotaxonomic system on fishes, and (3) to assess the traditional knowledge and vitality of language using ethnotaxonomy and nomenclature. Considering the novelty of the methodology, a pilot study with Kanekes people from Banten Indonesia was conducted. The pilot testing employed a mixed method utilising both qualitative and quantitative methods. About 358 food plant names were documented during the baseline documentation stage, following which interviews were conducted with 76 collaborating individuals. The pilot testing shows that Kanekes people use TK mechanisms such as: ecology (51), morphology (177), quality (39) and utility (61) and, linguistic mechanisms such as metaphors (109), metonymies (189) and portmanteaus (10) to name their food plant names. The results show that the traditional knowledge and language vitality of Kanekes community could be considered to be safe (0.981). The core research with the Ba'ie Segan people of Sarawak, Malaysia also utilises a mixed methodology approach. About 81 individuals were interviewed during the entire course of study and the results were juxtaposed against the results of another language vitality assessment undertaken using UNESCO's (2003) Language Vitality and Endangerment (LVE) framework. The study documented the ethnobiological knowledge of Ba'ie Segan people on fishes, and also elucidated their ethnotaxonomic system. The Ba'ie nomenclatural system involving 141 species of fishes was also studied, and used as an indicator for assessing traditional knowledge and language vitality. The results show that the Ba'ie Segan people use TK mechanisms such as ecology (08), morphology (50), quality (6), and utility (01) as well as linguistic mechanisms such as metaphors (17) and metonymies (48) to derive fish names. The traditional knowledge and language vitality of Ba'ie Segan people can be considered as safe (0.836), which is in contrast to the largely 'unsafe' indication resulting from the LVE assessment. Though the results of the two assessments differ, a closer look at the results of the traditional knowledge and language vitality assessment shows that participants who do not practice the traditional occupation of fishing show a value (0.773) that is quite close to 'vulnerable'. The study highlights the need for drafting adequate participatory intervention measures aimed at this group, to stem loss of TK and language vitality. The results demonstrate the novelty and reliability of the methodology adequately. The present study is the first known research investigation to use a community's ethnotaxonomic and nomenclatural system as the indicator of TK and language vitality. The study is possibly the first to demonstrate that a community's nomenclatural system is derived using both TK and linguistic mechanisms, providing fillip to TK and language revitalisation efforts.

Keywords: ethnobiology, biocultural diversity, indigenous language, traditional knowledge

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Chapter 1 Introduction

1.1 Biocultural diversity

Biocultural diversity is a term coined to portray the inseparable relationship between language, human culture, and biodiversity (Maffi 2005). Co-occurrence between the three entities in major biological hotspots of the world is often cited as a major evidence to show that these three entities are linked to each other and might have co-evolved. At the global level, a positive correlation exists between cultural diversity, linguistic diversity and biodiversity, which is corroborated increasingly by various researchers from the fields of Geography, Anthropology, Linguistics, Ethnobiology, etc. ; geographically, areas of high linguistic, ethnic and cultural diversity are also abodes of high biological diversity (Nababan 2003, Gorenflo et al. 2012, Young 2006, Zent and Maffi 2009). Biodiversity hotspots such as East Melanesian Islands, Guinean Forests of West Africa, Indo-Burma, Mesoamerica, and Wallacea have more than 250 indigenous languages, with New Guinea alone home to around 1000 endemic languages. On the other hand, areas of low biodiversity such as Chilean forests, Cape Floristic region, New Zealand, Southwest Australia, and Succulent Karoo hotspots only use around three languages (Gorenflo et al. 2012).

Latitude and environmental factors are known to give rise to linguistic diversity. This classical hypothesis is rooted on the notion that physical barriers such as mountains could prevent easy movement of humans leading to isolation and then language speciation (Cashdan 2001, Foley 2004, Harmon 1996, Nichols 1997, Roberts 2008). Nettle (1998) also espouses the environmental factors theory, proposing that temperature could be the chief driver of language diversity at the global level. Tait and Khaufman (1994) show how linguistic diversity in North America increases along with an increase in latitude. New Guinea's high language diversity and biological diversity could also be influenced by geographical and environmental factors. According to Michalopoulos (2007), habitat heterogeneity is a major factor that gives rise to language diversity. The habitat isolation due to mountains and oceans could limit interaction with other ethnic groups leading to cultural and linguistic heterogeneity (Stepp et al. 2004). However, Currie and Mace (2012) argue that the latitude and climates are mere proxies of linguistic diversity. According to them, subsistence strategies in food production play important roles in supporting the population of the society. People have to travel and trade foods and goods for livelihood sustenance. The pattern noticeably occurred in hunter- gatherer and pastoralist communities where the people have to travel long distances due to the geographically wide-spread nature of food resources, while agriculture reduces the need for travel and interaction between communities due to the ready and availability of food. Lack or availability of food may thus cause language sharing or isolation which in turn shapes the linguistic diversity of the region (Currie and Mace 2012).

With increasing world complexity, subsistence strategies are also getting more complex. Previously, human beings were organised with respect to the subsistence strategies fitting the locale; however, contemporary times have seen a shift towards a centralised food production system that relies heavily on trade and complex economic scenarios that forces the acquisition of new language skills. Earlier, Currie and Mace (2009) argued that political complexity of groups can be a key factor deciding linguistic diversity. For instance, in the 16th century, Russia which was previously concentrated in Moscow shifted eastward due to the prevailing political situations, and indigenous languages of the erstwhile east that came in contact with this expansion became influenced by the Russian language. As a result, Russian language became dominant and widely spoken (Hosking 2001). With due consideration to the environmental and socio-ecological factors, Gavin et al. (2013) used four key processes, viz., (1) neutral change, (2) movement, (3) contact, and (4) selection, to elucidate factors of language diversity at the global level. The linguistic diversity situation in fact reflects the cultural diversity situation in many regions. The hypotheses discussed above are major breakthroughs in the field of biocultural diversity. Yet, they do not fully answer the direct relationship between language, cultural and biological diversities. In the following section, the possible connection between these three entities is discussed.

1.2 Linguistic Endangerment

Linguists believe that not less than 97% of people in the world speak about only 4% of the languages in the world and 96% of languages in the world are spoken only by less than

3% of human population (Benard 1992, UNESCO 2003). The situation has attracted linguists to focus on the extreme diversity of languages spoken by a few groups. The number of speakers of a language will influence language vitality-the smaller the number of speakers, the greater is the possibility of a language disappearing altogether, when compared with languages that are spoken by relatively larger number of people (Currie and Mace 2012, Gavin et al. 2013). Nettle and Romaine (2002) also predicted that around 50-90% of the present day's languages will disappear from the world's language atlas by end of this century.

Language loss is the situation where speakers abandon a language to acquire another language. In some cases, this is indicated by the language shift from minority into dominant languages. In such situations, most probably the speakers will become bilingual or multi-lingual, using more than one language accordingly. There are so many examples of minority languages that did not survive the phenomenon and gradually disappeared due to the un-healthy vitality status of their language. The 65th Annual Meeting of Linguist Society of America reported that almost half of the world's languages (6000) will be dead after 75-100 years, and of the 3000 languages that are expected to survive, not less than 45% are under threatened category and going to be extinct soon (Holden 1991).

Like biological species, languages also share a similar pattern and development that could be studied in different stages. Ethnologue classified languages based on Expanded Graded Intergenerational Disruption Scale or EGIDS (Lewis and Simons 2009), which is an adaptation and expansion of Fishman's (1991) Graded Intergenerational Disruption Scale (GIDS). The GIDS has been used by Fishman (1991) to indicate the status of language based on its "domain of use" in the speaker population. There are eight levels of GIDS: level one is when the language is used in education, work, mass media, and government at the nationwide level and in the last level of GIDS, the only remaining speakers of the language are members of the grandparent generation. Later, Lewis and Simons (2009) expanded the eight GIDS levels into 10 levels of Expanded Graded International Disruption Scale (EGIDS) ranging from international, national, regional, trade, educational, written, vigorous, threatened, shifting, moribund, nearly extinct, to be extinct. According to Ethnologue, 578 languages of the world are in 'institution' grade, 1,598 in the ‘developing’ grade, 2,479 are in ‘vigorous’, 1,531 ‘in trouble’, and 916 are ‘dying’ (Lewis, Simons, and Fennig 2015).

A language is in danger when the speakers stop using the language in increasing number of domains, and is no longer being transmitted between intergeneration. As a result, such a language is not spoken by the younger generation (UNESCO 2003). UNESCO also developed the Language Vitality and Endangerment (LVE) framework that seeks to assess language vitality and endangerment using nine factors viz., (1) intergenerational transmission, (2) absolute number of speakers, (3) proportion of speakers within the total population, (4) trends in existing language domains, (5) response to new domains and media, (6) materials for language education and literacy, (7) governmental and institutional language attitudes and policies, including official status and use, (8) community members’ attitudes toward their own language, and (9) amount and quality of documentation. The urgency of language vitality assessment is aimed at sustaining linguistic diversity, encouraging linguistic diversity, and incorporating the traditional pedagogies into formal educational systems wherever possible and appropriate. All linguists uphold the belief that languages have to conserved and revitalised wherever required. Sutherland (2003) shows that languages are threatened even more than mammals and birds. Although the general public is aware of the loss of species, not much awareness exists on the loss of languages. At the global level, there is parallel extinction happening at the linguistic, cultural, biodiversity fronts. However, the mechanisms by which languages interact with biodiversity and ecosystems are not yet known. The present study presumes that Traditional Knowledge (TK) could be the major pathway through which languages, especially the indigenous ones interact with their respective ecosystems.

1.3 Traditional Knowledge

Language is not only the medium for sharing information, but also an invaluable vault of the outstanding cultural wisdom of the community accumulated as TK. TK includes information on genetic resources (human beings, plants and animals as well as their relationships) and adaptations to the surrounding environment and environmental changes. TK has become even more relevant in the contemporary times as it is the premier *sui generis* agent facilitating the development of new solutions and strategies to cope with aggravated environmental changes.

In any society, the relationship between people and environment leads to the development of a set of rules and concept expressed in the vocabulary, and communities usually possess great number of vocabulary than scientists may expect (Evans and Levinson 2009). The story of Eskimo snow vocabulary is a classical example that shows how people who have stronger connection with a specific environment might generate diverse, yet precise vocabulary to address their resources. For instance *aput* is 'snow on the ground', *qana* refers to the 'falling snow', and *piqsirpoq* is the 'drifting snow' (Boas and Powel 1966). Fraser et al. (2011) studied the ethnotaxonomy of soil in Central Amazon to reveal that the community knows greater categories of soil and apply the knowledge to manage their land. Bostoen's (2007) study on the *Lozi* plant names in the province Zambia shows that analyses of folk plant names can give an insight into linguistic strata. From Paulista, Mourao, Araujo and Almeida (2006) show how the hunter community could precisely recognise the mastofauna games using the TK of their micro and macro habitat encoded in their respective folk names.

The above evidences show how culture is linked and affected by biodiversity, through the agency of TK (Selin 2003). Traditional Knowledge refers to the cumulative knowledge and beliefs on the relationship between human beings and their environment that is acquired, accumulated and transmitted over many generations through cultural mechanisms (Berkes, Colding, and Folke 2000). In many cases, TK promotes conservation of biodiversity in ecosystems managed by indigenous communities. But, not all of TK is being conserved well and the TK of the indigenous communities are facing risk of loss/erosion. Cultural change, change in occupational preferences and formal schooling are some of the factors that are generally associated with the loss of TK. However, increasing evidences also highlight the major role played by languages in the conservation and transmission of TK (Saynes- Vásquez et al. 2013).

Lexemes produced by humans due to interaction with environment can shape adaptation and modification of the environment. Human understanding of the environment is embodied in these vocabularies through the utilisation (uses, maintenance, or exploitation) of the biological diversity. On the other hand, environment shapes the human culture and thought processes. Interaction between human beings and environment is encoded in, and transmitted through language in the form of TK (Franco and Narasimhan 2009). Lexemes are the building blocks of languages, as well as the ethnotaxonomic systems (Franco et al. 2015), and hence, studying them could provide an understanding of the vitality status of both languages and TK.

1.4 Ethnotaxonomic and nomenclatural systems

Ethnotaxonomy is an elaborate science which is equally relevant as the various 'modern' systems of classifications. Berlin and co-workers proposed a template for folk classification system, on the basis of their work with the Tzeltal people in Chiapas Highlands (Berlin, Breedlove, and Raven 1966). Since then, various studies have been conducted by different ethnobiologists to analyse the ethnotaxonomical systems of various communities. For example: ethnobiological classification about reef fish species in Wakatobi-South east Sulawesi Indonesia (May 2005); bird classification in Southern Luri-Iran (Anonby 2006); ethnotaxonomy of mastofauna as practiced by hunters in municipality of Paulista, state of Paraíba-Brazil (Mourao, Araujo, and Almeida 2006); ethnocategory of insect among Tapera people in Sao Goncalo dos Campos, Bahia, Brazil (Costa-Neto and Magalhaes 2007); botanical nomenclature in Bulgarian traditional (Nedelcheva and Dogan 2009); wild plant diversity among Mongolians in Ejina-China (Khasbagan and Soyolt 2008); folk biological classification of minor millet in India (Rengalakshmi 2005).

Ethnotaxonomy uses various mechanisms and categories for identifying and classifying biodiversity in their cultural domain: the Wola people of Papua New Guinea recognize varieties of sweet potato based on morphological character such as size, shape, and its leaf colour (Silitoe 1983), whereas the Irulas from South India categorize *Cassuarina equisetifolia* L. and *Tamarinx indica* Willd. As '*chavukku*' and '*kattu chavukku*' respectively on the basis of ecology. According to some researchers, linguistic categories in ethnobotanical classifications are restricted to individual cultures and ecological domain and hence cannot be considered as universal (Newmaster et al. 2006). However, it is undeniable that the template provided by Berlin and co-workers are invaluable reference material for all ethnotaxonomic studies (Berlin et al. 1966; 1968; 1973).

1.5 Focus of the study

Traditional knowledge and language come together and provide ethnotaxonomical system to classify and name biological diversity. Vocabularies are the basic units of both language as well as TK (Unasho 2013). The same vocabularies also shape human thought processes on the environment, influencing the management of natural resources (Franco et al. 2015). Based on this idea, this study is designed to generate a theoretical understanding of the ethnotaxonomic and nomenclatural system of a community as the meeting point of language and traditional knowledge. Using a case study with the Ba'ie Segan people of Bintulu, this study argues in favour of the hypothesis that *the vitality of language and traditional knowledge of a community related to biodiversity is reflected in the community's taxonomic and nomenclatural systems*. Thus, this study employs ethnotaxonomic and nomenclatural systems as indicators to assess the vitality of language and TK competencies at the individual and community level. This study aims to support the hypothesis through the following three objectives: (1) to document the ethnobiological knowledge of the Ba'ie Segan people on fishes, (2) to elucidate the Ba'ie Segan ethnotaxonomic system on fishes, and (3) to assess the vitality of language and traditional knowledge using ethnotaxonomy and nomenclature. Specific research questions answered are: 1) How extensive is the Ba'ie TK on fishes, 2) What are the mechanisms employed by the community to recognise, identify and name their fish diversity, 3) What is the status of the social support available for TK and language transmission at the community level? and 4) Can the methodology adopted complement the existing methodologies such as the Language Vitality and Endangerment (LVE) framework developed by UNESCO (2003)? The rationale behind the study has been published in the form of an article (Franco et al. 2015).

1.6 Study area

Sarawak is known for its rich biological, cultural and linguistic diversity with many ethnic groups including Iban, Bidayuh (Land Dayak), Melanau, orang Ulu and Kedayan who closely interact with each other. The exact number of ethnic and languages group of Sarawak is debatable due to huge variations in their names and classification (Langub 1987). For instance, sea Dayak and land Dayak were two popular terms used previously to refer to the Iban and Bidayuh of today (Babcock 1974). Likewise, the Murut who are also known as *Lun Dayeh* or *Lun Bawang* inhabit at least three different political states viz. Kalimantan, Sabah, and Brunei (Crain 1978). Kroeger (1998) classified eight families of ethnic group in Sarawak as: Malayic, land Dayak, Kelabit (Apo Duat), Kenyah, Punan and Penan, Kajang, Melanau, and Lower Baram, and suggested that Melanau dialects and Kajang should become priorities for future studies. The umbrella term of Melanau is used to refer to non-Malay ethnic groups of Sarawak who are neither sea Dayak nor land Dayak during the early periods of Raja Brooke (Morris 1989). Blust (1974) classified Melanau into seven as: Bintulu, Balingian, Mukah, Dalat, Matu, and Serikei. Hudson (1970) classified Melanau into Melanau (Mukkah, Oya, Matu, and Rejang), Kanowit, and Tanjong. Zaini (1989) employed emic perspective to group the Melanau into Kuala Rajang, Seduan (Sibu, Kanowit, Tankong), Matu-Daro, Mukah Dalat, Belingian, and Bintulu. Supporting Blust (1974) and Zaini (1989), Ghani (2006b) clearly stated that Bintulu is a different language from Melanau. The language that was earlier referred to as Bintulu and included under the Melanau group is now known as 'Vaie' based on the emic perspective. Prior to the commencement of this research, The Bintulu speakers were referred to as the 'Segan people' or the 'Baie Segan' in their dialect (Ghani 1992), as reflected in the title of this thesis. However, as the research progressed, it was understood that the emic perception of the language and the community is 'Va'ie'. However, for the sake of this thesis, the term 'Ba'ie Segan' has been retained.

1.7 The Ba'ie land and People

Melanau Ba'ie settled in Bintulu situated on the Sarawak coast at the mouth of the Kemena river; it is the district headquarters of the Bintulu District Fourth Division. There are three major towns in Bintulu divisions; they are Bintulu, Tatau and Sebauh. The Ba'ie language is spoken in surrounding areas of Bintulu such as Kampong Majid, Kampung Sinong, Kampung Sibiew, Kampung Datuk, Kampung Baru, Kampung Jepak, Kampung Sebuan, Kampung Batu Sepuluh. It is difficult to verify the place of origin of Bintulu native speakers because of the lack of written records, and this is one reason why the community chose to collaborate in this study.

The Ba'ie Segan people share similarities in cultural traits and historical ties to others coastal indigenous group of Sarawak, to such an extent that they were once traditionally referred as Melanau (Omar 1983). Most of Baie people maintain diglossic situation, speaking two different languages. Malay and Ba'ie language are used for different parts of the community life. According to Ghani (2006a), at least 85% of community members under 10 years of age, as well as those in the age group of 11-20 years exhibit a bilingual pattern involving Ba'ie as their autochthonous language (L1) and Malay as the Allochthonous (L2); at least 11% of the population was found to be monolingual in Malay and 4% monolingual in Ba'ie. For the adults in the age group of 21- 30 years, 31-40 years, 41 years and above, it was found that 91% were bilingual in Ba'ie language and Malay, 6% definitely monolingual in Malay and 3% monolingual in Ba'ie. As a result of social and cultural development, the language situation seems to have changed. For, it is common that languages are shaped by the cultural and social environment in which they evolve (Edris and Ghani 1992).

Ba'ie segan people are known as a community that practices fishing traditionally. They embraced Islam when it was introduced to Sarawak through the Brunei Raja, and hence, do not practice the traditional worship ceremonies such as *Kaul* that is still practiced by the Melanau Mukah (Welman 2011). Bintulu, the ecosystem inhabited by Baie Segan people has undergone urbanisation due to the industries catering to the Oil and Gas sector. This has had its impact on the community, visible in the form of occupational and language shifts, and lifestyle changes. From a small fishermen community, Bintulu has gradually transformed into an urban society due these changes. Sociocultural environment plays an important role in the development and the transformation of language; languages or dialects change along with the changes in the society and with times in order to meet new demands or needs. Even if the society does not change completely, some forms of adaptation is necessary. Although the relationship is dynamic, at times it could lead to loss of TK and language vitality. This is an undesirable situation as both these entities are quintessential for fostering adaptation to changes in the environment. The present study conducted in collaboration with the Ba'ie people provides an understanding of the TK-Language scenario and the various factors affecting it at the community level.

Summary

Co-occurrence of language diversity, cultural diversity, and biological diversity in the global level can be considered as an evidence for a mutually dependant relationship. Even though there is debate about the causation factors of linguistic diversity, language distribution, and biological diversity, the heterogeneity of views only contribute to a better understanding of the complex scenario. Reviews show that the direct relationship between these three entities is still unclear. In this background, this study uses ethnotaxonomic and nomenclatural systems as proxy for assessing traditional knowledge and language vitality to argue in favour of the hypothesis that *the vitality of language and traditional knowledge of a community related to biodiversity is reflected in the community's taxonomic and nomenclatural systems.* Using a case study with the Ba'ie Segan people of Sarawak Malaysia, the present study aims to support the hypothesis through the following three objectives: (1) to document the ethnobiological knowledge of the Ba'ie Segan people on fishes, (2) to elucidate the Ba'ie Segan ethnotaxonomic system on fishes, and (3) to assess the vitality of language and traditional knowledge using ethnotaxonomy and nomenclature. The outcome of the study would help the community by providing an understanding of the vitality status of TK and language, and assist them in developing participatory measures to re-vitalise their Biocultural Diversity.

Chapter 2 Literature Review

2.1 Introduction

This chapter discusses the progress of South East Asian Ethnobiology towards Biocultural Diversity, using a methodological review that uses the five phases concept (Hunn 2007 and Wolverton 2013), following the methodology adapted from Albuquerque et al. (2013). More than 3000 publications indexed in SCOPUS and Web of Science were accessed using the names of 11 SE Asian countries and various disciplines of ethnobiology as keywords (Hidayati, Franco, and Bussman 2015). These articles were then manually screened and segregated according to the five-phase concept. The results give an idea of the trend in ethnobiological research, and the level of acceptance of the concept of Biocultural Diversity (BCD). The results indicate that ethnobiological research in Southeast Asia is increasingly moving towards phase 5, which can be considered as the phase of Biocultural Diversity. However, there are major gaps in dealing with language and Traditional Knowledge beyond the theory level. Since BCD itself is result of the conceptual evolution happening within Ethnobiology, it is imperative to understand the due course of its evolution, especially in SE Asia where the study focuses.

2.2 Development of Ethnobiology

Ethnobiology originates from "ethnos" and "biology". It is a sub- discipline of biology that can be defined as the interdisciplinary study of the relationship between human culture and the biological components of the environment in the context of past and present. Ethnobiology comprises the sub disciplines of, ethnozoology, ethnoecology, ethnopharmacology, ethnomedicine, ethnomycology, and ethnoveterinary (Conklin 1954; Cotton 1996; Harshberger 1896). In the past, ethnobiology and ethnozoology have begun without a name in Asia and Mediterranean basin (Ford 2011). Ethnobotany was formerly known as aboriginal botany (Powers 1874) but then in 1896 Harshberger introduced the documentation of uses of plants as ethnobotany (Harshberger 1896). Ethnobiology developed as economic botany due to the scientific interest in the economic value of plants, by the eighteenth century. Christopher Columbus sailed to Bahama island, assessed economic potential of tobacco (unknown in Europeans until then) as well as brought back corn (*Zea mays* L.), allspice (*Pimenta dioica* (L.) Merr.), and cotton (*Gossypium* spp) that were used by the local people there (Hobhouse 1992; Simpson and Corner-Ogorzaly 1986). Besides that, researchers from various fields such as botanists, zoologists, ethnologists, adventurers and even missionaries also inadvertently turned into ethnobiologists while collecting information for museum purposes (Cotton 1996).

Development of ethnobiology cannot be traced without considering the contribution of ancient medicinal systems such as Greek in Europe, Egyptiana in Africa, and Assyrian, Siddha, Ayurveda, Chinese and Tibetan in Asia (Bala 1985, Žuškin et al. 2008). Those ancient medicinal systems were closely related to religious beliefs and cultural practices. Greek and Roman medicinal systems used cannabis against nosebleed and tapeworms (Butrica 2002). In India, various ancient medicinal systems such as Ayurveda, Siddha, Yoga and Naturopathy originated from folk medicinal knowledge (Ravishankar and Shukla 2007); for example the use of *Oroxylum indicum* Linn. for anti-inflammatory and diuretic (Gujral, Saxena, and Mishra 1955). These codified systems of medicine are invaluable records of medicinal plants that provide clue for modern bioprospecting research.

Svanberg et al. (2011) has described the history of ethnobiological research in Europe in the nineteenth century as works of explorers and armchair scholars. Research in this period was documented in travelogues and ethnographical monographs, and it continues to be relied upon by scholars studying historic plant and animal use. This phase was also crucial for the development of Ethnobiology as a discipline. Many dictionaries, travelogues, folklore record of plants have been written and published with their indigenous names. In America, Brent Berlin in 1969 proposed his ideas that drew from linguistics, anthropology, and biology to position ethnobiology as a cognitive science. His work with Tzeltal Maya brought to light their ethnotaxonomy and classification system which was characteristic to their culture, ecosystem and language (Berlin et al. 1966; 1973). It was an excellent example for integrative approach in ethnobiology carried out in the middle of 20th century.

Cultural analyses have played an important role in conducting ethnobiology research especially in indigenous and rural communities. Development of this pattern had consequences on the relationship between scholars and communities, underlining the position of scholar as recorder of knowledge and communities as knowledge holders. The first ethical guideline to conduct research involving humans is the highly popular Nuremburg code which later formed the basis for various ethical standards (Hardison and Bannister 2011). In 1957, ILO (International Labour Organization) brought out a proper definition for indigenous and tribal people, giving fillip to their fight for due rights, partnerships and recognition. Through the *United Nations Declaration on the Rights of Indigenous Peoples,* indigenous people rights have been respected to a large extent (United Nation 2008). Under these, indigenous rights issues related to protection of traditional knowledge, human and land rights, as well as intellectual property have received more attention. In 1988, the first ethnobiology congress was been held in Belem, Brazil which marked a paradigm shift from the usual academia style to a community driven style. Not less than 600 delegates from 35 countries joined hands to recognise, and support all forms of human rights in ethnobiology including recognition of cultural and language diversity (ISE 2006). By 1992, the first International Society of Ethnobiology (ISE) Code and Conduct was developed and continued to evolve through various amendments effected in 2001, 2006, and 2008 (ISE 2006). This code consists of preamble, purpose, 17 principles and 12 practical guidelines, which lays out set of principles and guidelines aiming to optimise the positive outcomes of study while mitigating any adverse impact of ethnobiological research on the community. The ethical principles outlined by the code include: prior Rights and Responsibility, self-determination, inalienability, traditional guardianship, active participation, full disclosure, educated prior informed consent, confidentiality, respect, active protection, precaution, reciprocity, mutual benefit and equitable sharing, supporting indigenous research, the dynamic interactive cycle, remedial action, acknowledgement and due credit, and diligence.

In the 20th century, ethnobiology was marked by the embracing of a multi-dimensional approach in working with communities. Besides continuing methodological advances, ethical commitments such as Prior Informant Consent (PIC) and Intellectual Poverty Rights (IPR) started receiving attention among researchers and communities. Knowledge holder rights such as information, biodiversity, and land have been guaranteed in ISE code and conduct as well as in the benefit sharing concept issued by *United Nation in*

Convention on Biological Diversity (United Nation 1992). The understanding reached another milestone with the development of the concept of Biocultural Diversity proposed by Posey (1992) and Maffi (2005). Researchers such as Manne and Lisa (2003), Sutherland (2003), Stepp et al. (2004), Maffi (2005), Michalopoulos (2007), Zent et al. (2009), and Gavin et al. (2013) subsequently discussed and analysed biocultural diversity at global level with various indicators and proxies. However, the concept of biocultural diversity acknowledges the human-language-culture-TK complex relationship both at the community level as of global biocultural diversity. At present, the immediate concern is the rapid and tremendous loss of biodiversity, cultural diversity and language diversity, and the accompanying loss in TK.

Clement (1998) categorised the evolution of ethnobiology into three phases viz., the pre classical period (1860-1899), the classical period (1950-1980), and the post classical period (1990s) (Figure 2.1). The first phase is characterised by heightened documentation of plant and animal use knowledge of various communities, which paved way for the rise of economic botany. The classical period saw the emergence of 'emic' perspective in ethnobiology, and in the third phase, there was a special emphasis on participatory resource management and intellectual property rights.

Hunn (2007) later expanded the above concept into four periods by further categorising the classical period into two. The first period was thus a period of documentation, second is marked by the rise of cognitive psychology and linguistics (Berlin et al. 1966), the third emphasised on environmental knowledge and the fourth phase saw advancements in cooperation between ethnobiologists around the world. Wolverton (2013) further added a fifth phase as one that refers to the rise of Ethnobiology as an umbrella discipline, connecting the human-environment-culture matrix. One of the major contributions of this thesis is the argument that the fifth phase could very well be the phase of Biocultural Diversity, as the concept itself promotes collaboration between linguists, anthropologists, ecologists, and ethnobiologists (Maffi 2005; Hidayati, Franco, and Bussman 2015).

Phase I

(1860-1899)

Pre-classical Period

Phase 2

(1950-1980s)

Classical Period

Phase 3

(1990s)

Post-classical Period

Clement (1998)

Phase I

(1895-1950)

Pre-classical Period

Phase 2

(1950-1970s)

Classical Period (1)

Phase 3

(1970-1980s)

Classical Period (2)

Phase 4

(1990s)

Post-classical Period

Hunn (2007)

Phase 5

(Late 1990- 2000s)

An umbrella discipline bringing together many disciplines, bridging and solving human- environment and cultural issues (Wyndham, Lepofsky, and Tiffany (2011).

Figure 2.1 Evolution of ethnobiology, until Biocultural Diversity

2.3 Many faces of Ethnobiology in South-East Asia

Southeast Asia is a haven for complex regional, ethnic, culture, language, and biological diversity. It consists of 11 political countries divided into main land and island zones. Myanmar, Thailand, Laos, Cambodia and Vietnam are main land zone, which are extension of Asia continent. Island or maritime zones includes Malaysia, Indonesia, Philippines, Singapore, Brunei and the new nation of East Timor that was formerly a part of Indonesia. Southeast Asian countries are situated in tropical areas with hot and humid tropical climate. As a result, the region is blessed with abundant biodiversity. Of the 35 global hotspots, four major hotspots viz., Sundaland, Wallacea, Philippines, and Myanmar (included under Indo-Burma) which are reservoirs of biological diversity yet threatened by human activities occur in SE Asia (Sloan et al. 2014). Ironically, SE Asia is also a region of conservation concern due to loss of biodiversity and heavy deforestation compared to other tropical region, driven by various anthropogenic factors (Navjot et al. 2004). In Laos, Malaysia, Cambodia, and Indonesia, million hectares of forest and land area have been replaced by oil palm plantation and rubber farms. Philippines government has approved more than 300 mineral productions and allowed foreigners to own mining operations since 1990. Besides loss of biodiversity, such situations also lead to conflict between governments and indigenous people. Conditions in each country will affect the lifestyle and quality of indigenous people, and also the kind of ethnobiology research undertaken in the respective countries. Development of research involving indigenous people is known to be affected both by government policy and availability of funds (Clarke 2001).

As a part of the methodological review, about 312 quality papers dealing with ethnobiology of SE Asia were sourced from Scopus and Web of Science for the last 55 years (1960-2014). The present review finds that ethnobiology study in SE Asia has gradually advanced from a mere one in 1972 to 151 papers in 2014. The first paper was published by Bisset (1972) on *Lignum colubrinum* (snake- wood). Indonesia contributed the highest number of papers (93), followed by Thailand with 68 papers, Malaysia with 58 papers, Philippines with 42 papers, Vietnam with 31, Laos with 29 papers, and 44 papers from other SE Asian countries (Table 2.1)

Table 2.1 Country wise data for languages, ethnic groups, and number of paper published

Country	Total Languages	Total Endangered languages	Ethnic groups	Total papers
Brunei Darussalam	16	0	8	8
Cambodia	25	19	24	13
East Timor	19	6	16	6
Indonesia	718	148	365	93
Laos	92	32	49	29
Malaysia	101	26	94	58
Myanmar	120	28	135	13
Philippines	196	15	110	42
Singapore	32	0	0	4
Thailand	84	26	34	68
Vietnam	110	27	53	31

Source: AIPP, IWGIA, FORUM-ASIA (2010): Lewis, Simons, and Fennig (2015): Moseley (2010).

A significant (0.73) correlation was found to exist between number of papers in each country and number of indigenous groups, pointing to the opportunity existing to collaborate with indigenous groups for the purpose of ethnobiological research. However, Indonesia and Myanmar that are home to 365 and 135 ethnic groups respectively are encouraged to produce more research on ethnobiology. Interestingly, Thailand with 34 ethnic groups could successfully produce double the number of studies. A highly significant correlation also exists between numbers of papers with total language in each country (0.76). Similarly, correlation between number of papers from each country and total endangered languages is also noteworthy (0.77). All these indicate that countries privileged to be called as home to higher number of languages had also returned higher number of studies. Besides, this also indicates the potential for future projects possible on the biocultural diversity conservation front.

2.4 Ethnobiology in SE Asia during the last decade

By analysing the progress happened in the last decade, the contemporary status of SE Asian ethnobiology could be understood so as to provide an idea of the gaps and potential the field. Country wise, during 2010-2014, Indonesia led the ethnobiological studies in SE Asia with 57 papers, followed by Thailand (50), Malaysia (50), Philippines (32), Laos (25), and Vietnam (25), while 37 papers were produced together by Cambodia, East Timor, Myanmar, Brunei Darussalam, and Singapore. Phase wise, total number of papers in phase 1 is 55, phase 2 is 12, phase 3 is 47, phase 4 is 114, and phase 5 is 48 (Figure 2.2). All SE Asian countries have produced at least one study corresponding to phase 5. It indicates that the SE Asian countries have already embraced the concept of phase 5 that mostly deals with biocultural diversity.

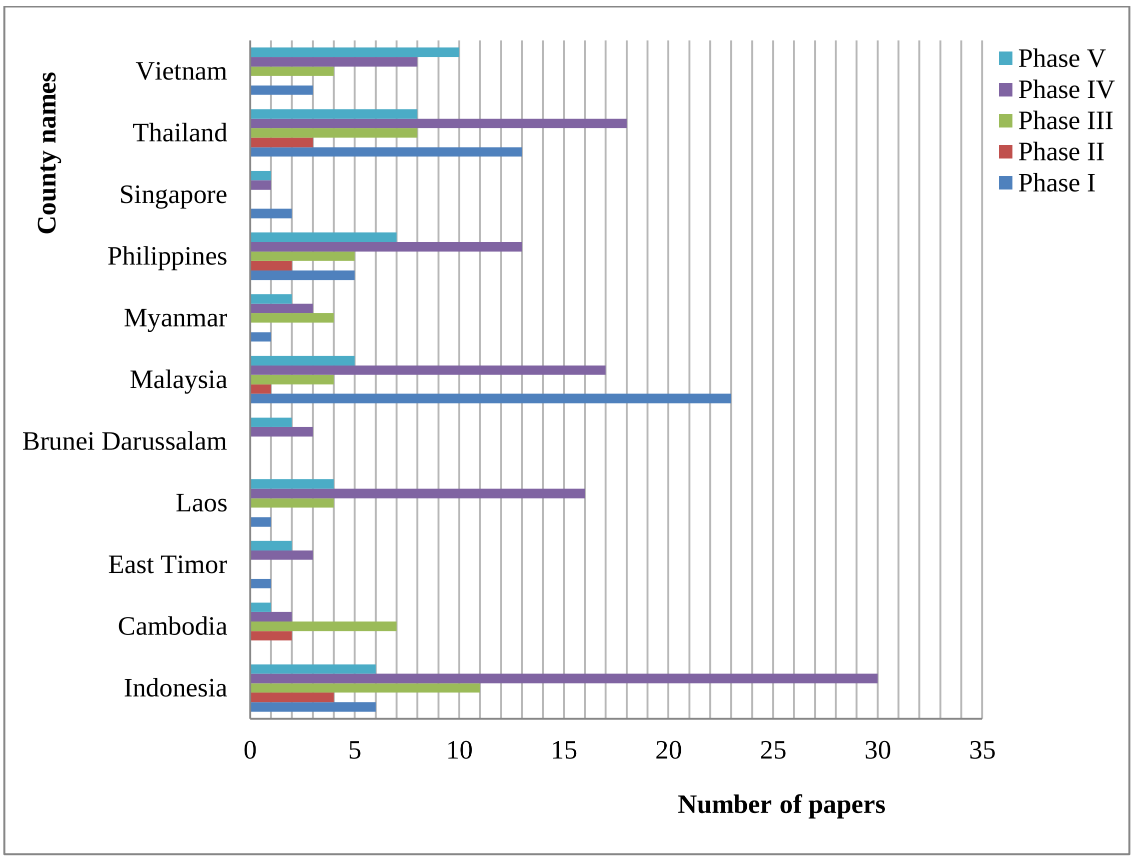


Figure 2.2 Phase wise analysis of SE Asian ethnobiology for the last decade

Interestingly, Malaysia (23 papers) and Thailand (13) produced higher number of studies in phase 1 indicating the continuing enthusiasm shown by researchers in cataloguing or documentation of useful plants and animal. However, for ethnobiology to progress in SE Asia, the two countries have to expand the number of quality studies that could be phase 5 type. During the last decade, studies in cognitive ethnobiology appeared to have received less attention on the cognitive ethnobiology sector, with Indonesia (4), Cambodia (2), Malaysia (1), Philippines (2), and Thailand (3) attempting to try the concept. However, higher number of studies in the phase three indicates the great focus on ecological issues facing the countries. Interestingly, countries with relatively less ecological concerns such as Brunei, East Timor, and Singapore did not produce any research in this phase. On the opposite side, countries such as Indonesia, Cambodia, Laos, and Malaysia produced studies dealing with the deforestation issues. AIPP, IWGIA, FORUM ASIA (2010) reports that SE Asian countries are facing the loss of million hectares of forest, land use change into oil palm and rubber plantation, and large scale of mining operations in indigenous areas.

An extraordinarily high number of ethnobiological studies in SE Asia happen in the phase 4 (114 papers) sector. Indonesia, Laos, Malaysia, Philippines, and Thailand become the higher producers of the ethnobiological studies in phase 4. This indicates that the countries have warmly accepted the concepts of ethical guidelines, obtaining prior consent, and acknowledgement of indigenous community as the knowledge holders for benefit sharing arrangements. The phase 4 papers published show a higher number of papers resulting from international collaboration, indicating the cooperation between researchers around the world. By conducting research with international collaboration, exchange of ideas and capacity building can be achieved. However, in some cases the content of papers with international collaboration still deals with the documentation of useful plants and animal. It is suggested that the researchers should use the international collaboration opportunities to gain additional skills and step forward to the next phases.

Wyndham, Lepofsky, and Tiffany (2011) suggest that ethnobiology should make itself relevant to the biocultural crisis. Vietnam with 10 papers, Thailand (8 papers), Philippines (7 papers), Indonesia (6 papers) and Malaysia (5 papers) have produced higher number of papers published in phase 5. These five countries also happen to have a large number of threatened languages, pointing to the relevance of studies carried out by ethnobiologists.

2.5 Ethnobiology in Malaysia: Moving forward to address the contemporary issues

Ethnobiology and its related disciplines are indispensable for understanding, improving, and conserving the relationship between humans and environment for promoting sustainable living. By understanding the status of ethnobiological studies from a country, the evolution, trend, gap, problems, and future prospect of the study could be analysed. Ethnobiology gains special relevance in a country such as Malaysia which has the fourth highest number of ethnic groups (94) in SE Asia.

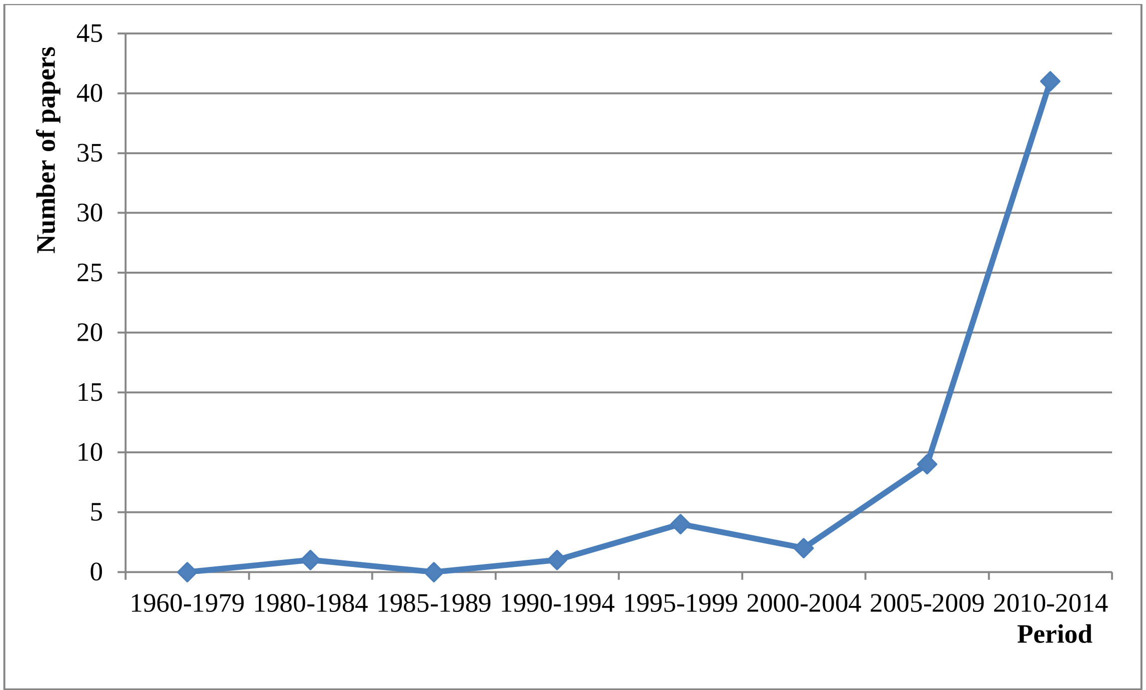


Figure 2.3 Ethnobiology studies from Malaysia during 1960-2014

Ethnobiological studies in Malaysia began in 1984 when the first paper was published by Houghton (1984) about "Ethnopharmacology of some *Buddleja* species" widely used in India, Nepal, China, Africa as well as Malaysia. The researcher started from the traditional knowledge of *Buddleja* species that can be considered as phase 1 in ethnobiology development. From one research paper in 1984, ethnobiological study in Malaysia has gradually increased to reach a relatively better 41 papers during the period 2010-2014. Ethnobiology in Malaysia reached its peak during the period 2005-2014, indicated by the number of papers published (Figure 2.3). A total of 52 papers have been published in various technical journals, four in seminars and conferences, and 2 papers are as book chapters. The four conferences were presented in the 20th Congress of the International-Commission-on-Irrigation-and-Drainage held in 2008 in Pakistan, 7th Flora Malesiana Symposium held in 2009 in Leiden-Netherlands, ASEAN conference on Environment-Behavior Studies (AcE-Bs) held in 2010 in Kuching- Malaysia, and Knowledge Management International Conference (KMICE) held in 2012 in Johor Baru- Malaysia.

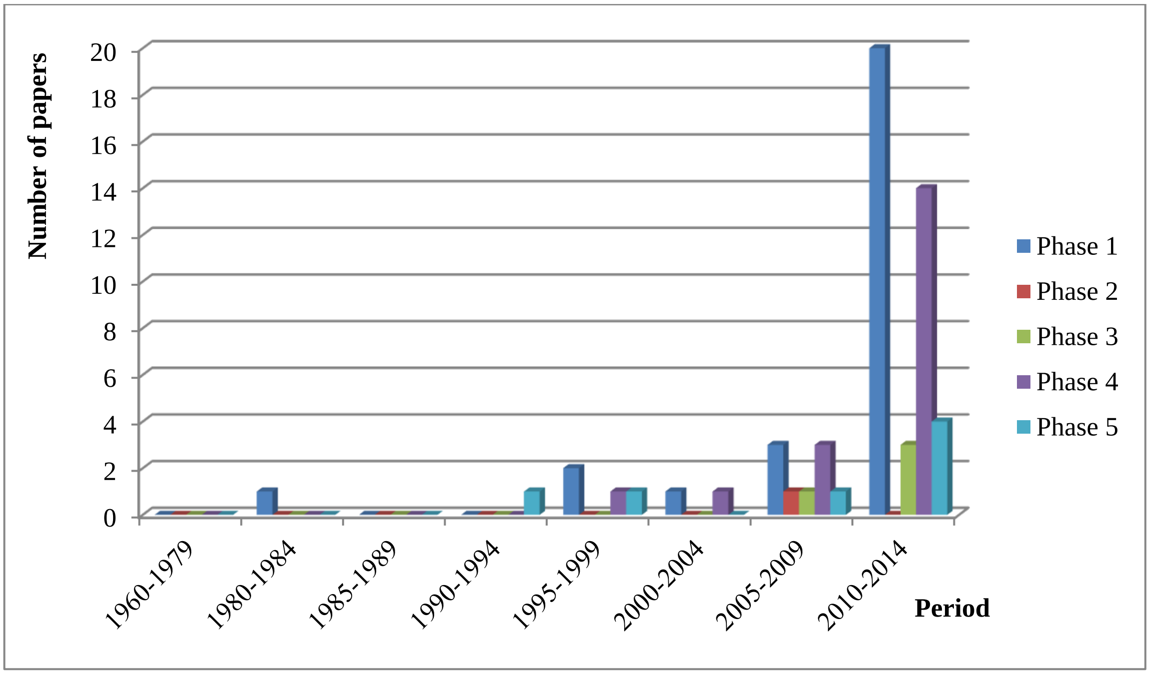


Figure 2.4 Phase wise analysis of Malaysian ethnobiology during 1960-2014

In the last 10 years, Malaysia produced a good number of papers in various phases (Figure 2.4). Documenting and cataloguing of useful plants and animals were still undertaken by ethnobiologists in Malaysia, whereas, ethnoscience and folk taxonomy corresponding to the second phase has been of less concern. Only one study published by Julius Kulip in 2005 can be considered as of phase two. In general, we see an overall less emphasis on studies of emic nature. From 1960 to 2014, only six percent of ethnobiological studies in SE Asia were dealing with phase two.

Six papers that could be classified as of third phase have been published in the last decade. Achieving more knowledge in ethnoecology could help local people to minimise the problems related to land tenure such as palm oil farming and mining. Laws were enacted by the British during their colonial rule recognizing the customary land rights and customary law of the indigenous peoples. However, large-scale resource extraction and plantations seem to be of high priority for the government. Human Rights Commission of Malaysia (SUHAKAM) have received more than thousand cases about land issues (AIPP, IWGIA, FORUM-ASIA 2010). Most of the ethnobiology studies of phase three nature from Malaysia were about successfully documenting their natural resources and traditional knowledge in plant or animal as well with reference to ecology. For instance, studies discuss about irrigation evolution (Nobumasa, Shiro, and Yutaka 2010), traditional weather forecasting, disease, and spatial perception (Rajamani and Marsh 2010; Dickin, Schuster-Wallace, and Elliot 2014; Gotzone and Puri 2011), and ecological knowledge of Orang Asli (Roozbeh et al. 2014). Only one study has discussed the role of indigenous and community-conserved areas of Sabah, Malaysia (Vaz and Agama 2013) that also dealt with land management issues. This indicates a grey area in land issues which has not been received adequate attention from ethnobiologists yet. This study sees great opportunities for ethnobiologists to expand their study in ethnoecology and land issues to benefit the indigenous people of Malaysia.

Fifteen papers that can be classified as of fourth phase have been published in the last decade; they involve international collaboration and address intellectual rights issues. Although contextually only four papers have obtained prior informed consent and give consideration to the intellectual property rights of their respective community, 11 papers resulting from international collaborations could also be classified as phase four. In this phase, international collaboration seemed to have increased the quality of papers. However ethnobiology in Malaysia is encouraged to move ahead from bioprospecting and documentation of traditional knowledge. Ethnobiologists have to be stimulated to recognise community rights, starting the study by acknowledging the indigenous rights. It could be done by adapting some procedures aimed to conform to the code of the International Society of Ethnobiology (ISE 2006).

Five papers have been published in the last decade that could be classified as of fifth phase i.e., bio-cultural diversity and socio-ecological knowledge. After 2000s, ethnobiology studies in Malaysia show shift towards the biocultural diversity era, indicatied by Loh and Harmon's (2005) study which had applied the global index of biocultural diversity in three main areas such as Amazon Basin, Central Africa, and Indo-malaysia/ Melanesia. The researchers assured that the index could provide strategic guidelines in biocultural diversity conservation, while for the public, the index might help as a reminder of the bioculturally important areas. For researchers, the index might help to understand global context of biological diversity and cultural diversity. Yet, this index only worked in global level to understand the pattern and could not clearly define the community intra dynamics. A South East Asia chapter of the book titled Traditional forest-related knowledge: sustaining communities, ecosystems and biocultural diversity, is an encyclopaedic treatment of the topic with case studies from Africa, Latin America (Argentina, Bolivia, and Chile), North America, Europe, Russia, Ukraine, the Caucasus, Central Asia, Northeast Asia, South Asia, Southeast Asia, and the Western Pacific. It also becomes the evidence that Malaysia as a part of Sout East Asia has tremendous potential for conducting more researches on the biocultural diversity front.

Salis-Lagoudakis and co-workers (2011) used multidisciplinary study on taxonomic, phylogenetic, biogeographic, and ethnobiological informations and drew the parallel of available resources and ethnobiological uses practice. Their study suggested that cultural importance index of biological species show the dynamics of cross-cultural phenomenon occurring in communities. Adnan and Othman (2012) also found cross cultural pattern of plants uses and culture in Malay with emphasis on the aesthetic perception. Yet, the findings dealt more on the description of plants uses, and the level of biological species in the culture has not been investigated. Answering the gap, a study of the biocultural importance of *Tanying* [Koompassia excels (Becc.) Taub] in Sarawak Malaysia by Franco et al. (2014) elucidates the cultural importance of the tree by using intensity of uses, frequently and multiple uses, name and terminology in language, role in narratives, persistence and memory of use towards culture, level of unique position in culture, and opportunities for resources acquisition as the key factors following Garibaldi and Turner (2004). However, from these five studies, it can be understood that Biocultural Diversity has been accepted largely at the theoretical level alone and there has been no study dealing with the relationship between language, culture and biodiversity at the ecosystem level.

This study has investigated the gaps in ethnobiological studies arising from Malaysia, especially those of the second phase nature and breaks ground by bridging the second phase with the fifth by providing theoretical advancements in biocultural diversity. While undertaking the analyses it was noted that no study has dealt with the relationship between language, culture and biodiversity, and no known methodology to assess language and TK vitality simultaneously exists. Moreover, there is no study that argues the usability of a community's ethnotaxonomic and nomenclatural system as indicators of TK and language vitality. A careful search for literature on the Ba'ie ethnobiological knowledge or ethnotaxonomy also yielded no results. The present study aims to fill in these gaps, and provide new directions for future research in Biocultural Diversity. Although cognitive ethnobiology of phase 2 (Berlin et al. 1966; 1968; 1973) is the backbone of the study, the study moves towards the biocultural diversity phase (phase 5) by applying the phase 2 concept to assess the traditional knowledge and language vitality of Ba'ie people of Sarawak, Malaysia.

Summary

In this chapter, the rise of Ethnobiology as a discipline from mere documentation phase to Biocultural Diversity has been discussed, using number of papers published and the areas dealt with as proxy for the quantity and quality of studies undertaken. Ethnobiological studies in SE Asia have gradually increased from 1 in 1972 into 151 papers in 2014. The first study recorded from Indonesia attests that Ethnobiology in SE Asia began in 1972. Indonesia produced the highest number of papers (93), followed by Thailand with 68 papers, Malaysia with 58 papers, Philippines with 42 papers, Vietnam with 31, Laos with 29 papers, and 44 papers from other SE Asian countries. Based on the papers published in the last ten years, we see a positive trend in SE Asian ethnobiology that follows a trajectory towards the Biocultural Diversity. However ethnobiological studies from Malaysia shows gaps in the second and fifth phases, indicating less attention given to studies in cognitive ethnobiology and biocultural diversity. While undertaking the analyses, it was noted that: 1) Although SE Asia has warmed up to the concept of Biocultural Diversity the acceptance is mostly at the conceptual level, and no study has dealt with the relationship between language, culture and biodiversity at the community and ecosystem levels 2) There is no known methodology to assess language and TK vitality simultaneously 3) There is no study that argues the usability of a community's ethnotaxonomic and nomenclatural system as indicators of TK and language vitality 4) No study has documented the ethnobiological knowledge & the ethnotaxonomy of Ba'ie community. Therefore, the present study would fill in these gaps, while providing new directions for future research in Biocultural Diversity.

Chapter 3 Research Methodology

Introduction

This chapter discusses the methodology used in this study to meet the objectives. The study employs a mixed methodology approach with both qualitative and quantitative data used; such methodology can answer the weaknesses of using a single method alone (Hesse-Biber 2010; Sandelowski 2000). The mixed method approach also becomes more relevant when multiple disciplines such linguistics, traditional knowledge, and conservation are involved. The following sections discuss the methodology used in the entire research. The baseline documentation of the ethnobiological knowledge and elucidation of ethnotaxanomic system of Ba'ie fishes are qualitative, while the traditional knowledge and language vitality assessment uses both quantitative and qualitative approaches that have been developed specifically for this study (Franco et al. 2015). The study also uses UNESCO's framework for assessing Language Vitality and Endangerment (LVE) in the Ba'ie context. Considering the novelty of the study, the methodology has been pilot tested in collaboration with the Kanekes people of Kanekes, Banten-Indonesia.

3.1 Documenting the ethnobiological knowledge of the Ba'ie people on fishes

Fieldwork for data collection was conducted during December 2014 - February 2015 in collaboration with the Ba'ie community members from villages such as Kampung Kuala Tatau, Kampung Segan, Kampung Sebuan, Kampung Jepak, Kampung Batu 10, Kampung Sebiew, Kampung Baru, Kampung Dato, Kampung Sinong, and Kampung Mesjid, and urban areas such as Kidurong and Kampung Asyakirin. Based on the data available in the official website of "Pejabat Residen Bahagian Bintulu" (2015), the Bintulu area includes Bintulu, Tatau, and Sebauh with not less than 39 *kampongs* (villages). Although the study could not cover all these villages, both rural and urban areas were adequately represented in the sample.

This study began with the baseline documentation of ethnobiological knowledge of the Ba'ie on fishes. Unlike knowledge domains such as medicinal or ceremonial knowledge, ‘food’ could be considered as a domain commonly known to all community members. In addition, being a traditional fishing community, fish and fishing are assumed to be of paramount cultural importance to the Ba’ie people. Food and the ingredients is a cultural domain that can be used to define human identities (Civitello 2008). For instance, people who do not eat meat and usually consume vegetables are addressed as vegetarians. For the Ba’ie, knowledge of fish as food is integral part of their life and hence, knowledge, culture and vocabularies related to fishes might be shared throughout the community. This also implies that folklores, beliefs, and taboo also should ideally be in the common domain of Ba’ie culture and knowledge.

Qualitative methodology employing tools such as open ended conversations and participant observation were used for the documentation of the traditional knowledge; this is to ensure that as much as knowledge is documented (Berlin and Berlin 2005; Lawrence et al. 2005; Given 2008). Given that the intention was to collect as much as information possible, focused interviews with a single sample group associated with high language and TK proficiency was conducted.

A total of fourteen participants (8 male and 6 female) were selected by purposive sampling and interviewed to elicit ethnobiological knowledge of Ba’ie people on fishes. Collected ethnobiological data includes the vernacular names, traditional ecological knowledge, medicinal knowledge, recipes, and folklores. Folk history and urbanisation record of Bintulu was also documented to clarify and supplement the secondary data wherever insufficient. The study also collaborated with the Persatuan Nelayan Kawasan Bintulu and Bintulu District Fisheries Office to collect secondary data on economically important fishes of Bintulu. This research has been approved by the Curtin Ethics Committee (CSEA 041214) and the Sarawak State Planning Unit [(61) UPN/S/G1/10.1.Vol.33]. All respondents were requested for their consent prior to the interview, following the code of ethics of International Society of Ethnobiology (ISE 2006).

Fishes were scientifically identified using the Field Guide to Marine & Estuarine Fishes of Sarawak (Khiok and Gambang 2009) and Marine Fishes Identification Sheet (Khiok and Ali 2014). Photographs were also collected from various fish landing and market such as *Pasar Utama Bintulu* (*PUB*), *Pasar Kampung Baru*, and *Pasar Nelayan Asean Bintulu Fertilizer* (*ABF*) (Figure 3.1, Figure 3.2, Figure 3.3, Figure 3.4).

Figure 3.1 A familiar sight at the fish landing spot near *Pasar Utama Bintulu* (*PUB*)

Figure 3.2 *Pasar Utama Bintulu* (*PUB*); typical daily activity

Figure 3.3 *Pasar Kampung Baru* (*PUB*), additional view

Figure 3.4 Fish landing site of *Pasar Nelayan Asean Bintulu Fertilizer* (*ABF*)

3.2 Elucidating the Ba'ie ethnotaxonomic system of fishes

Based on the baseline information collected, ethnotaxonomic system of the Ba'ie community on fishes was drafted with the assistance from Encik Bolhassan Bin Ismail and Encik Mat Bin Suai, who facilitated the study as interpreters. The data generated was then compared with the template provided by Berlin et al. (1966). Berlin's principles of ethnobiological classification of plants and animal categories is the most important treatise of folk classification (Berlin et al. 1966, 1968, 1973). His team collaborated with the Tzeltal Maya people of Chiapas Highland to develop an outline of the named taxonomic structure of the plants known to the community (Berlin et al. 1973). According to the model, there are nine general principles of classification and nomenclature in folk biology (Figure 3.5):

1. All languages are capable to group species of varying taxa.
2. Taxa are further aggregated into classes.
3. The ethnobiological categories follow a hierarchial patterns that can be represented schematically as below:

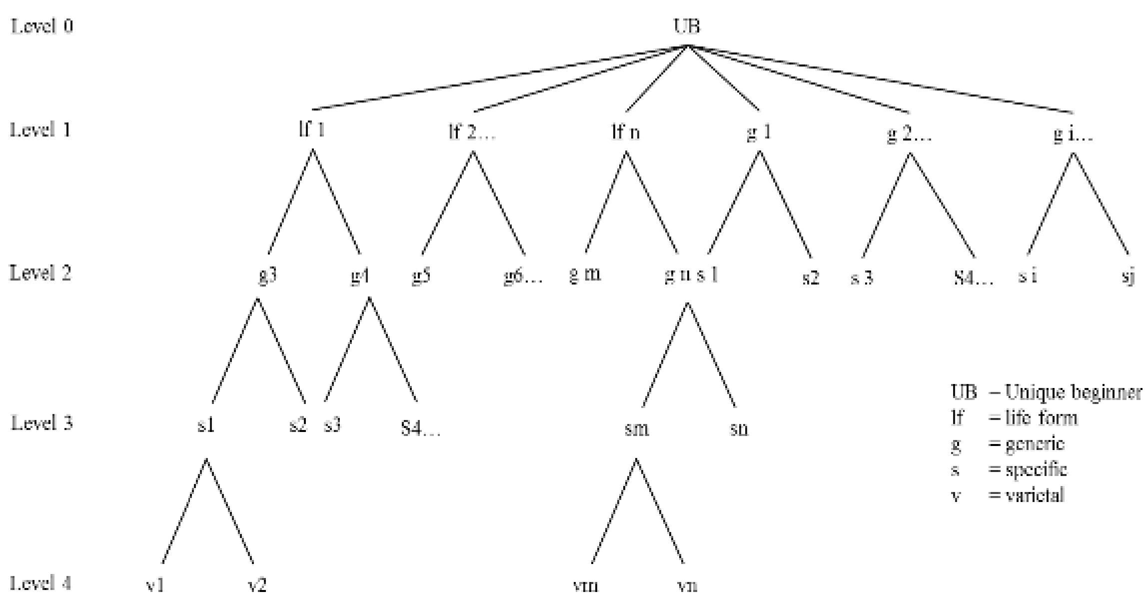


Figure 3.5 Universal ethnobiological taxonomic categories adapted from Berlin et al. (1973)

4. Taxa falling under the same category appear at the same level of the hierarchy.
5. In folk taxonomy, Unique Beginners are not usually named by a single habitual expression.
6. Taxa of the life form categories are generally fewer in number compared to the taxa included under them.
7. Taxa included as members under generic level are higher in number than the life form category.
8. Members of generic taxa are more enormous than life form.
9. Taxa that could be included both under generic category as well as life form are considered as intermediate taxa.

In the ethno-nomenclatural systems, species are named using lexemes that are characteristic of the respective language. Typically, there were two lexemes used i.e. primary and secondary lexeme. Primary lexemes could be either unanalysable or analysable semantically, whereas secondary lexemes were used to superordinate the entity to a higher category. In the Ejina Mongolian folk botanical nomenclatural system (Khasbagan and Soyolt 2008), primary lexemes are semantically unitarian- using single expressions such as *bodugaran, bogqinuur, boya, xirki*, etc. that have no other meanings than the denotatum itself, whereas, secondary lexemes that were formed by adding modifier can describe the plants. For example, in the case of the taxa *wulan suhai* (*Tamarix ramosissima* Ledeb.) and *imaan suhai* (*Tamarix leptostachys* Bunge), *wulan* and *iman* are used to distinguish those two species and attribute them to the primary lexeme *suhai*.

The studies of Franco and Narasimhan (2012), Kakudidi (2004) and Newmaster et al. (2006) were also used as reference for understanding the mechanisms behind naming of the fishes. The communities around Kibale name the plants on the basis of four major TK mechanisms viz. morphology, ecology, quality, and utility. The Kondh, Poraja, Gadaba, and Bonda from Koraput Region of Odisha, India also used the four mechanisms to name their folk plants. The mechanism of utility might be of cultural or spiritual significance, ecology tends to refer to habitat characteristics and dispersal mechanisms, some chemical properties reflected in names use the quality mechanism, and morphological characters.

However, there are also miscellaneous categories, as understood from Newmaster et al. (2006). For this research, the analysis of lexical semantics was also undertaken to expand and enrich the nomenclatural system of Ba'ie fishes, after the pilot work with Kanekes people. Besides, this is required to prove that folk names are derived using both TK and linguistic mechanisms. The works of Evans (1997), Turpin (2013) and Zariquiey (2014) were used as models and adapted according to the community settings and emerging results.

3.3 Assessing the vitality of language and traditional knowledge using ethnotaxonomic system (Franco et al. 2015)

The following sections explain about the sub-stages of vitality of language and traditional knowledge assessment using ethnotaxonomic system developed by Franco et al. (2015) (Figure 3.6).

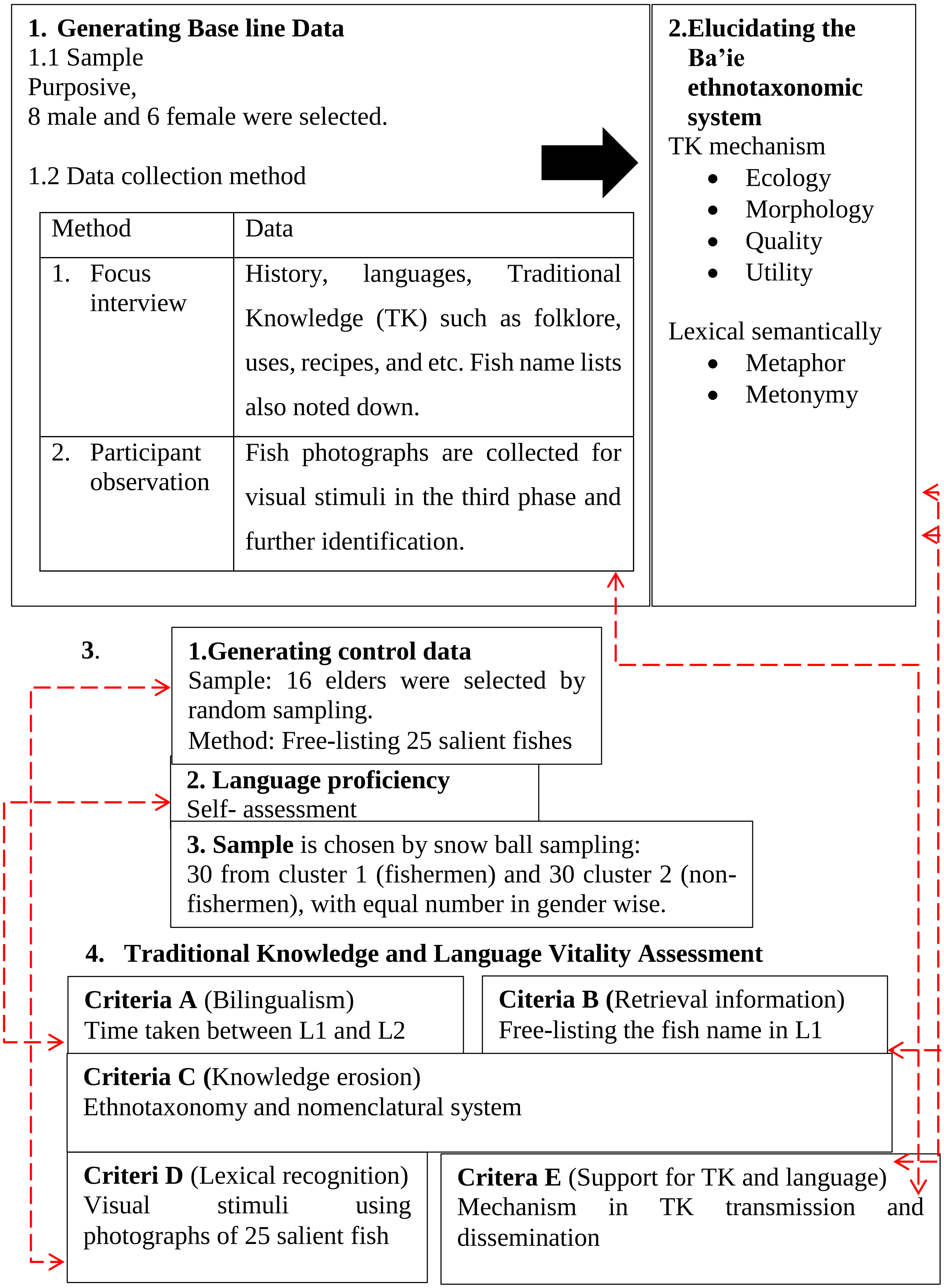


Figure 3.6 Flow chart of TK and language vitality assessment with Ba'ie people

After generating the baseline data, the ethnotaxonomy and nomenclatural system was sketched. With this as the background guiding material, TK and language vitality of Ba'ie people was assessed through the following steps:

1. ***Generating control data***

   Sixteen Ba'ie elders (> 60 years) were selected through random sampling and were requested to free-list 25 cultural salient fishes. The purpose of using random sampling was to collect information on TK of fishes that can be safely assumed as commonly known throughout the elder generation for data analysis. Random sampling involves randomly identifying and selecting individuals from a target group who are especially knowledgeable about a particular phenomenon (Cresswell and Plano 2011). Identification and selection was based on the research goals. Three major criteria have been used to determine the sample of this study as follows:

   (a) Elders above 60 years old are selected as they are a great source of knowledge in every local community. The elders are repositories of knowledge, playing an important role in many traditional knowledge domains such as healthcare, food, plant and animal protection, weather, and sustainable natural resources management (Dixit and Goyal 2011). Zent and Maffi (2009) also see elders of the population as a control and confer full marks for their traditional environmental knowledge for assessing Vitality Index of Traditional Environmental Knowledge (VITEK).

   (b) TK in a community could be stratified gender-wise. Hence, to evade any gender bias, equal number of both gender were considered.

   (c) Only Ba'ie people who were born to Ba'ie parents, as well as grandparents have been selected for this study. There have been many debates on people and linguistic groups of Sarawak (please refer to Chapter 3. contextual background) and this study goes with the emic perspective of the community about themselves. Tracing the original Ba'ie people was complicated and required an elaborate genealogical study. This study overcame possibility of linguistic bias by considering Ba'ie people who are known to be of third-generation, at least. This study makes an informed assumption that the third generation acquired and transmitted their traditional knowledge through their mother tongue Ba'ie (Figure 3.7).

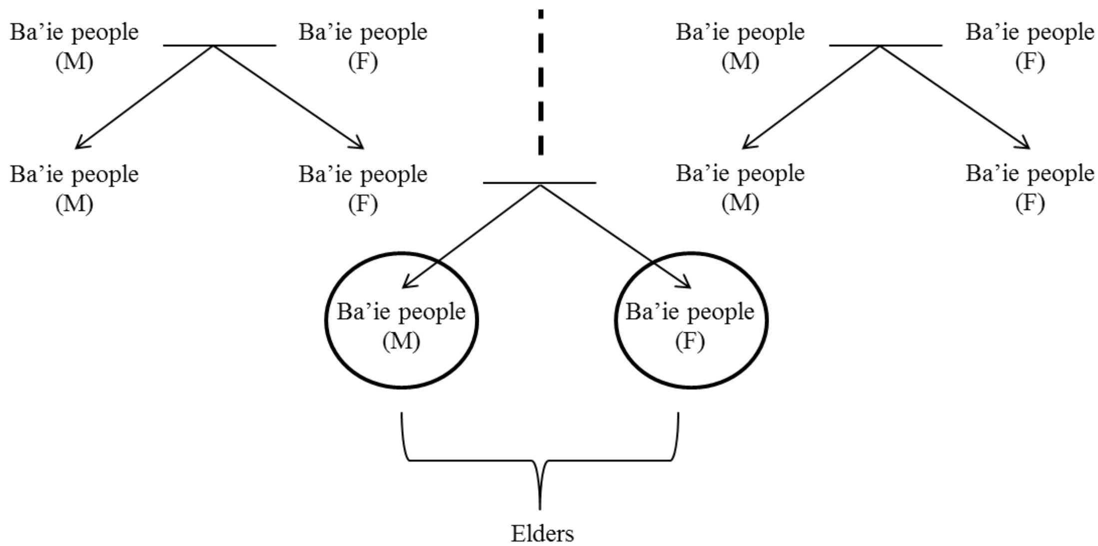


Figure 3.7 Sample selections of Ba'ie people

From the generated 'control' list, 25 most commonly known ones were selected on the basis of their salience. Free listing is a simple, quick, and accurate procedure to collect data from large sample of individuals. It helps in detecting salience and knowledge in any given domains (Quinlan 2005). Free- listing is based on three main assumptions: (1) the produced list tends to be familiarity based, (2) respondents who know more will produce longer list, and (3) terms that are mentioned with higher frequency are the locally salient items (Bolton, Curtis, Thomas 1980). Besides, free-listing could also generate emic perception of the food resources domain among the Ba'ie people. Based on these assumptions, 25 common fish names were listed by the sixteen elders. The images of these 25 species were accumulated for further use.

2. ***Selecting 60 participants for traditional knowledge and language vitality assessment.***

Ba'ie people are a riverine community inhibiting the Kemena, Segan and Tatau river basins; they traditionally practice fishing as the major occupation and agriculture as a subsidiary. Thus, marine and riverine ecology are commonly featured in their common thought and cultural domains.

This study assumed that urbanisation is a major driver impacting the vitality of Ba'ie language and TK, and occupational shift from fishing to non-traditional jobs such as blue collar/industry ones was considered as the primary indicator of urbanisation. It is assumed that such shifts influence the TK and language acquisition and transmission which could be reflected in the ethnotaxonomic systems of the respective occupational groups.

Thirty participants from the community (>20 years) practicing their traditional occupation of fishing (cluster 1) and 30 participants who do not involve in fishing (cluster 2) were interviewed. To minimise gender bias, 15 men and 15 women in each cluster were selected.

Cluster 1: 15 fishermen and 15 fishermen's wives were selected. In Ba'ie culture, women do not practice fishing, however they play an important role in fishery management. They help their husbands to group the fishes based on the species as well as size, to stock them, and to process them into quality food. Only those fishermen's wives who are really involved in fishing and its associated activities were selected for this study.

Cluster 2: In the Ba'ie culture, some fishermen only fished during their free time while pursuing other major occupations for the rest time. Although they are are hobbyist fishermen, they are considered as cluster B due to the recreational nature of the job. To represent this group, five hobbyist fisherman and five wives of hobbyist fisherman were also included, along with 20 other Ba'ie members who do not involve in fishing (10 men and 10 women).

The sampling technique at this stage was snowball method. Headmen from each village were contacted to point to the initial participants from whom the next participant recommendation was received. From the next participant, the further participants were found and thus, the number of sample increased resembling a rolling snow ball that grows in size (Figure 3.8).

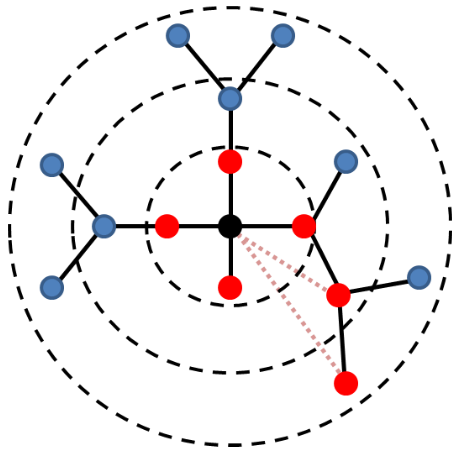


Figure 3.8 The snow ball method in sampling technique

3. Assessing language proficiency

A basic structured questionnaire intended to assess the language proficiency of the participant from a self-assessment stand point was designed using a five point Likert scale. The five following questions were used in this questionnaire:

(1) What is your first language (L1)?

(2) How many languages do you know?

(3) What is your second language?

(4) My proficiency in Ba'ie language is----------

(5) My proficiency in ----------------- (L2) language is

For question numbers 4 and 5, the Likert scale was rated as: very poor (1), poor (2), moderate (3), good (4), and very good (5).

4. Applying Traditional Knowledge and Language Vitality Index (Tralavi)

4.1 The informants were requested to free-list 25 fishes in their allochthonous Language (L2), and the time taken to complete the list was recorded. They were then requested to free-list 25 fishes in their autochthonous language (L1) and the time taken to complete the list was noted down. The time taken in L1 and L2 were juxtaposed against and scored as:

a. L2>L1= 25; this indicates L1 proficiency is stronger than L2, and also the priority accorded to L1 in the respective participant.

b. L2>L1 (incomplete list in L2) = 25; incomplete list in L2 indicates lesser acquisition of L2.

c. L2=L1= 25; a successful bilingual would have equal proficiency in L2 and L1 (Pacific Policy Research Centre 2010). Thus, an equilibrium between L1 and L2 could be considered as indicator of successful maintenance of bilingualism.

Intermediate marking (15) was given to:

L2< L1=15 (complete list in L1); complete list indicates ability of respondent to recall their traditional knowledge using their autochthonous language. However, lesser time taken in L2 compared to L1 also indicates the higher immersion level in L2. For this criterion to be given an intermediate rating of 15, the ratio of the time taken between L2 and L1 should not exceed 1:2. ie. the time taken in L1 should not be more than double the time taken in L2.

Weak marking (0) was given to:

a. L2<L1= 0; the time taken in L1 is more than double the time taken in L2. This condition indicates a definite shift from L1 to L2 and abandonment of L1 (Bastardas-Boada 2007).

b. L2<L1= 0 (incomplete list in L1); although this situation indicates the same scenario as in the previous criterion, the incomplete list of L1 indicates even serious abandonment happening in L1.

Due to many factors including history, education and trade, people in Sarawak tend to be proficient in two or more languages. Bilingualism and multilingualism involving shift towards politically powerful languages are linguistic consequences of globalisation, urbanisation, and many other complex perspectives in language contact (Bastardas- Boada 2002). However, bilingualism can also happen in indigenous set up where two indigenous language communities interact frequently, without negative effects on the L1. Bilingualisation can be considered sustainable only when the degree of valuation and functions of L1 is higher than L2 (indicated by lesser time taken in L1 free-listing). In the opposite side, lower level of L1 indicates threat in losing L1 (Bastardas-Boada 2007).

4.2 For the criterion B, successfully free-listed 25 fishes names in L1 were scored at 25 (1/ fish name). The ability to produce correct terms in given languages can be successfully used to gauge bilingualism phenomena (Kaushanskaya and Marian 2009). Depending on the language/TK competency, the list may or may not be completed.

-If the respondent is able to list only five species in L1, then the rating provided is five.

-If the respondent wrongly listed a lexeme borrowed from another language, then the rating given to that name is ‘0’. However, if the plant/animal does not have any known name in L1, then the rating is positive ie., ‘1’

4.3 For the criterion C, the participant is requested to explain the meaning of the L1 names free-listed in the above step (1/successful explanation). However, certain lexemes might not carry any meaning and the participant is provided full rating for such lexemes. Ethnotaxonomy being an interjunction between language and traditional knowledge (Evans 1997, Turpin 2013, Kakudidi 2004, Franco and Narasimhan 2012), participant’s ability to interpret the fish names indicates strength of traditional knowledge as well as language. However, the results are interpreted only in comparison with the control data and new interpretations are not rated positively.

4.4 The images of the 25 fishes initially shortlisted in step 3.1 were then shown to the informants who are requested to identify them in L1. For the criterion D, they will receive a score of 1/ successful identification of fish in L1 only. Visual stimuli have been widely used in many researches in social science and ethnobiological sciences as supporting strategy to help people in remembering particular types of information that may be of interest to researchers (Medeiros et al. 2008). Pictures of fishes have been used at this point, as using dried materials of fishes is impossible unlike ethnobotanical studies (García 2006). Several pictures for each species have been used to trigger the visual stimuli of respondents, the pictures presented both left and right side of the fishes, and were complemented by placing a pen or ruler to help people relate to the size of the fish.

There were possibilities of identifying the given species correctly in language other than L1. In some cases, especially in urban areas, knowledge could be originating from traditional as well as non-traditional mechanisms. For example *njen ruay* [*Parastromateus niger* (Bloch, 1795)] is culturally important among Ba'ie people and also for other communities such as Melanau Mukkah, Orang Kuching, and Malay people, in the names *ikan duai* (Sarawak Malay) and *ikan bawal* (Malay). In cases where the Ba'ie respondents identified the fishes in non L1 names as *ikan duai* or *ikan bawal*, they were given half ratings as the ability to recognise the given species correctly is a positive approach in sustainable utilisation of resources (UNEP 2003).

4.5 To understand their knowledge transmission mechanism for the criteria E, participants were requested to identify the fishes from the criterion D on which they have received or transmitted traditional knowledge (1/plant for which knowledge was received/transmitted through traditional mechanisms such as uses, belief, and folklore). This criterion provides an understanding of the level of traditional knowledge transmission occuring between community members. The knowledge transmission plays an important role in survival of traditional knowledge and language in community. Loss of traditional knowledge could be avoided in younger generation when the traditional knowledge is correctly acquired from childhood, practised lifelong, and disseminated between generations, (Takako 2004; Eyssartier, Ladio, Lozada 2008).

Both formal and traditional mechanisms of transmission could occur in any given community (Takako 2003). However, this study only considers traditional transmission of knowledge through cultural mechanisms such as belief, folklore and uses (culturally, culinary, medicinal). Formal transmission such as formal school and training were excluded in the criterion and scored as 0.

Maximum score for each criterion was 25, so maximum total score of TraLaVi will be 5 x 25 = 125. The resulting score is divided by 125 to segment the scale from 0 until 1. The status of TK and language vitality will thus assessed by comparing against the TraLaVi scale as dead (0), moribund (0.1-0.25), endangered (0.25-0.5), vulnerable (0.5-0.75), and safe (0.75-1). Microsoft excel 2010 was used for detecting the correlation between language proficiency (self-assessment) and time taken in L1 and L2 (criterion A) and SPSS 17.0 was used to analyse the statistical difference (Mann-Whitney test) between values obtained cluster and gender wise (Microsoft 2010; SPSS 2008).

During the period of study, the methodology was modified to vary from the one proposed during the candidacy according to the advancements made in knowledge and the feedback from the field. As a result, criteria A is an additional criteria not found in the candidacy proposal. Considering the novelty of the methodology, a pilot study was also conducted in April-June 2014 in collaboration with the Kanekes people from Banten, Indonesia. The feedback and experience from this study was used to refine the methodology.

3.4 Applying UNESCO Language Vitality and Endangerment (LVE) framework for assessing Ba'ie language

The assessment according to the LVE framework was based on the data collected during an open-ended interview that followed the TraLaVi interviews with the 60 participants of both Clusters 1 and 2. The nine criteria according to the UNESCO Ad Hoc Expert Group on Endangered Languages (2003) are:

1. Intergenerational Language Transmission
2. Absolute number of speaker
3. Proportion of speaker within the total population
4. Trends in existing language domain
5. Materials for language education and literacy
6. Language attitudes and policies
7. Governmental and institutional language attitudes and policies Including official status and use
8. Community member's attitudes toward their own language
9. Language attitudes and policies: interaction and social Effects

The given assessment (Appendix 7) has been perfectly followed and the results are represented in average value of assessment from 60 participants. The data obtained from the interview was complemented by the data from observations and field surveys.

3.5 Pilot testing with the Kanekes people, Kanekes- Indonesia

It is known that pilot testing is highly required in research where new methodology or new approach is employed for the first time. Pilot testing is a valuable step that helps to predict the reliability of the research, diminish ambiguity, and minimize risk to avoid wasting time, money, and effort (Blaxter, Hughes, Tight 2006). The pilot testing with Kanekes people clarified the reliability of using ethnotaxonomical system to assess the traditional knowledge and language vitality. The pilot testing was conducted in April-June 2014 with the Kanekes people inhabiting the Kanekes area of the Lebak District, Banten Province Indonesia.

The hypothesis was that the people of inner Kanekes area who follow their culture and tradition rigorously would show higher TK and Language Vitality than those from the outer Kanekes who live close to, and constantly interact with non-Kanekes groups. The methodology followed exactly that of Franco et al (2015). However, as the Kanekes community is an agriculture-forest dependent community, ethnotaxonomy of 358 food plants were taken into consideration instead of fishes, building upon the previous research works of the author (Hidayati 2013). A baseline data collection was conducted to develop the food plant ethnotaxonomy and the meaning of names were analysed for both TK and linguistic mechanisms. For the control data generation, 16 elders (male= 8, female=8) from inner Kanekes whose knowledge are considered culturally as ‘pure’ were interviewed with the help of Mr. Samin and Mr. Lamri. Specimens and photographs of the 25 salient food plants were collected and used as visual stimuli for TK and language vitality assessment. For the TraLaVi assessment, thirty people from inner Kanekes (15 male and 15 female) formed the cluster 1. These respondents are from Cibeo village (one of three inner Kanekes villages) who were selected through snow ball sampling. Cluster 2 comprised of another thirty people from the outer Kanekes (15 male and 15 female). The respondents were from Kaduketug village and were selected by snow ball sampling.

The language proficiency questionnaire prepared for the Baie set up was also administered prior to each interview.

The TraLaVi table was applied as such without modifications

Table 3.1 Criteria, indicators and rating in TraLaVi assessment

Criteria	Indicator	Rating
A	Bilingualism (Time taken)	25: L1<L2 and L1=L2 15: L1>L2 (complete list in L1); L1> L2 (in complete list in L2) 0: L1>L2 (incomplete list in L1)
B	Retrieval of Information (accuracy)	1 : correct lexeme in L1 0 : wrong lexeme
C	Knowledge erosion (accuracy)	1 : correct interpretation 0 : wrong interpretation
D	Visual recognition (recognition)	1 : correct recognition in L1 0: wrong recognition
E	Knowledge transmission	1: traditional mechanisms 0: formal education

Summary

In this chapter, the fieldwork methodology for data collection has been presented. Both qualitative and quantitative methods of data collection have been used in the study. The study was carried out in collaboration with the Ba’ie community members from villages such as Kampung Kuala Tatau, Kampung Segan, Kampung Sebuan, Kampung Jepak, Kampung Batu 10, Kampung Sebiew, Kampung Baru, Kampung Dato, Kampung Sinong, and Kampung Mesjid and urban areas such as Kidurong and Kampung Asyakirin. Fourteen people were interviewed for the baseline documentation of ethnobiological knowledge and diversity of fishes. Photographs of specimen for further identification and further stage of methodology were collected in markets and fish landing sites. Ba’ie ethnotaxonomic system of fishes was sketched and names interpreted with the help of Encik Bolhassan Bin Ismail and Encik Mat Bin Suai. The TK and language vitality assessment (Franco et al. 2015) protocol was tested with the Kanekes people of Banten Indonesia prior to the commencement of research in Bintulu. UNESCO’s LVE framework was also applied in the Ba’ie set up so that the results of TraLaVi assessment could be compared against an established framework.

Chapter 4 Pilot Testing of the Methodology with the Kanekes People

Introduction

This chapter discusses the pilot testing of the methodology undertaken with the Kanekes People of Banten, Indonesia. The study was conducted in May- June 2014 to build an understanding about the reliability and practicality of the novel methodology proposed by Franco et al (2015). The sections below give an idea of the Kanekes ethnotaxonomical system and their traditional knowledge and language vitality scenario.

4.1 Contextual background

Kanekes is the name of area inhabited by the Kanekes people, located in Leuwidamar, Lebak District of Banten Province, Indonesia. The area is situated in the mountain Kendeng, about 175 km from Jakarta which is the Indonesian Capital City. The Kanekes live around the Kenden montain, located in Kanekes village in Banten Province (6°27'27"–6°30'0" LS and 108°3'9"–106°4'55" BT). Topography is mainly hilly at about 300-600 meter above sea level and an average slope of 4%. The average temperature is 20° C with average rainfall of 4000 mm/year (*Dinas Sosial* 1999).

Kanekes land tenure includes 2000 hectare of domestic land and 3000 hectares of protected forest areas. Total population of the Kanekes in 2014 reached 11,000 with the sex ratio of women and men nearly 1: 1. Kanekes birth rate is quite high at 1.79% per year. In 1985, the total number of Kanekes hamlets was 30, and in 2014, there are 69 hamlets including three new ones (*Lembaga pamarentah Baduy* 2012).

4.1.1 Beliefs, culture, and Traditional Knowledge of Kanekes

The Kanekes believe that their ancestors originated in the altar of *sasaka domas* and hence they have a responsibility to conserve their forest and environment (Garna 1987). Kanekes people believe in the doctrine of *sunda wiwitan* that holds traditional swidden rice cultivation as an obligation (Garna 1973). Paddy becomes the precious thing as it denotes *Nyi Pohaci*, a life goddess. The Kanekes are a farming community, who consider farming as their *pikukuh* (obligation). As their belief teaches, they have to live in synergy with nature and utilise their natural resources wisely. Iskandar (1992) has documented the ecologically sound farming system practiced by the Kanekes people. Chen et al. (2010) also show how the Kanekes practice prudent natural tropical forest management along with their agriculture. Both agricultural and agroforestry system contribute to the enormous diversity of their ecosystem at the species level which in turn contributes to food, medicine, timber and any other needs. Although, Kanekes people are pre-dominantly farmers, other jobs such as crafting, weaving, and producing food (such as palm sugar) are also practiced by the Kanekes people.

The importance of *sunda wiwitan* doctrine could be seen in one of their obligation (*pikukuh*): "*lojor teu meunang dipotong, pondok teu meunang disambung*" that means *what is long may not be cut short, and what is short may not be lengthened*. This indicates that the people are required to live in harmony with the environment, utilising the natural resources wisely.

There is no formal education allowed since all community members are required to be farmers according to the *pikukuh* (obligation), as they believe that the tight schedule of formal education might disturb the community attention toward their environment. Yet, some of the Kanekes members could read and write due to the interaction with outsider through trading, tourisms, or government policies (training and aid).

The Kanekes ecosystem is culturally divided into inner Kanekes and an outer Kanekes. It has been widely acknowledged that the inner Kanekes always conform to their *pikukuh* (obligation) and *buyut* (prohibition) (Garna 1973). The inner Kanekes consists of three hamlets known as *tangtu* (old) viz. Cikeusik, Cikertawana, and Cibeo. The outer Kanekes consist of 66 hamlets and two additional hamlets- Baduy Kompol and Cicakal Girang located outside of Kanekes area. Inner Kanekes are required to wear white attire to denote 'cultural purity' while the outer Kanekes wear dark blue or black coloured attire; modern attire are also frequently worn by the outer Kanekes.

4.1.2 Language Setting

The Kanekes people speak the Kanekes dialect of the Sundanese language group. Generally, Indonesia shows enormous diversity in number, size, and vitality of languages.

However, some of the indigenous languages have been experiencing a shift towards Bahasa Indonesia and other foreign languages such as English due to social, political and economic pressures. Languages such as the Kanekes are considered as a dialect of Sundanese language (Rahmania 2009). However due to the differences in vocabulary with the standard Sundanese (*sunda lulugu*), some researchers also classify the Kanekes as a different language (Permana 2006). With approximately 11000 speakers, the Kanekes language might be considered as a small population (Krauss 1992) that could easily shift to the more dominant language.

4.2 Ethnotaxonomic system of Kanekes food plants

The study recorded 358 Kanekes plant taxa that were consumed as food. Of these, 214 correspond to the species rank, five as variety as per the formal systems of classification. These 358 taxa have been classified and named by using morphological (177), ecological (51), utility (61), and quality (39) TK mechanisms. Lexical semantic analysis shows 109 metaphors, 189 metonymies, and 10 portmanteaus occurring in the Kanekes ethnotaxonomic system (Appendix 1).

4.2.1 TK mechanisms used by Kanekes to name and classify their plants

Kakudidi (2004) shows how TK mechanisms such as morphology, ecology, chemical compounds, and utility help in ethno-nomenclature. The following section gives an about the TK mechanisms involved in Kanekes food plant nomenclature.

Morphology

Morphological traits such as size, colour, shapes, and dimensions or sizes are the most used mechanisms by the Kanekes people to name plants.

(1) Size

- *Awi gede* (*Gigantochloa verticillata* (Willd.) Munro)

  Awi (Bamboo), *gede* (big). The bamboo is bigger than others.

(2) Colour

According to Rahmanadia (2012), the Kanekes have seven basic colour terms, viz. *bodas* (white), *hideung* (black), *bereum* (red), *hejo* (green), *koneng* (yellow), *bulawok* (blue), *coklat* (brown), and *abu-abu* (grey). The Kanekes lack equivalent terms for pink (*kayas*) and purple (*bungur*) which others have. The Kanekes people have used all seven basic colour terms to name their food plants.

- *honje bereum* (*Etlingera solaris* (Blume) R.M.Sm.)
- *pare koneng* (*Oryza sativa* L.)
- *taleus hejo* (*Colocasia esculenta* (L.) Schott)

(3) Unique term- terms that refer to unique morphological features

- *huwi ramo* (*Dioscorea* sp.)

  huwi (tuber), *ramo* (finger). The tubers look like fingers.

- *huwi kumbili* (*Plectranthus rotundifolius* (Poir.) Spreng.)

  huwi (tuber), *kumbili* (smaller, round, uniform and aggregate). The tuber is smaller, round, and aggregate.

Ecology

Fifty one food plants were found to be named using three major ecological mechanisms, viz., (1) historical ecology- the source or plant origin, (2) habitat of the plant, and (3) 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.

(1) Historical ecology

- *cau ambon* (*Musa paradisiaca var. sapientum* (L.) Kunt.)

  cau (banana), *ambon* (capital city of Maluku Province)

- *jambu samarang* (*Syzygium samarangense* (Blume) Merr. & L.M.Perry)

  jambu (guava) , *samarang* (capital city of middle of Java Province)

- *Pare ambu ganti* (*Oryza sativa* L.)

  pare (paddy), *ambu* (mother), *ganti* (name of Ganti, the introducer). This pattern of naming has already been shown to exist in 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 (*Sorghum bicolor* L.) (Mekbib 2007).

(2) Habitat

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 2009).

- *Salam leuweung* (*Syzygium nervosum* A.Cunn. ex DC.)

  Salam is the genus name and *leuweung* (forest). *Sysygium* found in forests.

- *Walang biasa* (*Etlingera walang* (Blume) R.M.Sm.)

  Walang is the genus name and *biasa* (abundant). *Etlingera* that is abundant.

(3) Ecological characters

Some names are even more specific in nature, providing information on the ecological niche.

- *huwi dahong* (*Ipomoea batatas* (L.) Lamk)

  huwi (tuber), *dahong* = *rahong* (fissured land). The plant that could grow even in fissured land.

Utility

About 61 food plant names have been derived using Utility as mechanism. Some examples from the different categories might be seen below:

(1) Timing

- *Huwi mantang* (*Ipomoea batatas* (L.) Lam.)

  huwi (tuber) and *mantang* (prohibition)

(2) Recipes

- *Huwi kalapa* (*Dioscorea alata* L.)

  huwi (tuber) and *kalapa* (coconut)

- *Picung* (*Pangium edule* Reinw.)

  Picung comes from word *cung-cung* (submerged in water for a long time for detoxification purposes)

(3) Planting or harvesting procedure

- *kacang suuk* (*Arachis hypogea* L.)

  kacang (nuts) and *suuk* (collected from underground)

(4) Medicinal purpose

- *awi apus* (*Gigantochloa apus* (Schult. & Schult. f.) Kurz)

  awi (bamboo) and *apus* (erase)

- *keras tulang* (*Turpinia montana* (Blume) Kurz)

  keras (strong) and *tulang* (bone)

Generally, the Kanekes people consider time of utilisation as an important factor in food management, since rice is the most sacred resource for the community accessible only in certain customarily permitted days. Due to that, *huwi mantang* (means prohibited tuber) comes in as a substitute of rice during prohibition days. Kanekes people encode the recipes or procedure to consume the food plants in their nomenclatural system. *Huwi kalapa* is nice only when cooked with coconut, whereas the *picung* requires treatment before it could be consumed. The Kanekes people also label their food resources on the basis of planting and harvesting activities. Peanut is a commonly known resource, yet Kanekes people call the peanut as *kacang suuk* indicating that the nuts are collected from underground. It also implies that there is another nut collected above ground. Utilisation as medicinal purpose also encoded in Kanekes food plants name. For example, *awi apus* that means eraser bamboo indicates that this bamboo could be used to remove or relieve many diseases. Similarly, *keras tulang* which means strong bone is used as a bone tonic.

Quality

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

- *areuy amis mata* (*Ficus montana* Burm.f.)

  areuy (vine), *amis* (sweet), *mata* (eyes)

- *cau haseum* (*Musa paradisiaca* L.)

  cau (banana) and *haseum* (sour)

- *pare menyan* (*Oryza sativa* L.)

  pare (paddy) and *menyan* (incense)

The Kanekes people use tastes of sweet, sour and smell of their food plants in the name.

4.2.2 Lexical semantics of Kanekes Ethnotaxonomic system

The following section deals with the metaphors, and metonymies occurring in Kanekes ethnotaxonomical system. This study also presents portmanteau as a unique mechanism used in Kanekes food plant names.

Metaphors

The present study noted 109 taxa that are named on the basis of visual similarity with other entities (both living and non-living), human expressions, and cultural mechanisms. In most cases, the metaphors deal with the colour, shape, size, texture, and structure as well as qualities that the association is based on.

a. Shape, colour, and size

The example of using shape, colour, and size in Kanekes food plants through metaphor mechanism could be seen below:

- *Cau badak*

  cau (banana) and *badak* (rhinoceros)

- *Cau haseup*

  cau (banana) and *haseup* (smoke)

- *Cau rejang*

  cau (banana) and *rejang* (*Microhyla achatina* Tschudi, 1838)

In the examples above, metaphors have been used to compare the similarity of the plants with other entitites/phenomenons. For instance, the shape of *cau badak* fruit is similar with the rhinoceros horn. *Cau haseup* which has reddish colour is indicated through the mechanism of smoke that is produced only when fire exists. And, *cau rejang* which has small fruits resembles the smallest sized frog in the Kaneskes ecosystem [*Microhyla achatina* Tschudi, 1838]. Apart from that, Kanekes people also use human body parts as metaphors to name their food plants.

- *Huwi ramo* (*Dioscorea* sp)

  h*uwi* (tuber) and *ramo* (hand)

- *Huwi curug* (*Ipomoea batatas* (L.) Lam.)

  huwi (tuber) and *curug* (index finger)

In the examples above, hand and finger are used to point to the tuber shape.

b. Texture

Metaphors are also used by Kanekes people to identify the nature of surface in food plants.

- *Nangka bubur* (*Artocarpus* sp.)

  nangka (jack fruit) and *bubur* (porridge)

- *Dangdeur karet* (*Manihot carthaginensis* subsp. *glaziovii* (Müll.Arg.) Allem)

  dangdeur (cassava) and *karet* [rubber/ latex from *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.]

In the examples above, the softness of porridge is used to explain the softness of *nangka bubur* fruit surface. The fruits of this landrace are very soft and could not be segregated into individual fruits, just like the rice porridge where the individual rice grains are inseparable. Similarly, the leaves of *dangdeur karet* are bigger than the common cassava and also produce latex like *H. brasiliensis*. Moreover, this landrace does not produce any tuber furthering its similarity with rubber tree.

c. Structure

- *Supa nyeruan*

  supa (mushroom) and *nyeruan* [*Apis cerana* Fabricius (1793)]

The gills of *F. tenuiculus* basidium resembles the hive of *A. cerana* Fabricius (1793).

d. Pattern

Animal body and colouring pattern have been used in naming Kanekes food plants, such as:

- *Pare hawara benteur* (*Oryza sativa* L.)

  pare (paddy), *hawara* (quick), and *benteur* [*Barbodes binotatus* Valenciennes, (1842)].

e. Strength

Kanekes people use word "*ki*" meaning grandfather in their food plant names to indicate the cambium content. Strength of the grandfather's wisdom is used to highlight the strength of the plant.

- *Areuy ki koneng* (*Arcangelisia flava* (L.) Merr.)

  areuy (vine), *ki* (grandfather), and *koneng* (yellow)

- *Huwi ki hiyang* (*Ipomoea batatas* (L.) Lam.)

  huwi (tuber), *ki* (grandfather), and *hiyang* (desire)

f. Palatability, taste, and smell

Palatability, taste and smell are important lexical features in the food plant names that could be used to distinguish the plant from another.

- *Jambu batu* (*Psidium guajava* L.)

  jambu (guava) and *batu* (stone), guava as hard as stone.

- *Cau raja* (*Musa paradisiaca* L.)

  cau (banana) and *raja* (king), the king of bananas (most delicious banana).

- *Pare menyan* (*Oryza sativa* L.)

  pare (paddy) *and menyan* (incense), paddy that emanates a desirable fragrance when cooked.

Metonymy

Apart from metaphor, this study also documented 189 taxa named using metonymy. Metonymy is a figurative speech where the name of an entity is substituted by that of another for its attribute or whatever it is associated with. The substituting words are usually given on the basis of the salient characteristic of the flora or fauna species (Turpin 2013). The association could be cause- effect, part to whole or whole to part, product and producer, and etc. Evans (1997) proposed three major role in metonymy between plant and animal name viz. temporal, spatial, and cultural as well as complex chain of metonymy. This study classifies metonymy into two main categories based on Turpin (2013) and Evans (1997), while presenting a few new categories.

1. Simple metonymy

In simple metonymies, lexemes that directly point to a particular characteristic feature substitute the plant name.

(a) Ophthalmoceptory (shape, size, colour)

- *Kukuk* (*Lagenaria siceraria* (Molina) Standl.)

  kukuk= lekuk (curved), the fruit that is curved.

- *Awi gede* (*Gigantochloa verticillata* (Willd.) Munro)

  awi (bamboo) and *gede* (big), this bamboo is big.

- *Dangdeur koneng* (*Manihot esculenta* Crantz)

  dangdeur (cassava) and *koneng* (yellow), the cassava tuber is yellow.

(b) Tactioceptory

- *Areuy Canar* (*Smilax leucophylla* Blume)

  areuy (vine) and *canar* (prickly), the vine is prickly.

(c) Gustaoceptory

- *Cau haseum* (*Musa paradisiaca* L.)

  cau (banana) and *haseum* (sour), the banana is sour.

(d) Procedural (medicinal and ceremonial uses; planting, harvesting, and recipe)

- *Awi apus* (*Gigantochloa apus* (Schult. & Schult. f.) Kurz)

  awi (bamboo) and *apus* (erase). Bamboo that can cure (erase) many diseases.

- *Areuy leuksa* (*Pipturus repandus* Wedd.)

  areuy (vine) and *leuksa* (traditional ceremony to make *leuksa* that will be presented to government representatives as a part of the *seba* ceremony).

- *Calogor* (*Nephelium juglandifolium* Blume)

  logor (baggy). Procedure to collect the fruit is to clear the canopy and let the fruit tumble down.

(e) Ecological or spatiological

- *Salam leuweung* (*Syzygium nervosum* A.Cunn. ex DC.)

salam (the genus name) and *leuweung* (forest). The *salam* found in forests.

(f) Calendrical (Temporalogical)

- *Katulampa* (*Elaeocarpus glaber* Blume)

  katulampa (walking together), plant that blooms in the flowering season, but produce fruits belatedly.

(g) Behavioural metonymy

- *Kowang dungkuk* (*Canavalia gladiata* (Jacq.) DC.)

  Kowang (genus name) and *dungkuk* (handicapped). The *kowang* that can grow only at the ground level.

- *Pare hawara* (*Oryza sativa* L.)

  pare (paddy) and *hawara* (quick), short-term paddy.

2. Complex metonymy

Complex metonymy arises when two lexemes that are not connected semantically, are linked metonymically through cultural practices (Evans 1997). This mechanism is a product of extensive traditional knowledge, with the meanings often hidden. The linked lexemes may or may not be linguistically related.

(a) Sound metonymy

Turpin (2013) has introduced several categories of metonymies; one of them is sound metonymy, based on sound connection portrayed by the lexemes involved. Unlike animals that have distinctive body parts to produce and transmit sound, plants generally do not produce sounds by themselves, and it is the human cultural element of utilisation of plant and materials that produce sound.

- *Cau kepok* (*Musa acuminata* Colla), *cau* (banana) and *kapok* (sound *pok pok*).

  The name refers to the sound that is produced when Kanekes kids play with the trunk.

  The banana trunk is split by the kids and whipped in air to create the sound. The winner is the one who can produce the strongest sound. This banana trunk produces higher sound than others.

- *Awi ater* (*Gigantochloa atter* (Hassk) Kurz), *awi* (bamboo) and *ater* ("ter" sound)

  This bamboo has shorter internodes, compared to the other bamboos of the Kanekes ecosystem. The short internodes are an indication of strength and also results in the production of a 'ter' sound when cut vertically.

(b) Diet metonymy

In the Kanekes food plants name, diet metonymies bring out the connection between the plant and its consumer such as eagles and other birds.

- *Cau Kulutuk* (*Musa balbisiana* var. *brachycarpa* (Backer) Häkkinen)

  cau (banana) and *kulutuk* (eagle).

- *Hantap Manuk* (*Sterculia* sp.)

  hantap (*Sterculia* sp.) and *manuk* (bird).

(c) Human influence metonymy

This metonymy explains the phenomenon where an entity denoted by a lexeme is influenced by a human action, or vice versa. In Kanekes ethnotaxonomy, it is used with preventive intentions.

- *Binglu* (*Mangifera caesia* Jack)

  Binglu is a dermatic condition similar to urticaria that is culturally believed to be caused if a Kanekes individual passes by or below the *bingulu* tree. Kanekes people avoid walking by the tree to prevent possibility of getting the disease.

- *Cecendet* (*Physalis angulata* L.)

  Cecendet is the swelling of the penis corona due infection and scar, happening usually after circumcision. The Kanekes boys who have just undergone circumcision abstain from consuming the fruit as it could aggravate the swelling.

(d) Introducer metonymy

Metonymical mechanisms could also throw light on the person who introduced a plant taxa to the community, or the place of origin of the taxa. Unlike human influence metonymy, it is the human history that is encoded in the name of species, serving as a folk Intellectual Property protection measure (Mekbib 2007).

- *Pare ambu ganti* (*Oryza sativa* L.)

  pare (paddy), *ambu* (mother), *ganti* (name of the individual)

- *Pare Kolelet* (*Oryza sativa* L.), *Pare* (paddy) and *kolelet* (Desa Kolelet Wetan of Banten province, Indonesia).

Portmanteaus

One unique feature of Kanekes food plants name is the abundance of portmanteaus (Pound 1914). Of the 358 taxa documented, ten taxa were found to be abbreviated forms of two or more words (Bauer 1992; Kridalaksana 2001). Indonesians in general love to use portmanteau in their cultural life (Wandelt 2009), not only in social interaction but also in formal uses (De Vries 1970; Pratiwi 2008). In Kanekes food plant names, most portmanteaus denote folk genera, which at the first instance appear as un-analysable primary lexemes. It is imperative for researchers working the ethnotaxonomic systems of Southeast Asia using Berlin's (1973) framework to look into the possibility of portmanteaus denoting folk genera categories. Of the examples listed below, *ranji*, *kondang*, *kupa*, and *tokbray* are based on morphological features, *boteng* is based on ecology (availability in nature), *kaweni* is based on historical ecology, and *kecapi* and *waluh* on utility.

1. *Ranji* (*Dialium indum* L.)

   Ran (*renggang*= loose), *jeung* (with), *biji* (seed). The seed loosens from the pericarp when it is ripe.

2. *Bonteng* (*Cucumis sativus* L.)

   Bon (*kebon= swidden forest*), *teng* (*enteng*= light). The plant is easily accessible in the Swidden fields.

3. *Kecapi* (*Sandoricum koetjape* (Burm.f.) Merr..)

   Kecap (speaking), *kana* (in), *pi* (*pipi*= cheek). The fruit is very sour and cause sharp sensation in the mucosa.

4. *Kaweni* (*Mangifera odorata* Griff.)

   Kawen (*kawin*= married), *jeung* (with), *nini* (*nini*= grandmother). The plant resulted from hybridisation.

5. *Kondang* (*Ficus variegata* Blume)

   Kon (*dikoko*= hold on) , *laju* (then), *ndang* (*dipandang*= looked at). Latex from the plant can be used to cure stomach-ache; should be examined carefully to differentiate from other latex

6. *Kupa* (*Syzygium polycephala* (Miq.) Merr. & L.M.Perry)

   Ku (*Dikuku*= opened), *ku* (by), *pa* (*bapa*= father). The fruits are supposed to be opened by father.

7. *Tokbray* (*Blumeodendron tokbrai* (Blume) Kurz)

   Tok (*Diketok*= pounded), *bray* (*ngegebray*= smashed). The fruits have to be opened by pounding

8. *Waluh* (*Cucurbita pepo* L.)

   Wa (*Wawuh*= know), *jadi* (become), *luh* (*sedulur*= relative). Culturally the fruit will be served for the guest.

Portmanteaus are also reported from specific epithets. *Taleus loma* is a common edible yam (*Colocasia* sp) planted by the Kanekes during the initiation of *huma* (swidden field) season. *Loma* refers to its availability in swidden fields. Similarly, *jambu cingcalok* refers to a guava that grows in ditches (*cicing dina legok*).

9. *Taleus loma* (*Colocasia esculenta* (L.) Schott)

   Lo (*Loba*= alot), *dina* (at), *ma* (*huma*= swidden forest). The yam found aplenty in swidden rice fields since it is normally planted by the Kanekes.

10. *Jambu cingcalok* (*Syzygium aqueum* (Burm.f.) Alston)

    Cing (*Cicing*= stay), *dina* (at), *calok* (*legok*= ditch). The guava grows in ditches.

4.3 Traditional Knowledge and language Vitality of Kanekes people

The first phase of the study yielded the list of 25 common food plants that were shortlisted on the basis of their salience from the free lists generated by 16 elders (>60 years of age) from inner Kanekes (Table 4.1). These plants are those commonly available for the Kanekes and widely consumed. The Kanekes people recognise and classify their environment and biodiversity in Kanekes tongue, although some of the borrowed elements such as *balimbing wuluh* (*Averrhoa bilimbi*) and *cokelat* (*Theobroma cacao*) are identified by their non-Kanekes names.

Table 4.1 Twenty five salient food plants in Kanekes

	Taxa	Scientific name	Meaning behind name
1.	*Bonteng*	*Cucumis sativus* L.	Easy to find
2.	*Cau*	*Musa* x *paradisiaca* L.	-
3.	*Cikur*	*Kaempferia galanga* L.	"*Cik*" means short, this plant cannot be tall
4.	*Cokrom*	*Solanum melongena* L.	This fruit can be eaten even raw by biting
5.	*Hiris*	*Cajanus cajan* (L) Millsp.	Spread by pieces
6.	*Huwi kalapa*	*Dioscorea alata* L.	This tuber is nice when cooked with coconut
7.	*Huwi kumbili*	*Plectranthus rotundifolius* (Poir.) Spreng.	This tuber is small and assembling
8.	*Huwi mantang*	*Ipomoea batatas* (L.) Poir	This tuber can be eaten even in prohibited days

	Taxa	Scientific name	Meaning behind name
9.	*Huwi ramo*	*Dioscorea alata* L.	This tuber looks like the hand
10.	*Jaat*	*Psophocapus tetragonobulus* (L.) DC.	This plant is wicked because it grows on paddy
11.	*Jahe*	*Zingiber officinale* Roscoe	-
12.	*Jagong*	*Zea mays* L.	-
13.	*Kacang panjang*	*Vigna unguiculata* (L.) Walp.	Long bean
14.	*Kadu*	*Durio zibethinus* L.	If you do not eat this fruit you will regret
15.	*Kalapa*	*Cocos nucifera* L.	-
16.	*Kaweni*	*Mangifera odorata* Griff.	A cross –bred plant
17.	*Kokosan*	*Lansium parasticum* (Osbeck) K. C. Sahi & Bennet	Use mouth to open this fruit
18.	*Koneng*	*Curcuma domestica* Valeton Syn. *Curcuma longa* L.	Yellow
19.	*Kucai*	*Allium chinense* G. Don.	-
20.	*Pisitan*	*Lansium parasiticum* (Osbeck) K.C. Sahni & Bennet	Consumed after ripping open the fruits
21.	*Peuteuy*	*Parkia speciosa* Hassk.	-
22.	*Roway*	*Phaseolus linatus* L.	-
23.	*Taleus*	*Colocasia esculenta* (L.) Schott.	-
24.	*Tundun*	*Nephelium lappaceum* L.	-
25.	*Waluh*	*Cucurbita moschata* Duchesne	This fruit is used to serve the guest

As the Kanekes culture considers the people of inner Kanekes as ‘pure’, the study assumes that their language and TK vitality would be high. Hence, for the pilot testing, it was decided to compare the scores of inner Kanekes (Cluster 1) and outer Kanekes people (Cluster 2).

All of (60) respondents from both clusters declared that they are very good in Kanekes language (L1). Seven of the 30 participants from cluster 2 declared themselves as very good in Bahasa Indonesia (L2), whereas none of the 30 respondents from cluster 1 declared themselves as very good in Bahasa Indonesia. Those who had declared themselves as proficient in Bahasa had learnt Bahasa Indonesia through trade, tourism activities, government policy (training and aids), members of neighbouring non- Kanekes villages and also researchers who frequently visit the area. The Kanekes require Bahasa Indonesia to trade forest, agricultural and handicraft products such as banana, palm sugar, ginger, and *asam ranji* (*Dialium indum*) which are the commonly traded produces besides timber. During the interviews, all respondents from cluster 1 and cluster 2 could free-list food plant names in Kanekes language as well as Bahasa Indonesia with various timings. Almost all of respondents could recognise and explain the meaning behind the plant names rightly.

Visual recognition of 25 salient food plants assessment also indicates that Kanekes people could easily recognise the plant based on pictures presented. Although confusion between cultivars was noted at times, the respondents were able to distinguish them when the fruit and tuber were presented. Examples are *kokosan* (*Lansium parasticum* (Osbeck) K. C. Sahi & Bennet and *pisitan* (*Lansium parasticum* (Osbeck) K. C. Sahi & Bennet as well as *huwi ramo* (*Dioscorea alata* L.) and *huwi kalapa* (*Dioscorea alata* L.). *Pisitan* and *kokosan* are distinguishable only from the fruit morphology, where *pisitan* resembles *dukuh* (*Lansium domesticum* Correa.) with the flesh easily detachable, whereas *kokosan* seeds and flesh are subtle. As a result, *pisitan* fruits can be easily be opened by hand unlike that of *kokosan*. *Huwi ramo* and *huwi kalapa* are also quite similar, but *huwi kalapa* has a black strip on each axil, and could also be distinguished through the tuber shape. *Huwi ramo* resembles human hand whereas *huwi kelapa* is big and round. The above cases also indicate the intricate knowledge embedded in folk names (Franco and Narasimhan 2009; Newmaster et al. 2006). The situation could also be caused because of the limitation of using visual stimuli such as photographs that provide no tactile feedback. Also, *pisitan*, *kokosan* and *dukuh* are quite similar in tree profile, morphology of leaves, and fruit shape. Yet, skin of fruit, and the fruit inside is different and distinguishable only when the people open the fruit.

All respondents declared that traditional knowledge on food plants is transmitted from one generation to another by oral means, facilitated by various social mechanisms. Grandparents (*nini* and *aki*) and parents (*ambu* and *bapa*) transmit knowledge on plants to the children. Learning process also accompanies activities such as farming and daily activity. All the respondents (60 people) reported that they primarily had received the knowledge from the family members during childhood. Knowledge is also acquired from their peer group after 10 years of age (14 people stated). Furthermore, social interaction with other family members such as uncle/ auntie, sister/brother in law, etc. might also help in sharing knowledge (46 people stated). Cultivated lands which are managed together allow cooperative management and sharing of their understanding of agriculture and related knowledge.

4.4 Status of TK and LV in inner and Outer Kanekes

The results for TraLaVi was found to be extremely high (0.981), denoting the safe status of the language and traditional knowledge. Results of the self-assessment of language proficiency and the criteria A shows highly significant correlation (0.831). It indicates that the ratio of time taken in L1 and L2 could point to the language proficiency of individual. Although they could speak Bahasa Indonesia, the results show that there has been no language shift, indicating their adeptness in bilingualism. Recently Paniagua- Zambrana et al. (2014) found that bilingualism has positive correlation with traditional knowledge on palm in 25 locations in Amazon, Andes, and Chocó of north-western South America. They argue that bilingualism could favour acquisition of new knowledge that could be useful to fulfil food needs. It should be noted here that in Kanekes, formal education is customarily prohibited.

Table 4.2 Traditional Knowledge and Language Vitality assesment for Kanekes

Criteria	**Inner Kanekes**			**Outer Kanekes**		
	Female	**Male**	**Mean**	**Female**	**Male**	**Mean**
A	25	25	25	24.33	23.67	24
B	25	25	25	25	25	25
C	22.8	24.73	23.77	24.07	24.13	24.1
D	25	25	25	22.53	24.4	23.47
E	25	25	25	25	25	25
Mean Values	122.8	124.7	123.77	120.93	122.20	121.57
TraLaVi index	0.982	0.998	0.99	0.967	0.978	0.9725

Based on the Table 4.2, the Kanekes people from both clusters were found to have extremely high (0.99) TraLaVi values (C1= 0.99, C2= 0.9725). There is no significant difference between clusters 1 and 2, indicating that people from inner and outer Kanekes are strong in TK with safe language vitality. Although inner Kanekes and outer Kanekes are distinguishable outwardly; it does not mean they are different. The role is same, their belief are also the same; outer Kanekes people often come to inner Kanekes area for attending ceremonies exclusive to the inner Kanekes. However loyalty towards the role may explain why values for outer Kanekes index is marginally lower than inner Kanekes.

Although Kanekes people are not permitted to use any electronic device such as mobile phone, lamp, computer, and etc., using mobile phone and flashlight are common in outer Kanekes. By using mobile phones, they start learning alphabets. Besides, it also widens the contact network to the non-Kanekes. Slowly they go forward to the contemporary lifestyle. Unlike inner Kanekes, outer Kanekes members are permitted to use transportation such as public bus, motorcycle, and car. Thus they could travel to longer distances than inner Kanekes people, and involve in selling honey, accessories, and agricultural product. In the beginning, Kanekes people could fulfil their food requirements by their subsistence strategy as their rice could not be sold (Iskandar and Ellen 1999). They only bought food such as salt and salty fish from outside. But now, they also buy other stuffs including the instant ones. They start to collect more money for shopping. Moreover since government applied the policy on *raskin* (*beras miskin*: rice aid), Kanekes people start to buy rice, reduce their farming activity, and shift to do other job especially among outer Kanekes. Changing on food strategy and political complexity are two factors which could influence diversity in language (Currie and Mace 2012, Gavin et al. 2013).

Interestingly, people from C1 (23.77) were found to have lower values than C2 (24.1) in their ability to explain the meaning behind name. However, the lower level could not be assumed as lower knowledge levels in C1 than C2, as the people from inner Kanekes tend to answer the question quickly with minimal words, as a part of their cultural practice. The women from inner Kanekes also tend to be shy when be interviewed. On the other hand, intergenerational knowledge transmission indicated by the criteria D and E suggested that people from inner Kanekes have stronger social transmission mechanisms than the outer Kanekes.

A set of code and conduct on their taboo regulate them and influence to nature management (Garna 1987). Moreover social control between outer Kanekes and inner Kanekes are very firm, although it is changing in outer Kanekes, situation may not change in inner Kanekes quickly. When the outer Kanekes go to inner Kanekes they have to obey any strict rule, they should not use sandals, modern clothes, or use Bahasa Indonesia. Once in the inner Kanekes territory, they revert to their original Kanekes culture. Outer Kanekes also muffles and reduces influence from outside; thus the influence of outer world factors wane gradually from the outer Kanekes to inner Kanekes.

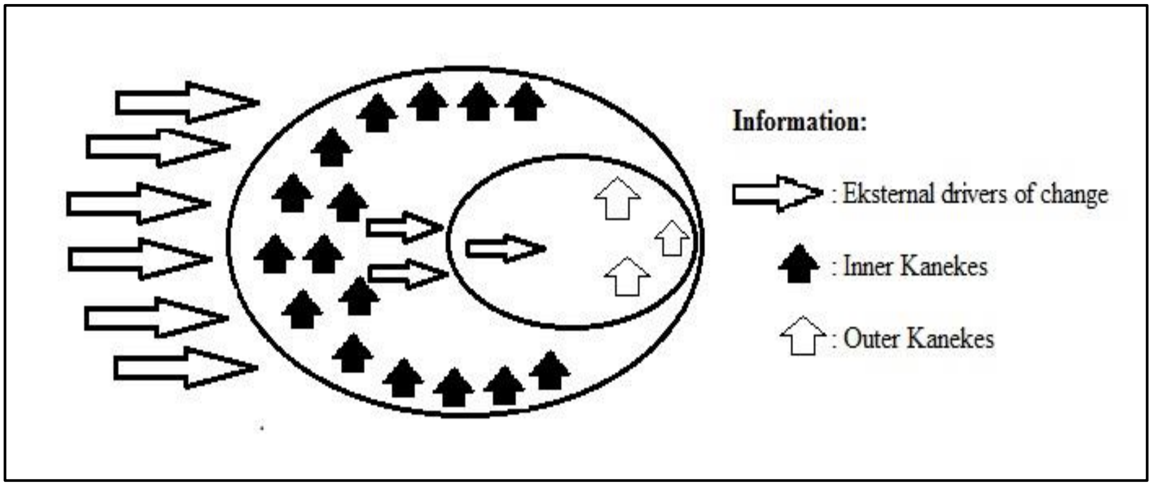


Figure 4.1 Outer Kanekes as buffer zone for conserving TK and language in the inner

Outer Kanekes could be serving as the buffer zone to defend the culture (Figure 4.1). Analogically in forest management, zoning aims to minimise the negative environmental impacts of forestry while maintaining timber supply (Cote´ et al. 2010; Robinson, Albers, Busby 2013). They divide forest into three broad land-use zones: conservation, ecosystem management, and wood production. Likewise, to conserve inner Kanekes, outer Kanekes may filter negative impact from outside while at the same time, catering to the non-Kanekes visitors (tourism, market, and etc.). Through this mechanism, inner Kanekes will remain secure, ensuring that customs are conserved and regulations are followed strictly.

Summary

The analysis of Kanekes food plant names shows that Kaneskes food plant names are derived on the basis of morphological (177), ecological (51), utility (61), and quality (39) mechanisms of TK. Lexical semantic analyses also notes 109 metaphors and 189 metonymies in Kanekes ethnotaxonomical system. Ten portmanteaus also have been recorded; this is the first report for the occurrence of portmanteaus in ethnonomenclatural systems. The results indicate that the TK and language vitality of the Kanekes people could be considered as safe (0.981). The strength of the Kanekes language comes from a robust informal educational system and the set of *pikukuh* (obligation) and *buyut* (taboo). Separately, the participants from inner Kanekes (0.99) had a marginally higher TK and language vitality level than outer Kanekes (0.9725). The separation of inner and outer Kanekes does not seem to affect the *pikukuh* (obligation) and *buyut* (taboo) practices in Kanekes. Although the flexibility of the outer Kanekes people in terms of customary obligations might be the reason for the slightly lesser score, the difference is not significant. However, it should be borne in mind that for Language and TK vitality to be progressively maintainable, isolation cannot be a factor and the community will have to develop strong *sui-generis* educational systems to deal with the non-Kanekes domains that are bound to increase their influence on the people.

Chapter 5 Traditional Knowledge of Ba'ie people

Introduction

This chapter discusses the traditional knowledge of the Ba'ie people on fishes and related biological diversity. The chapter begins with the descriptional history of Ba'ie origins from an emic perspective to gain a cultural understanding of the community. As the Ba'ie are a fishermen community, the traditional method of fishing is documented to understand the community dynamics. Besides, Food as a basic need also plays important role in Ba'ie culture, and hence, cultural importance of *Metroxylon sagu* Rottb. for the Ba'ie people also been documented. The study highlights traditional uses, folk lore, and history of 141 fishes of the Ba'ie, to show the ethnobiological knowledge of the Ba'ie Segan people.

5.1 Ba'ie and their origin

A long and focussed interview was conducted with Encik Kapeh bin Hosen, a Ba'ie elder from Kampong Segan. He was born 81 years back, and has worked with Tom Harrison in the Niah cave excavation as well as with Sarawak museum. He classified the folk history of Bintulu into four: folklore era, Rajah Brooke period, Japanese and British colonialsm. The last three periods have been documented well and archived by the Sarawak museum (Runciman 1960, Harrison 1962, Walker 2012). Whereas, information on the folk understanding of the history of the community is very limited, except for a book by Ibrahim Saad (1971) authored in Bahasa Melayu.

5.1.1 The story of Levau Penyilem (Deep pool of Penyilem)

Encik Kapeh narrated a story passed on to him by his mother while she was weaving mats and he was cleaning the soot of the traditional lighter. The setting of the story is Bintulu before the advent of Islam to the region. *Penyilem* is a sacred place in Bintulu in the Kemena river basin. The Ba'ie used to hold *pinom*, their traditional ceremony of rice harvest at the *penyilem* where people were usually provided rice wine and liberally allowed to have physical relationship with members of the opposite sex. The ceremony can also be considered as the initiation ceremony for adolescents who are accepted as adult members of the community once they have engaged in sexual activities.

The preparations for this day-long ceremony were carried out during the previous day. Once, the community members were on their way back after hunting and gathering when they came across a huge male snake that was visibly tired and asleep. People killed the snake believing that he was taking rest after killing their poultry and livestock. They removed the skin and cut the body into pieces; the flesh was cooked barring the tail portion that was kept aside for a family who did not join the *pinom* ceremony.

People consumed the snake during the *pinom* ceremony, got drunk and continued with merry making throughout the night, after which they fell asleep. The family that did not eat the snake or enjoy the *pinom* ceremony were planning to prepare *salai*, a traditional preserved food out of the tail. The family hung the tail above the fireplace, for smoking.

The wife of the killed snake assumed the figure of a lady and went around the village in search of her husband. Upon spotting the tail, she enquired them what it was and if they had seen a huge male snake. The lady replied in the affirmative that the tail was being prepared for *salai*, and she had indeed seen a snake coming into the village. The lady enquired again if the the *salai* is made from the snake to which the lady of the family agreed, adding that they had not consumed it as it was just the tail devoid of flesh. The snake lady became angry and agitated, but controlled her emotion and enquired again if the other members of the community had eaten it. The lady replied that they had consumed the snake on the previous day itself. Immediately, the snake lady reverted to her original form of snake and revealed that the snake was her husband, and she was going to crush (*pudi*) the village the very next day as a mark of vengeance. Since the family was not a part of the act of killing and consumption, she instructed them to escape from the village immediately.

The family fled the village immediately on a bamboo raft to escape the wrath of the female snake. The family name was the Duyan family, duyan signifies durian (*Durio zibethinus* L.). Duyan was born from durian fruit and married to Bintulu a lady, who gave birth to seven children. The family along with the seven children escaped and spread throughout Bintulu as described below:

1. Berngek was the eldest one who escaped to Sube'zau (modern day Sebiew)

Berngek was the eldest of all siblings and the most powerful in Bintulu. Berngek died and was burried in the Sube'zau (Sebiew) river; his grave is believed to be visible even now when the water level subsides. The river was given the name by Berngek, who heard music from *gelinang,* a traditional music instrument coming from a long house. People normally play this music while constructing a longhouse. Based on that, Berngek named the river as sube'zau, '*sube'* meaning 'to try' and *zau* meaning 'sound'.

He also named the Kemena and Tatau Rivers in the Kuala tatau. Kemena River is the most important river for Ba'ie people; it flows from the South China Sea into the Kemena River with so many tributaries. The word Kemena was coined from the words *aqau* (I) and *mena* (ahead), which means 'I am going ahead', to signify that Berngek and his group were going ahead towards the South China Sea. Similarly, Tatau originates from the words *ta* (no) and *tau* (long handled scoop), meaning 'no scoop'. When Berngek and the group were crossing this river, the boatmen lost the scoop and when Berngek asked for the scoop they replied "*tatau*", meaning scoop has been lost.

2. Jaleb was the second one who escaped to Segan (Kampung Kuala Segan)

The story of Jaleb and Segan village starts when his daughter died after being accidently hit by Berngek's grand-daughter while pounding *amping* (chips) together. So the community members prepared a funeral for Jaleb's daughter; some of them prepared food for the guests while others were busy either fishing or picking the vegetables. A Ba'ie elder who was fishing in the river caught a *tavai* [*Wallago leerii* (Bleeker, 1851)] fish. As the fish was very big and heavy he could not pull it alone and called the youngsters for immediate help (*bersegan)*. Since then, the river and its basin was known as Segan. Despite the earnest efforts put in, story of the other siblings could not be fully documented, as nobody could recollect them. However, what is understood is that the other five siblings had also spread out to other regions of Bintulu as follows.

3. Bazok was the third sibling who escaped to Se'padoq

The place was called as Se'padoq as the *sepa'doq ong* [*Artocarpus integer* (Thunb.) Merr.] fruits were found in abundance in the area.

4. Su'das, the fourth sibling had escaped to Silas
5. The fifth sibling Durang escaped to Bukit Durang.
6. Si'pei the sixth escaped to Dewan Suarah (in present day Bintulu).
7. Ja'bae, the youngest of all escaped to Tanjong beach (in present day Bintulu).

All the seven siblings founded their own longhouses for which they became the *tengelan* (head of the longhouse). As time passed, the families of the seven siblings grew and spread in the Bintulu area.

5.1.2 *Ilai tahi* (faecal) epidemic

The descendants from the seventh sibling are said to be the founder population of Bintulu. It is said that one night some Ba'ie people were rowing a boat in the river of *sungai mas* (Golden River). The people had brought *ketupat* (rice cube) for dinner, but could not finish it and threw it away into the river. The *ketupat* felt sad and floated down the river, until it met a few pieces of gold floating towards Bintulu. The *ketupat* asked the gold why it was going to a community that did not value food, but loved gold which was inedible.

Miffed by the actions of the community, the *ketupat* cursed the Bintulu people that all of their food would change to *tahi* (shit), an epidemic that would later be known as the *ilai tahi* epidemic. True to the curse, all food in the possession of Ba'ie turned into faeces and most people fled Bintulu so far even up to Sabah and Philippines. The fleeing population took *balau* (*Metroxylon sagu* Rottb.) as food stock with them. Thus the *balau* which could be easily grown became an important component of the Ba'ie diet.

5.2 Ba'ie and their fishing tradition

5.2.1 Panau

Panau is the traditional fishing technique of Melanau people. The traditional fishing technique is practised by groups of Melanau from Bintulu, Mukkah and Sibu and also reportedly practised by the Melanau in Brunei. However, this traditional fishing method is rarely documented due to the limited of facilities. Nearly eighty percent of activities connected to *Panau* fishing are accomplished quickly underwater, showcasing the freediving skills of the fishermen. On the basis of the data collected from the interviews a description of Panau is provided below.

According to Saad (1971) who is a Ba'ie himself, people who are involved in *panau* were called as Melanau. Nowadays, not many Melanau people practice *panau* due to limited human resources, knowledge, and skills. *Panau* is practised in a group consisting of 8-9 people to catch *njen ruay* [*Parastromateus niger* (Bloch, 1795)] and *jamah* (Carangidae). Generally, Carangidae fishes such as *Atule mate* (Cuvier, 1833), *Carangoides praeustus* (Anonymous [Bennett], 1830), *Carangoides armatus* (Rüppell, 1830), and *Carangoides coeruleopinnatus* (Rüppell, 1830) are caught using this technique.

Panau is a complex fishing activity that begins with the preparation of the lure. The lure is made from *Nipah* (*Nypa fruticans* Wurmb) leaves, synthetic ropes (usually made by nylon or polyester, 45 metre in length), a plastic bag of sand as load, and foam or plastic ball as float (Figure 5.1). Pairs of nypah leaves are tied to the rope at regular intervals of 1.5 m. Individual lures are tagged with the boat number to avoid conflicts and confusions with the lures of other fishermen. The area for laying the *Panau* is fixed on a first come first serve basis. Since the fishermen are affiliated to the Persatuan Nelayan Kawasan Bintulu at the Ministry of the Fisheries Department, Sarawak Malaysia, every boat and fisherman are expected to register themselves and obtain a certificate which helps in regulating the practice.

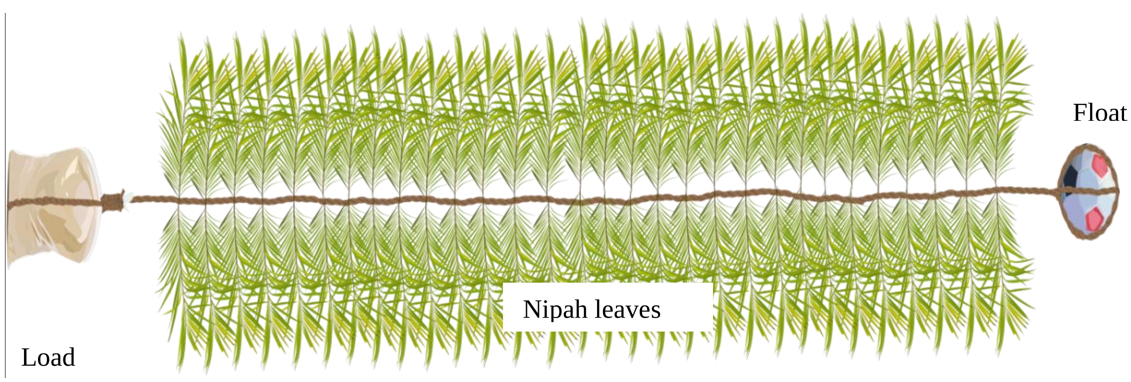


Figure 5.1 Researchers' rendering of the contemporary *Panau* lure

Nipah leaves are used to attract the fishes, and as the ones that are attracted 'dance' around the leaves when they are trapped. According to some informants, the fishes are attracted to the mites and insects on the *nipah leaves*. Others informants were of the opinion that the *ruay* and *jamah* fishes love to play round the *nipah* leaves. These two claims show that although traditional method is still used, the knowledge of the technique and the philosophy behind it has not been transmitted clearly.

If *panau* is considered as a traditional fishing method, or as an old fishing technique, some questions will rise from the materials that are used by the contemporary fishermen. Although technically they still use their ancestral knowledge, they substitute a few componentns with non-traditional ones. The lure used by their ancestors used to be sourced from natural products. Rattan was once used as rope, stone as load, and tree trunks as float. The rattan was sourced from forests near by. Light trees such *meranti* (*Shorea* sp.) were used as a float on the top of the lure, and on the opposite end, heavy stones were used as load. The entire mechanism keeps the lure suspended vertically in the water.

Urbanisation of Bintulu had led to loss of *rattan* habitats, prompting people to look for substitutes such as synthetic ropes. However the synthetic ropes have to be changed more often than the rattan, as they turn brittle after being in the water for a long time. Sand bags are also used due to the limitation of big stones for load. Similarly, *Shorea* sp. have been substituted with foam due to their rarity. These changes arise due to ecological changes and limitation of natural resources. However, these substitutions also give rise to issues of ecological concerns; usage of rope, plastic bags, and foam produces non-degradable wastes that are hazardous to the ecosystem.

Around 45-100 lures spaced at an interval of 20m will be laid in the sea, so as to proceed from a central point towards the South China sea. The central point is decided by the team leader using GPS. The interviews could not throw light on the exact procedure followed by the *Panau* fishermen and it is believed that intuition too plays an important role in deciding the point. The fishermen these days also follow instructions from *tekong kapal* (boat owner) and also rely on modern technologies such as GPS and tide table provided by the Malaysian Government.

Two hours later, the fishermen will inspect the lures, looking out for groups of *Carangidae* in the vicinity of the lures. *Panau* activity will commence only when a large group of Carangidae fish is spotted. Three or four people from the team dive down up to eight metres depending on the season and the condition of the sea. Their goal is to ensure that the fishes do not swim away from the nipah leaves. When the fishes are close enough, one of the fishermen will surface and signal with a "woo" sound indicating that they are ready to trap the fish. Subsequently, two or four people would follow him with a big net in their hands. The second group cover the assembling fish and then pull the rope to signal others on the boat that the fish has been caught. One or two fishermen waiting in the boat would then pull the net and load the fish onto the boat. They might get approximately 45 kg of fish in a single dive. The whole process takes about 15 minutes. Diving skills and cooperative labour are essential requirements for this technique.

The fishermen have to prepare new lures everytime they venture for diving. They could undertake 3 to 4 diving activities per day and bring not less than 150 kg fish back to the jetty which will then be sold to the market or the middlemen on the same day, As the community is aware that the *panau* fisherman will bring fresh fish from the sea, these fishes are much soughtafter than those caught using bottom trawler.

5.3 The Ba'ie food tradition

5.3.1 Cultural Importance of *Metroxylon sagu* Rottb. for the Ba'ie people

Tupi' as fisherman staple food

Tupi' is a staple food for both the Melanau as well as the Ba'ie. Every Ba'ie family used to have specific portions of the house called *tu'bau* and *bilai* dedicated for *tupi'* preparation. However the study could identify only three siblings from Kp. Jepak who are still involved in the processing of *tupi'*. The eldest of the three siblings is Macik Puteh and the younger ones are the twins Lima bin Budin and Sadom bin Budin.

The art of making *Tupi'* were acquired from their parents during childhood itself. *Tupi'* is made from *sei* (sago stratch) extracted from *balau* (*Metroxylon sagu* Rottb.) trunks in the Kemena River basin. The preparation of *tupi'* commences with the preparation of *sei* from *balau*. *Balau* trunks in bloom are identified using TK and harvested. Apart from the presence of flower, they also check for appearance of blue spots when the trunk is cut horizontally. Only those trunks with blueish spots will produce more *sei*. The strategy to choose the right *balau* is very important as the energy required to process a trunk of *balau* will remain same but the yield would differ depending on the quality of balau used.

The selected trunk is cut and brought to the processing place. Normally 1-3 *balau* could be processed by two people in a day's time. The *balau* trunks are cut into smaller size, and the bark is removed using a big knife. The clean *balau* trunks are rolled up to the *qu'bau* (workplace to make *sei*) where the trunks are cut into even smaller size and washed. After that, the pieces of *balau* are scraped using a modern scraper (Figure 5.2). Traditionally, *balau* is scraped using traditional scrapers operated by two people.

Figure 5.2 Puan Lima with her modern scraper

After this, the scraped *balau* is moved to the *idas* (traditional mat) and wetted to extract the starch. The extraction is done manually and the procedure is repeated until the water becomes clear indicating less starch content. The starch liquid will flow through the *seludan* (traditional pipe system) into a big *jalur* (starch tank) made from *belian*

(*Eusideroxylon zwageri* Teijsm. & Binn.)- a culturally important tree of Sarawak collected from the forest (Figure 5.3).

Figure 5.3 Manual starch extraction

After all the scrapings from the *balau* have been processed, the starch liquid from the *jalur* is transferred to the buckets. A *balau* trunk could produce around 5-9 buckets of starch liquid (Fig. 6.3.3). Following this, the starch liquid is left for sedimentation for a while. The water is then discarded and fresh water from Kemena River or rain water is mixed with sediment. Only fresh water could be used to wash the starch, as briny water could spoil the starch. In the beginning, the starch liquid is very dark and looks dirty. After repeated washings, the starch colour would turn into brown first and white later indicating the formation of *sei*. Normally it takes around two days for the entire process to be completed. The clean *sei* is collected in ceramic pots first (Figure 5.4) and then bagged in sacks for solidification after which they are again stored in ceramic pots for further use. The *sei* will be either processed into *tupi'* or sold to middle men.

Figure 5.4 The first result of *sei* extraction

Figure 5.5 *Sei*, at the end of the process

The next step is the processing of *sei* into *tupi'*. *Tupi'* is cooked in a different location of *bilai*. The *bilai* is located behind *qu'bau* and closer to water resources. Figure 5.6 shows a sketch of both *qu'bau* and *bilai*.

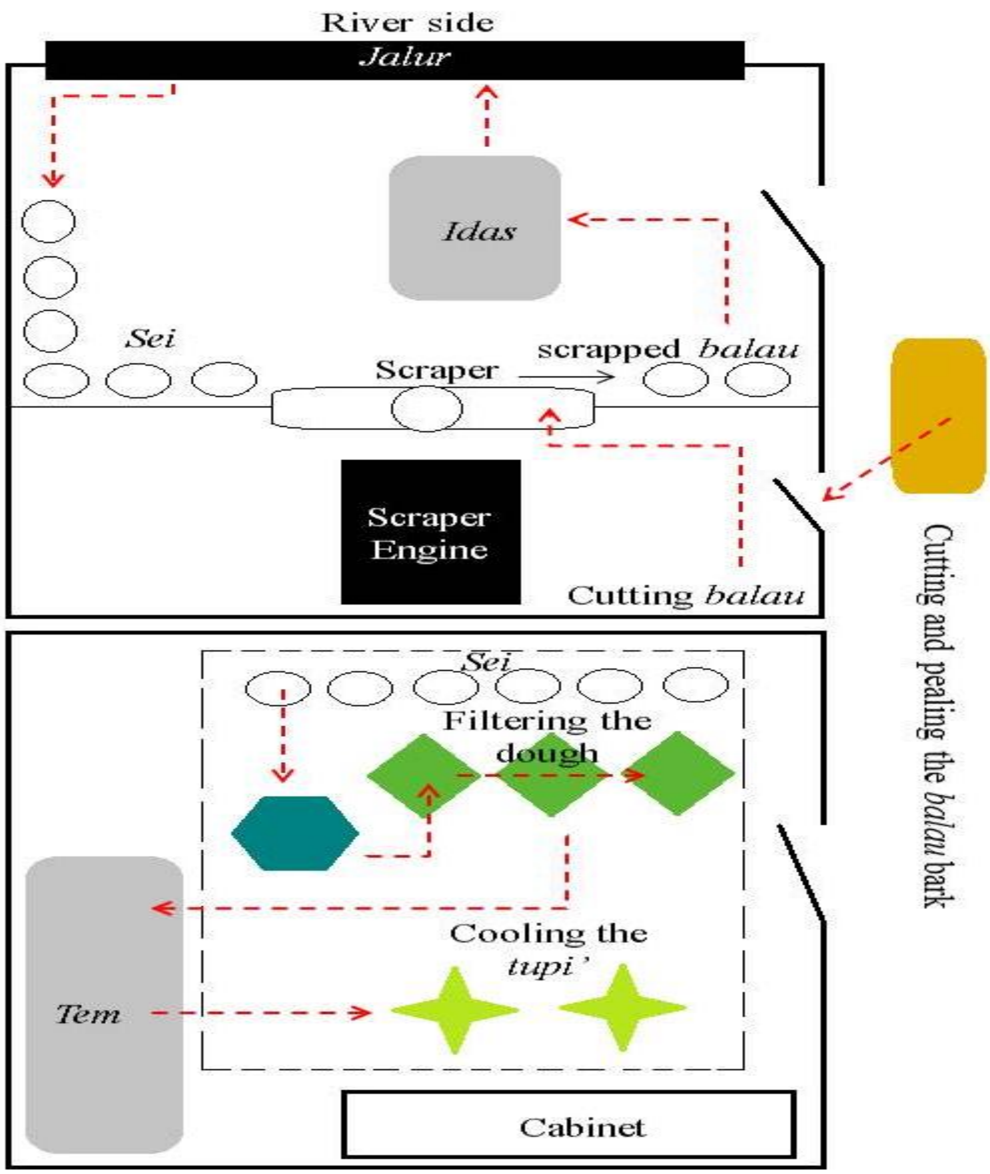


Figure 5.6 Schematic representation of *qu'bau* and *bilai*

Apart from *sei*, *habuk padi* (paddy dust) is also required to produce *tupi'*. *Habuk padi* is usually bought from the market at a price of around RM 15 for one *pasu* (nearly 7Kg). The *habuk padi* from the market can not be used directly and has to be sieved. Approximately, 5Kg of *sei* is mixed with 0.5 kg of *habuk padi* in a *kajangan* (traditional mat made from *balau* leaves) (Figure 5.7). The four corners of *kajangan* are lifted to mix the dough. The activity is called as *begulut*.

Figure 5.7 Mixing of (*begulut*) the dough in the *kajangan*

Once the dough begins to form chunks, *kadapi* (traditional sieve) is prepared to filter the dough. There are four sizes of *kadapi*, the smallest one is known as *tamau* and used to lift *tupi'* after cooking. The largest sieve is called as big *kadapi* which yields bigger sago and rarely used to make *tupi'* as only the intermediate and the smallest sieves are preferred to make *tupi'*. Sieving the dough through the intermediate ones makes the *tupi'* grains round, and the process of sieving the *tupi'* is called as *begugau* (Figure 5.8). During sieving, *Kadapi* is hung from the roof of the *bilai* with a rope and shook like a cradle.

Figure 5.8 Sieving and shaking process (*begugau*) to make *tupi'*

The filtering and shaking process are repeated until the entire dough is converted into small rounded *tupi'* grains. Following this, *tupi'* is roasted on a traditional stove using fire wood as fuel (Figure 5.9). *Tupi'* is roasted steadily over a medium flame and stirred using *ai* to ensure proper and uniform cooking. The *tupi'* would dry in about 30 minutes and turn brown, when it is lifted and moved to a well ventilated space for cooling. Roasted *tupi'* is extremely hot, and if not cooled properly, would be burned and spoiled. The *tupi'* is either cooled using a *suweq*, or sieved again for sizening and cooling the grains (Figure 5.10). The residue resulting from the cooking of *tupi'* is called as *habuk tupi'* and will be kept aside for making *belacan* (shrimp cake).

Figure 5.9 The stove and *tem*

Figure 5.10 Cooling of the *tupi'*

The cooked tupie will be packaged and sold to middle men at the rate of MYR 3-5 (Figure 5.11). Although *Tupi'* can be consumed daily as a staple food, it is mainly eaten by the fisherman during fishing, as it prevents sea sickness. Thus, tupi' plays a major role in the lives of the Ba'ie fishermen.

Figure 5.11 *Tupi'* packets sold in the market

Tupi' benyu **(Coconut tupi')**

Besides the rounded *tupi'*, Baie' people also process *tupi' benyu* which is made from grated coconut, dry *sei* and salt. Only the youngest of the three siblings is involved in making *tupi' benyu*. Coconuts sourced for making *tupi'* should neither be old, nor young to ensure uniformity in grain size. Also, coconut from medium sized trees will produce thicker flesh than the taller ones.

Preparation of coconut *tupi'* is simpler than *tupi'*. Around 30 coconuts could be cooked at a time. The first step is the grating of coconut in an electric grater, after which it is mixed in a *kajangan* with 10 kg of solid sun dried *sei*. Following this, the coconut and *sei* blend is roasted on the *tem* and stirred with *ai.* The process will take less than one hour and the product is considered mature when the coconut gratings turn brown. Coconut *tupi'* will produce oil as a result of the roasting process, and has to be spread over newspapers to remove the oil (Fig. 6.3.11).

Figure 5.12 Cooked *tupi' benyu*

Na'au

Na'au is another sago based food of the *Ba'ie*. *Na'au* is known as *linut* in Mukah and *ambuyat* in Sarawak Malay. However due to limitation of sago palm, people tend to make *linut* from cassava starch. Baie people normally make the *na'au* from solidified *sei*. *Sei* is mixed with fresh cold water slowly until the components are fully mixed. After that the belnd is then slowly added to boiling water and stirred until it slowly coagulates and the liquid becomes clearer.

Na'au is customarily eaten with *jeg* which is made from chili, *belacan* (shrimp cakes), anchovies, and lemon squash. Sometimes, the Ba'ie people also add *gulai tempoyak* (fermented Durian). *Na'au* could consumed along with sauted tender leaves of Cassava or Yam stem.

Te'bes

Similarly to the *na'au*, a traditional food item named as *te'bes* is also made from *sei*. However *te'bes* is not consumed as staple food, but as a snack normally consumed in the morning or evening. To begin with, *sei* is dried under sun and mixed with grated coconut and salt. The dough is then spread as a thin layer on a frying pan, and cooked over a small flame until it turns brown.

Ti'ong

Ti'ong is a salty snack made from *sei* and *njen ipon* (*Rasbora* sp.). *Sei*, grated coconut, and salt are mixed into a dough and put inside a wrap made from leaves of coconut or *Licuala grandis* H.Wendl. (Figure 5.13). The cleaned *ipon* fish severed from head and tail is positioned in the middle of the dough and covered with the dough. This then roasted *over* moderate fire until the leaves appear faded.

Figure 5.13 Macik Sahaniah binti Sulong demonstrating the *ti'ong* wraping process

5.3.2 Miscellaneous food traditions

Belacan Bintulu

Although *Belacan* is the most important shirmp cake in Sarawak, Bintulu *Belacan* is popular for its great taste and lesser odour. Belacan from Bintulu is made from fresh *bubuk* [*Acetes indicus* (H. Milne Edwards, 1830)], a group of planktonic shrimp found in the waters of Peninsular and East Malaysia (Amin et al. 2009). The shrimp season in Bintulu is April when the water is calm, and the bloom would extend from Sabah in the north, until Kuching in the South. The bloom occurs after the season of *njen lumek* [*Harpadon nehereus* (Hamilton, 1822)] and *njen piras* [*Setipinna breviceps* (Cantor, 1849)].

Traditionally, the Ba'ie people used a *paka* (traditional shrimp catcher) to collect the shrimp from the beach or river side, as a result of which it is prone to be mixed with the sand, resulting in poor quality *belacan*. The fishermen's wives grade the *bubuk* on the basis of the size. Bigger size *bubuk* will be kept aside for preparing *pie'* and the smaller ones are used to make *belacan*. Only clean and fresh *bubuk* is choosen to make high quality *belacan*. Around 3-3.5 Kg of *bubuk* is mixed with 3 handfulls of salt and 1 handfull of *deg* (*tupi'* residue). *Deg* is used to preserve the *belacan*, reduce its smell, as well as impart a pleasant colour.

The mixture of *bubuk*, salt, and *deg* is stored overnight in gunny bags to remove excess water. It is then sundried over traditional mat or *nyiru* (flat basket) for 3-4 hours per day until the shrimps are evenly dried. The *bubuk* is then pound using *lesung* and *tepa* (traditional pounder) and the smashed *bubuk* is stored in gunny bags again. The process of drying and pounding is repeated until the dough is truly dried and the color turns brown. The whole process will take around 5-7 days, depending on the conditions. The last pounding process will take longer than before, as the *belacan* has to be turned into cakes. The price of *belacan* from Bintulu could go up to MYR 50/ Kg (Figure 5.14). It is relatively more expensive compared to *belacan* from other parts of Sarawak.

Figure 5.14 *Belacan* sold in the market

***Pie'* (called as *Cencalu* in Sarawak)**

Pie' is a traditional Ba'ie food prepared from large *bubuk. Pie'* is known as *cencalu* in Sarawak Malay. Around 3-3.5 Kg of *bubuk* is cleaned and washed and strained to remove water. Salt and a little sugar is added as flavouring and preservative agents and left for 3-4 days in a glass bottle; following this, a handful of rice or roasted rice is added to fermented *pie'*. Usually, *pie'* will be mixed with chili and lemon squash and relished along with *tupi'* or rice. *Pie'* is also usually sold in the market in a glass bottle with a price of around MYR 5.

5.4 Twenty five culturally salient fishes in Ba'ie culture

Based on the interview with sixteen Ba'ie elders, 25 culturally salient fishes in Ba'ie culture were shortlisted. The 25 culturally salient fishes have cultural, economic, as well as historical relationship with the Ba'ie people. Table 5.1 shows that ruay [*Parastromateus niger* (Bloch, 1795)] is the most salient fish in Ba'ie culture, followed by *jamah* and *tengirq* (Table 5.1). The following sections give an understanding of the cultural and economic value of the 25 fishes salient in Baie culture.

5.5 Ba'ie Ethnobiological knowledge on fishes

About 141 species have been recorded in the present study. All these fishes are identified and recognised using Ba'ie names except for nine fishes that are unknown in the Ba'ie culture. Food preferences, cooking procedures and eating behaviour not only cater for human nutrient and energy requirements, but are also indicative of TK and human being culture. Table 6.2 documents the uses of 141 fishes identified and used by Ba'ie people. The study notes that all these fishes are used as food although four of them are rarely consumed viz. *njen nyaked* (*Oxyeleotris* sp.), *njen nyaked rat* [*Platycephalus indicus* (Linnaeus, 1758)], *njen pu'aw* [*Leiocassis micropogon* (Bleeker, 1852)], and *njen tilan* [*Mastacembelus erythrotaenia* (Bleeker, 1850)]. Nine of the fishes unidentified in the Ba'ie culture are: *Piaractus brachypomus* (Cuvier, 1818), *Helostoma temminckii* (Cuvier, 1829), *Parambassis* sp., *Cyclocheilichthys apagon* (Valenciennes, 1842), *Osteochilus microcephalus* (Valenciennes, 1842), *Lutjanus* sp., *Myripristis hexagona* (Lacepède, 1802), *Upeneus tragula* (Richardson, 1846), and *Siganus canaliculatus* (Park, 1797), indicating that these fishes might be a recent introduction to the Ba'ie culture and ecosystem. Medicinal properties such consumption as tonic after giving birth, and treatment of injuries or wound have been recorded for five species: *njen bueng* [*Channa striata* (Bloch, 1793)], *njen tengiriq batang* [*Scomberomorus commerson* (Lacepède, 1800)], *njen tengiriq papan* [*Scomberomorus guttatus* (Bloch & Schneider, 1801)], *njen perangiang* [*Chirocentrus dorab* (Forsskål, 1775)]. Asthma patients are restricted from the consumption of *njen kepburak* [*Liza vaigensis* (Quoy & Gaimard, 1825)] (Table 5.2).

Table 5.1 Culturally salient fishes of the Ba'ie

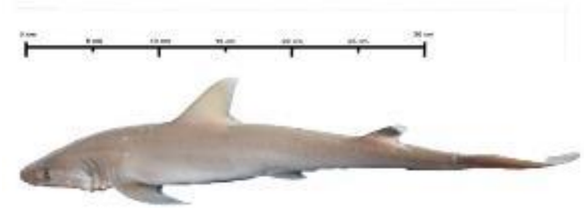
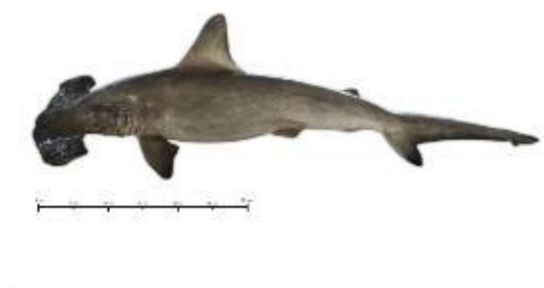
No.	Vernacular name	Scientific name	Elders																Total
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
1	*Njen ruay*	*Parastromateus niger* (Bloch, 1795)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	16
3	*Njen jamah*	*Atule mate* (Cuvier, 1833)		1		1	1	1	1	1	1	1	1	1	1	1	1	1	14
2	*Njen tengiriq*	*Scomberomorus commerson* (Lacepède, 1800)	1			1	1	1	1	1	1	1	1	1	1	1	1	1	14
		Scomberomorus guttatus (Bloch & Schneider, 1801)																	
4	*Njen puqoq*	*Otolithoides biauritus* (Cantor, 1849)	1	1	1	1	1		1	1	1	1		1		1	1	1	13
5	*Njen buleng*	*Nemapteryx macronotacantha* (Bleeker1846)	1		1	1				1	1	1	1	1		1	1	1	11
6	*Njen piras*	*Setipinna breviceps* (Cantor, 1849)	1	1	1	1			1	1		1	1	1				1	10
7	*Njen pay*	*Neotrygon kuhlii* (Müller & Henle, 1841)	1	1		1	1	1	1		1				1		1	1	10
8	*Qeret*	*Carcharhinus amblyrhynchos* (Whiteley, 1934)	1	1	1	1		1			1			1	1		1	1	10
9	*Njen seqael*	*Plotosus canius* (Hamilton, 1822)	1			1			1	1	1			1	1	1	1		9
10	*Njen lata'*	*Lobotes surinamensis* (Bloch, 1790)	1	1		1	1			1		1	1	1				1	9
11	*Njen gagog*	*Arius* sp.		1	1	1	1	1		1				1				1	8
12	*Njen reman*	*Rastrelliger kanagurta* (Cuvier, 1816)		1					1	1			1	1		1	1	1	8
		Rastrelliger brachysoma (Bleeker, 1851)																	
13	*Njen taoq*	*Osteogeneiosus militaris* (Linnaeus, 1758)	1			1		1		1	1		1	1				1	8
14	*Njen tavai*	*Wallago leerii* (Bleeker, 1851)		1		1		1			1	1					1		6
15	*Njen bageng*	*Arius maculatus* (Thunberg, 1792)	1		1						1		1		1		1		6
16	*Njen bibeq*	*Pampus argenteus* (Euphrasen, 1788)						1	1		1	1	1			1			6
17	*Njen da'ie*	*Kryptopterus kryptopterus* (Bleeker, 1851)	1	1	1					1	1						1		6

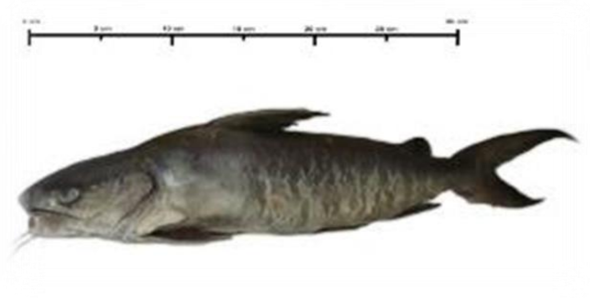
No.	Vernacular name	Scientific name	Elders																Total
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
18	*Njen kelapa*	*Lactarius lactarius* (Bloch & Schneider, 1801)	1	1		1	1			1					1				6
19	*Njen selusong*	*Lates calcarifer* (Bloch, 1790)	1	1		1						1		1		1			6
20	*Njen terupbuk*	*Tenualosa toli* (Valenciennes, 1847)				1		1	1					1	1	1			6
21	*Njen bengetot*	*Ilisha pristigastroides (*Bleeker 1852)						1	1			1		1	1			1	6
22	*Njen gilau*	*Clarias nieuhofii* (Valenciennes, 1840)		1	1									1			1	1	5
23	*Njen qapaw*	*Epinephelus sexfasciatus* (Valenciennes, 1828)				1	1	1					1			1			5
		Cephalopholis boenak (Bloch, 1790)																	
		Epinephelus areolatus (Forsskål, 1775)																	
24	*Njen tuqol*	*Thunnus tonggol* (Bleeker, 1851)	1	1			1			1					1				5
25	*Njen alu-alu*	*Sphyraena barracuda* (Edwards, 1771)						1		1			1		1	1			5

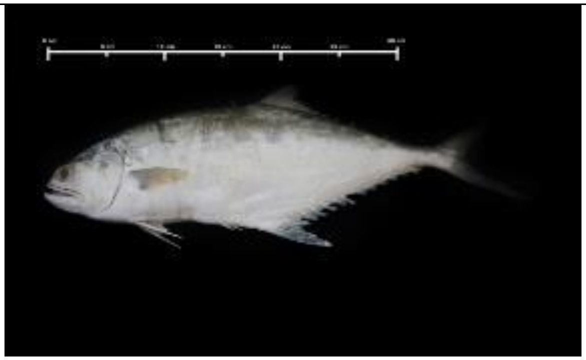
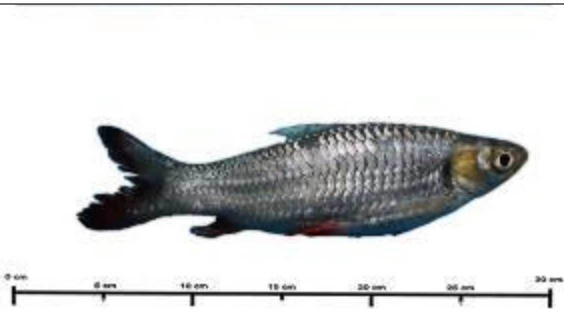
Njen tavai [*Wallago leerii* (Bleeker, 1851)] was found to be closely related with the history of *Segan* village. Based on the results of the interview with elders, it is understood that the word *segan* means 'immediately'. Long time ago, a fisherman who was fishing in Segan River hooked a *tavai* fish. As the fisherman could not pull it out by himself, he called out desperately for 'immediate' help. He knew that the *tavai* fish is normally heavy and energetic enough to pull the hook. This is the story behind the name '*segan'*. However, it is unfortunate to note that the government discourages the community from using the name *Segan* as it means 'shameful' in Malay, indicating a less developed community. This also highlights the need for interpreting ethnic names in a culturally sensitive way. Misinterpretation of names could cause loss of traditional knowledge In the case of *segan*, with the change in name the folklore behind the name will be lost for ever along with the lexeme '*segan'*.

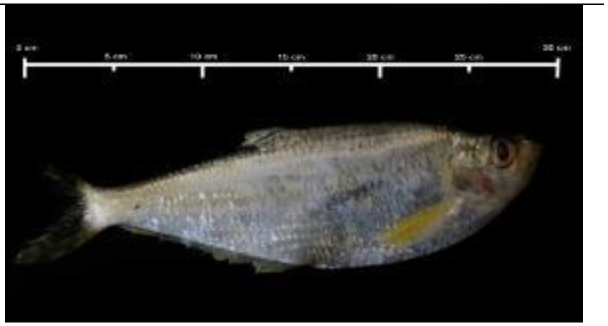
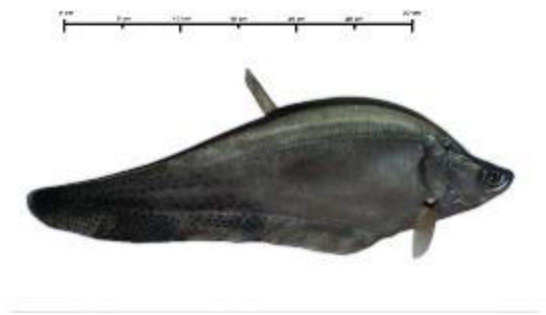
Table 5.2 Ba'ie Ethnobiological knowledge on fishes

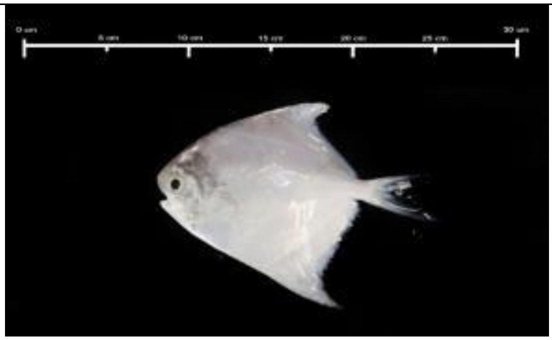
No.	Vernacular name	Scientific name	Uses	Pictures
1.	*Qeret Baem*	*Nebrius ferrugineus* (Lesson, 1831)	Sold fresh. Preparation of *umai*, Commonly cooked as curry and soup.	
2.	*Qeret jalur mapuq*	*Carcharhinus amblyrhynchos* (Whiteley, 1934)	Sold fresh. Preparation of *umai*, Commonly cooked as curry and soups. Sometimes roasted without oil since the fish is oily.	
3.	*Qeret karang*	*Atelomycterus marmoratus* (An onymous [Bennett], 1830)	Sold fresh. Preparation of *umai*, Commonly cooked as curry and soups.	

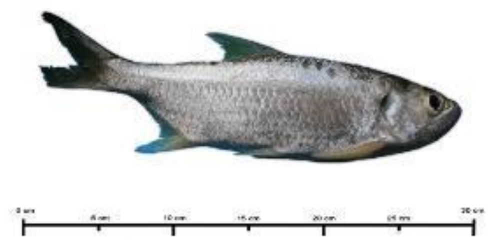
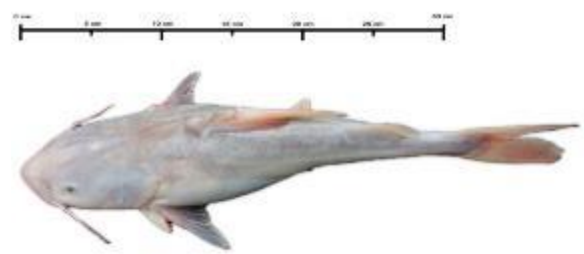
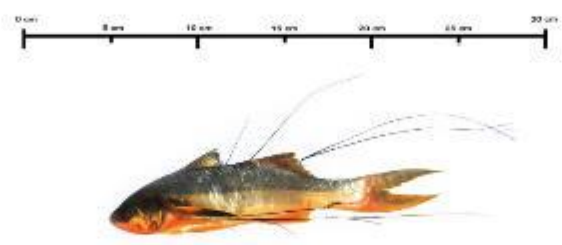
No.	Vernacular name	Scientific name	Uses	Pictures
4.	*Qeret Mapuq*	*Carcharhinus dussumieri* (Valenciennes *in* Müller and Henle, 1839)	Sold fresh. Preparation of *umai*, Commonly cooked as curry and soups.	
5.	*Qeret te'dal*	*Sphyrna lewini* (Griffith & Smith, 1834)	Sold fresh. Preparation of *umai*, Commonly cooked as curry and soups.	
6.	*Qeret teteq asang mapuq*	*Chiloscyllium punctatum* (Müll er & Henle, 1838)	Sold fresh. Preparation of *umai*, Commonly cooked as curry and soups.	

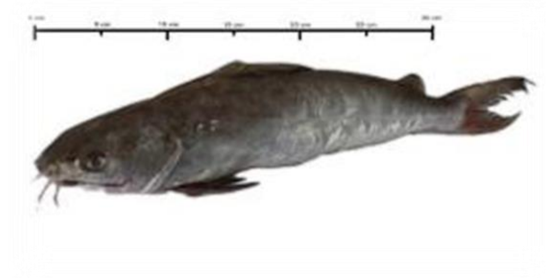
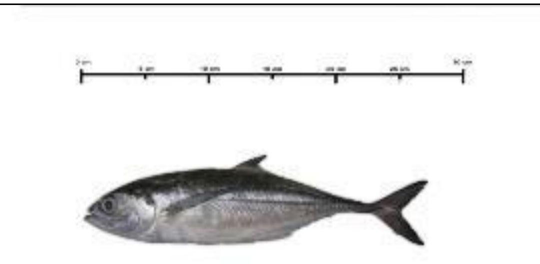
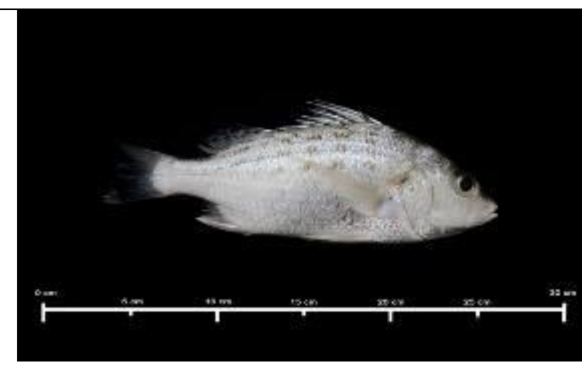
No.	Vernacular name	Scientific name	Uses	Pictures
7.	*Njen Aked*	*Saurida tumbil* (Bloch, 1795)	Sold fresh, commonly fried.	
8.	*Njen Alu-alu*	*Sphyraena barracuda* (Edwards , 1771)	Sold fresh, commonly cooked as curry or with coconut milk.	
9.	*Njen Bageng*	*Arius maculatus* (Thunberg, 1792)	Sold fresh and smoked, has a corrupted name *njen proton saga*.	

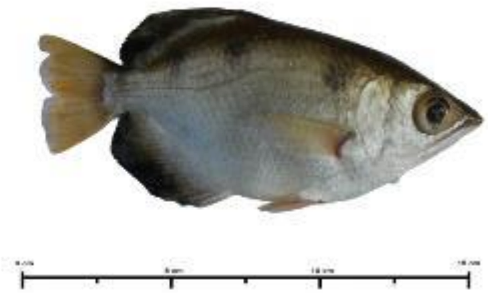
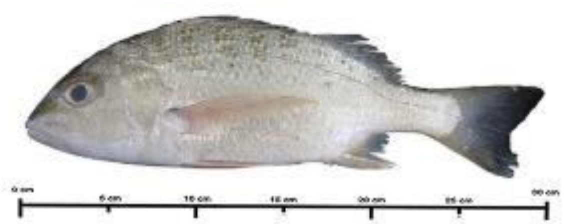
No.	Vernacular name	Scientific name	Uses	Pictures
10.	*Njen Balid*	*Scomberoides tala* (Cuvier, 1832)	Sold fresh, known to be a taboo for Chinese due to their folklores. Commonly fried and cooked with coconut milk.	
11.	*Njen Basung*	*Selar crumenophthalmus* (Bloch, 1793)	Sold fresh, commonly fried or *masak sambal* (Chili curry).	
12.	*Njen Beligu*	*Leptobarbus hoevenii* (Bleeker, 1851)	Sold fresh, commonly cooked as soups or with coconut milk.	

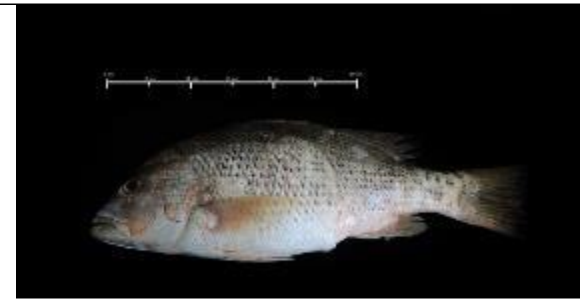
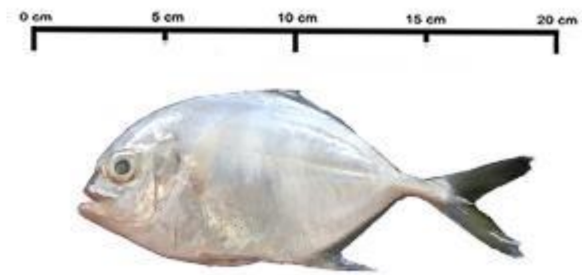
No.	Vernacular name	Scientific name	Uses	Pictures
13.	*Njen Belujau*	*Decapterus kurroides* (Bleeker, 1855)	Sold fresh, commonly fried or *masak sambal*.	
14.	*Njen Bengetot*	*Ilisha pristigastroides* (Bleeker 1852)	Sold fresh or dried and salted. Commonly cooked as *masak sambal* and roasted. Makes a sound "tod" when caught.	
15.	*Njen Berira*	*Chitala borneensis* (Bleeker, 1851)	Sold fresh. Commonly cooked as spicy curry or wrapped with banana leaves.	

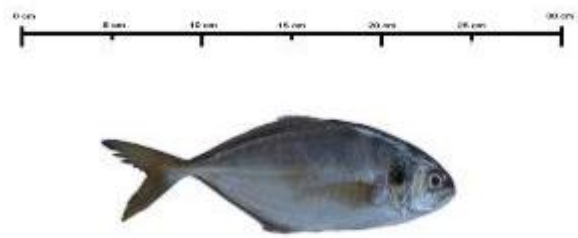
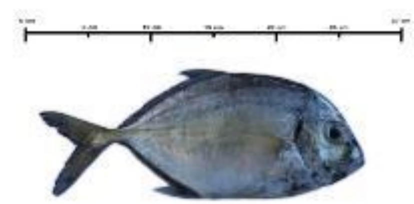
No.	Vernacular name	Scientific name	Uses	Pictures
16.	*Njen Bibeq*	*Pampus argenteus* (Euphrasen, 1788)	sold fresh. Commonly fried for consumption.	
17.	*Njen Bueng*	*Channa striata* (Bloch, 1793)	Sold fresh. Commonly used for medicinal purposes to for faster recovery from injuries and wounds; as tonic after giving birth or caesarian surgery.	
18.	*Njen Bulan*	*Megalops cyprinoides* (Broussonet, 1782)	Sold fresh. Commonly roasted or cooked as *masak sambal*.	

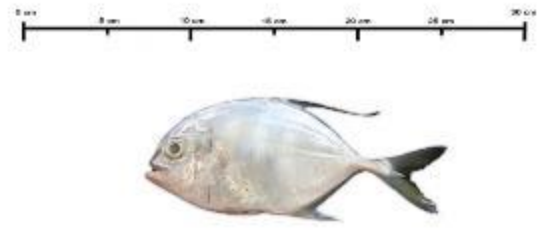
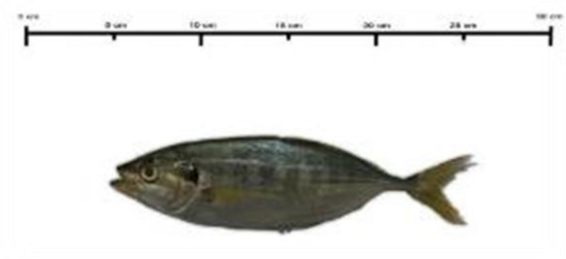
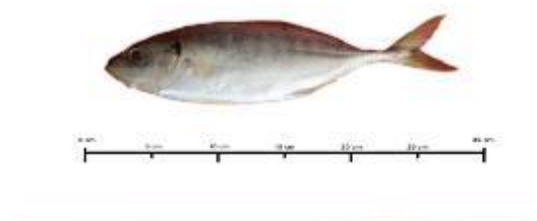
No.	Vernacular name	Scientific name	Uses	Pictures
19.	*Njen Bulan sungai*	*Tenualosa macrura* (Bleeker, 1852)	Sold fresh. Commonly roasted or cooked as *masak sambal*.	
20.	*Njen Buleng Suan*	*Nemapteryx macronotacantha* (Bleeker 1846)	Sold fresh and smoked. Has a corrupted name *njen proton saga*.	
21.	*Njen Bulong*	*Polynemus melanochir melanochir* (Valenciennes, 1831)	Sold fresh, dried, and salty. Commonly fried and cooked with sliced chili.	

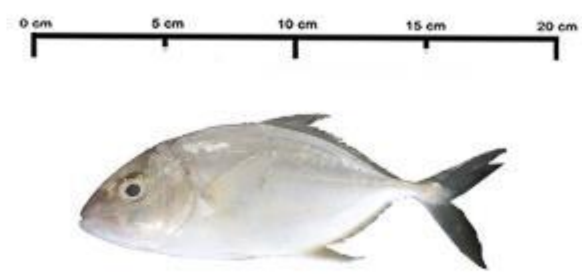
No.	Vernacular name	Scientific name	Uses	Pictures
22.	*Njen Gagog*	*Arius* sp.	Sold fresh and smoked. Has a corrupted name *njen proton saga*.	
23.	*Njen Gelonggong*	*Megalaspis cordyla* (Linnaeus, 1758)	Sold fresh or dried and salted. Commonly fried, cooked with coconut milk or *masak sambal*.	
24.	*Njen Gerut-gerut*	*Pomadasys argenteus* (Forsskål , 1775)	Sold fresh and commonly fried.	

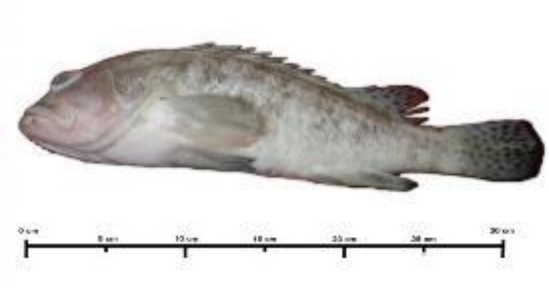
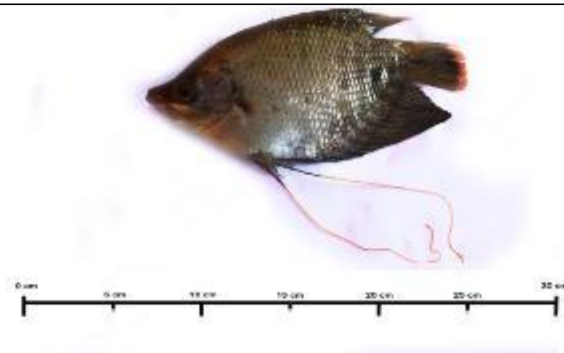
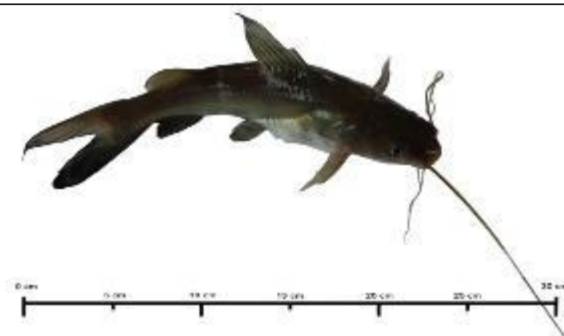
No.	Vernacular name	Scientific name	Uses	Pictures
25.	*Njen Gilau*	*Clarias nieuhofii* (Valenciennes , 1840)	Sold fresh and commonly fried, cooked with coconut milk, and *masak sambal*. It is mildly toxic and has to be detoxified before consumption	
26.	*Njen Ipot ba'*	*Toxotes jaculatrix* (Pallas, 1767)	Sold fresh, oftenly cooked. Normally *Iban* and *Chinese consume it.*	
27.	*Njen Iron*	*Pomadasys sp.*	Sold fresh and commonly fried.	

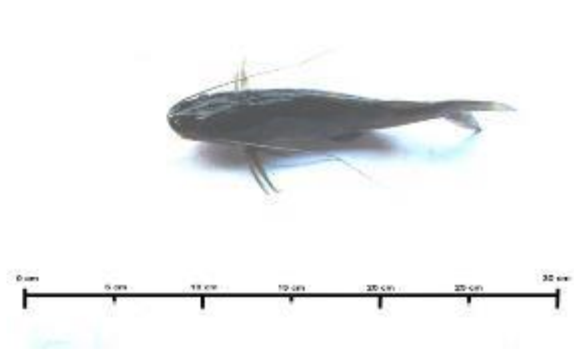
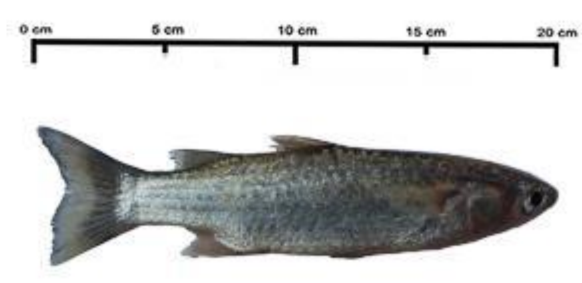
No.	Vernacular name	Scientific name	Uses	Pictures
28.	*Njen Iron mila*	*Lutjanus argentimaculatus* (Forsskål, 1775)	Sold fresh and commonly fried.	
29.	*Njen Jamah Beloqoq*	*Carangoides hedlandensis* (Whitley, 1934)	Caught by *panau* traditional fishing technique. Preparation of *umai,* commonly fried and cooked as *masak sambal.*	
30.	*Njen Jamah Beloqoq*	*Carangoides malabaricus* (Bloch & Schneider, 1801)	Sold fresh. Caught by *panau* traditional fishing technique. Preparation of *umai,* commonly fried and cooked as *masak sambal.*	

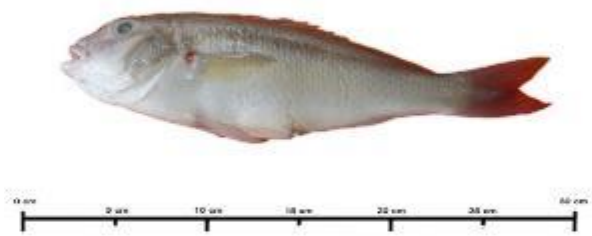
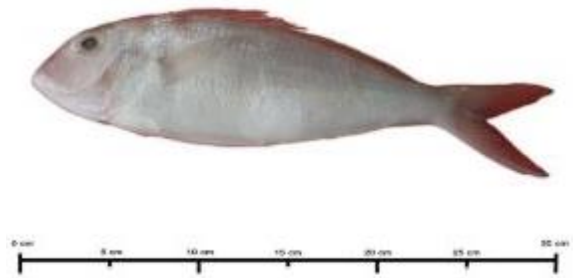
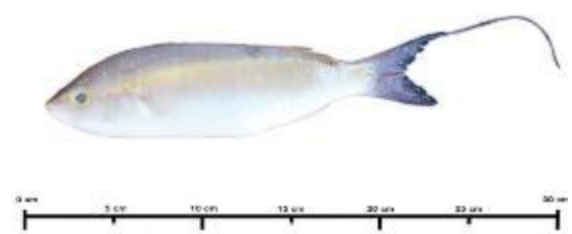
No.	Vernacular name	Scientific name	Uses	Pictures
31.	*Njen Jamah Iqoy Qunieng*	*Carangoides praeustus* (Anonymous [Bennett], 1830)	Sold fresh. Caught by *panau* traditional fishing technique. Preparation for *umai,* commonly fried and cook *masak sambal.*one of the favorite fishes of Ba'ie.	
32.	*Njen Jamah Kapek*	*Alectis indica* (Rüppell, 1830)	Sold fresh. Commonly cooked as curry.	
33.	*Njen Jamah Luleng*	*Carangoides coeruleopinnatus* (Rüppell, 1830)	Sold fresh, commonly cooked as curry with sliced chili.	

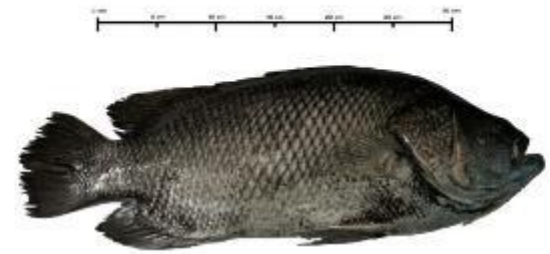
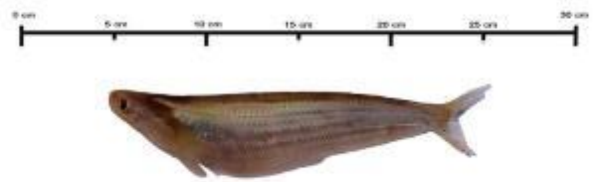
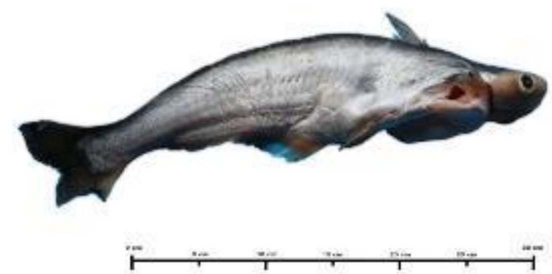
No.	Vernacular name	Scientific name	Uses	Pictures
34.	*Njen Jamah mapuq*	*Carangoides armatus* (Rüppell, 1830)	Sold fresh and dried. commonly cooked as curry with sliced chili.	
35.	*Njen Jamah panau*	*Atule mate* (Cuvier, 1833)	Sold fresh. Caught by *panau* traditional fishing technique. Preparation of *umai*. One of the favorite fishes of Ba'ie.	
36.	*Njen Jamah Seliday*	*Atule sp.*	Sold fresh. Caught by *panau* traditional fishing technique. Preparation of *umai*. One of the favorite fishes of Ba'ie.	

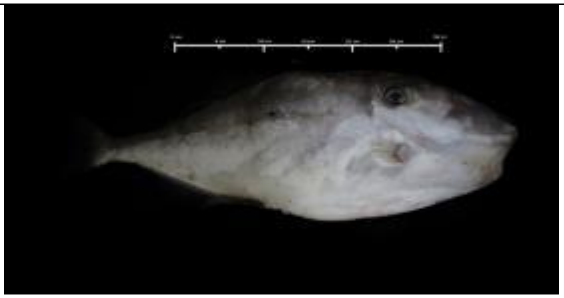
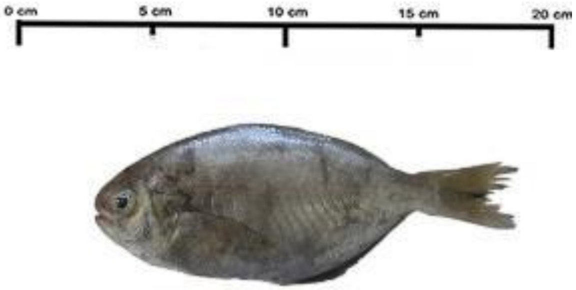
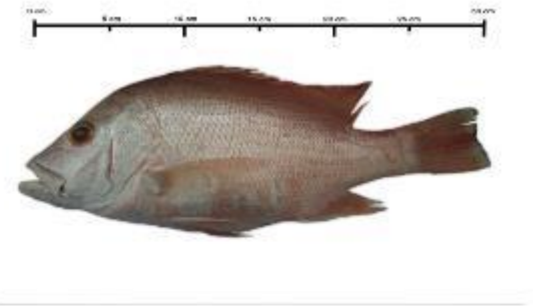
No.	Vernacular name	Scientific name	Uses	Pictures
37.	*Njen Jamah Sew*	*Caranx sexfasciatus* (Quoy & Gaimard, 1825)	Sold fresh. Caught by *panau* traditional fishing technique. Preparation of *umai*. One of the favorite fishes of Ba'ie.	
38.	*Njen Jayong*	*Coilia macrognathus* (Bleeker, 1852)	Sold fresh, dried, and salty. Commonly cooked after wrapping in banana leaves inside bamboo (*pansuh*).	
39.	*Njen Jolong*	*Strongylura strongylura* (van Hasselt, 1823)	Sold fresh. Commonly cooked as curry, steamed, and cooked with coconut milk.	

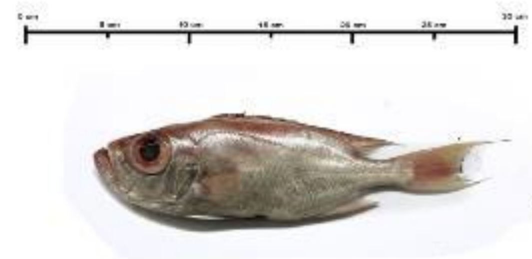
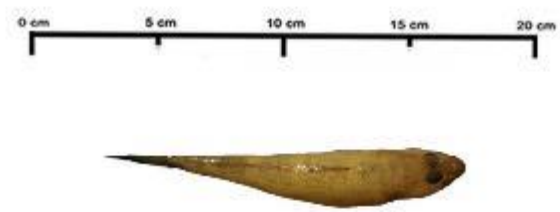
No.	Vernacular name	Scientific name	Uses	Pictures
40.	*Njen Kaci*	*Diagramma pictum* (Thunberg, 1792)	Sold fresh at around 5 MYR/ Kg. Often cooked due to its affordability.	
41.	*Njen Kaloy*	*Osphronemus goramy* (Lacepède, 1801)	Sold fresh, one of the favourite frsh water fishes. Commonly cooked as soup	
42.	*Njen Kejiken (1)*	*Hemibagrus nemurus* (Valenciennes, 1840)	Sold fresh, salty, and smoked. Commonly cooked as soups or in bamboo (*pansuh*).	

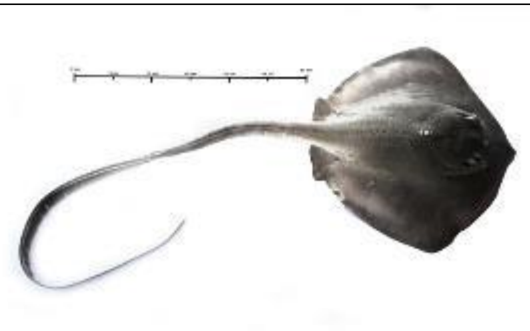
No.	Vernacular name	Scientific name	Uses	Pictures
43.	*Njen Kejiken (2)*	*Mystus gulio* (Hamilton, 1822)	Sold fresh, salty, and smoked. Commonly cooked as soups or in bamboo (*pansuh*).	
44.	*Njen Kelapa*	*Lactarius lactarius* (Bloch & Schneider, 1801)	Sold fresh and dried. Abundant and always available in market. Commonly fried or cooked with turmeric.	
45.	*Njen Kepburak*	*Liza vaigensis* (Quoy & Gaimard, 1825)	Sold fresh. Commonly fried and cooked as curry. Some people believe that asthma patients should not consume it.	

No.	Vernacular name	Scientific name	Uses	Pictures
46.	*Njen Kerisi (1)*	*Pristipomoides multidens* (Day, 1871)	Sold fresh. Commonly fried.	
47.	*Njen Kerisi (2)*	*Pristipomoides typus* (Bleeker, 1852)	Sold fresh. Commonly fried.	
48.	*Njen Kerisi (3)*	*Pentapodus setosus* (Valenciennes, 1830)	Sold fresh. Commonly fried.	

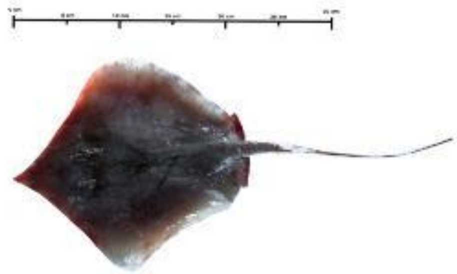
No.	Vernacular name	Scientific name	Uses	Pictures
49.	*Njen Lata'*	*Lobotes surinamensis* (Bloch, 1790)	Sold fresh. Head is the favorite part, commonly cooked as curry or spicy-sour curry. Some people also like to roast the fish.	
50.	*Njen Luey/ dai*	*Kryptopterus kryptopterus* (Bleeker, 1851)	Sold fresh. Commonly cooked without gut due to the high faecal content. Favorite fish of Chinese.	
	Njen Luey / dai	*Pseudolais micronemus* (Bleeker, 1846)	Sold fresh. Commonly cooked without gut. favorite of Chinese.	

No.	Vernacular name	Scientific name	Uses	Pictures
51.	*Njen Lupid*	*Aluterus monoceros* (Linnaeus, 1758)	Sold fresh. Needs special treatment to remove the skin before cooking. Commonly roasted.	
52.	*Njen Mapuq*	*Piaractus* sp.	Sold fresh. Commonly fried.	
53.	*Njen Mila*	*Lutjanus gibbus* (Forsskål, 1775)	Sold fresh. Pricey fish- around 45 MYR/kg. Commonly steamed, and particularly the head is cooked as curry.	

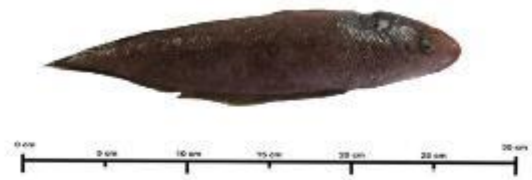
No.	Vernacular name	Scientific name	Uses	Pictures
54.	*Njen Mila Azeng mata*	*Priacanthus macracanthus* (Cuvier, 1829)	Sold fresh. Commonly fried, or cooked with turmeric. Has unique, yet corrupted name: *njen Uji Rashid* (Malaysian actress)	
55.	*Njen Ngeram*	*Setipinna melanochir* (Bleeker, 1849)	Sold fresh and wet salted (because it is oily). Preparation of *umai*.	
56.	*Njen Nyaked*	*Oxyeleotris* sp.	Rarely sold and infrequently consumed.	

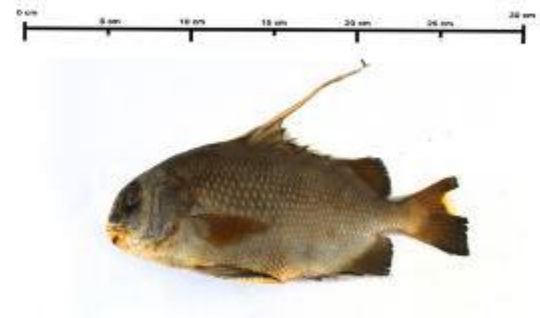
No.	Vernacular name	Scientific name	Uses	Pictures
57.	*Njen Nyaked rat*	*Platycephalus indicus* (Linnaeus, 1758)	Rarely sold and infrequently consumed.	
58.	*Njen Nyipa*	*Muraenesox cinereus* (Forsskål, 1775)	Sold fresh. Commonly steamed or fried.	
59.	*Njen Pai bendiraq*	*Pastinachus stellurostris* (Last, Fahmi & Naylor,2010)	Sold fresh or salted. Heart of the fish is highly priced. Commonly cooked as curry, roasted, or as *masak sambal*.	

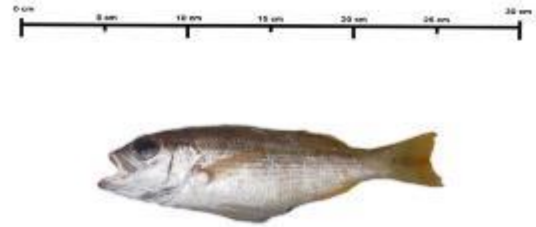
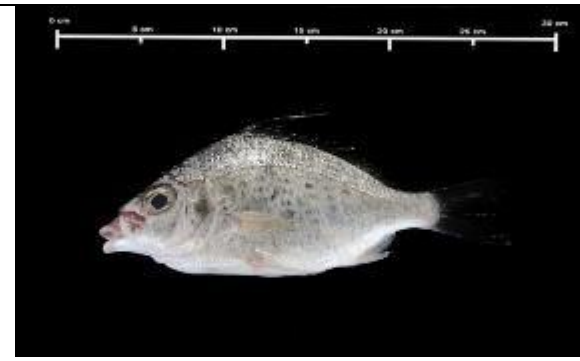
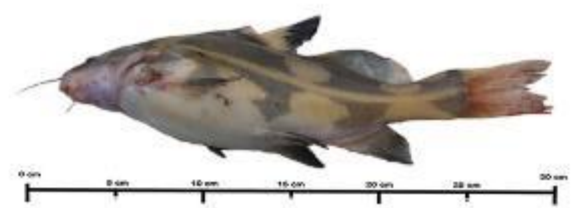
No.	Vernacular name	Scientific name	Uses	Pictures
60.	*Njen Pai Kebabeq*	*Gymnura poecilura* (Shaw, 1804)	Sold fresh or salted. Heart of the fish is highly priced. Commonly cooked as curry, roasted, or as *masak sambal*.	
61.	*Njen Pai Manuq*	*Rhinoptera javanica* (Müller & Henle, 1841)	Sold fresh or salted. Heart of the fish is highly priced. Commonly cooked as curry, roasted, or as *masak sambal*. The most favorite rays in Sarawak.	
62.	*Njen Pai Manuq titieq*	*Aetobatus ocellatus* (Kuhl, 1823)	Sold fresh or salted. Heart of the fish is highly priced. Commonly cooked as curry, roasted, or as *masak sambal*. The most favorite rays in Sarawak.	

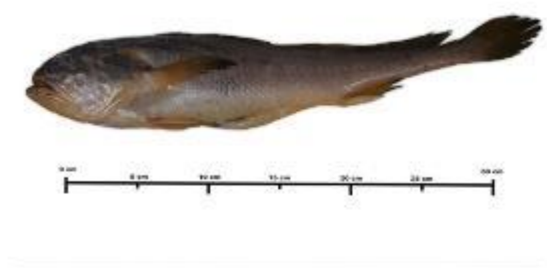
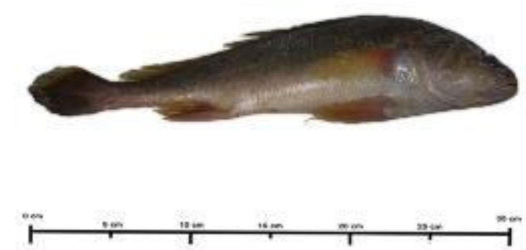
No.	Vernacular name	Scientific name	Uses	Pictures
63.	*Njen Pai minyak*	*Dasyatis zugei* (Müller & Henle, 1841)	Sold fresh or salted. Heart of the fish is highly priced. Commonly cooked as curry, roasted, and *masak sambal*.	
64.	*Njen Pai sureq*	*Himantura gerrardi* (Gray, 1851)	Sold fresh and salty. Heart of the fish highly priced. Commonly cooked as curry, roasted, or as *masak sambal*.	
65.	*Njen Pai tunggul*	*Himantura uarnacoides* (Bleeker, 1852)	Sold fresh or salted. Heart of the fish is highly priced. Commonly cooked as curry, roasted, or as *masak sambal*.	

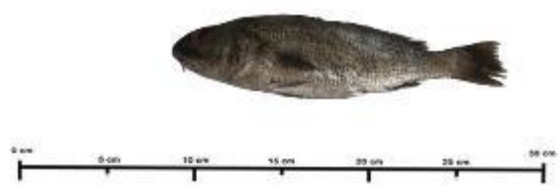
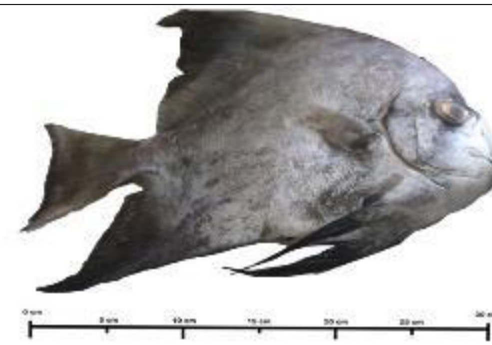
No.	Vernacular name	Scientific name	Uses	Pictures
66.	*Njen Pai (1)*	*Neotrygon kuhlii* (Müller & Henle, 1841)	Sold fresh and salty. Heart of the fish is highly priced. Commonly cooked as curry, roasted, or as *masak sambal*.	
67.	*Njen Pai (2)*	*Himantura lobistoma* (Manjaji-Matsumoto &Last, 2006)	Sold fresh or salted. Heart is highly priced. Commonly cooked as curry, roasted, or as *masak sambal*.	
68.	*Njen Papap (1)*	*Psettodes erumei* (Bloch & Schneider, 1801)	Sold fresh. Commonly steamed or as *masak sambal*.	

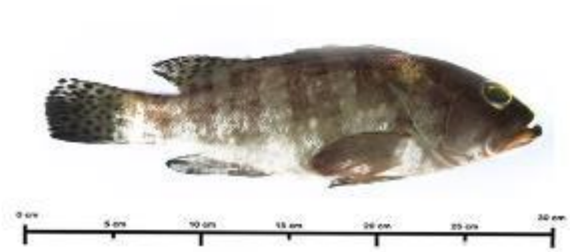
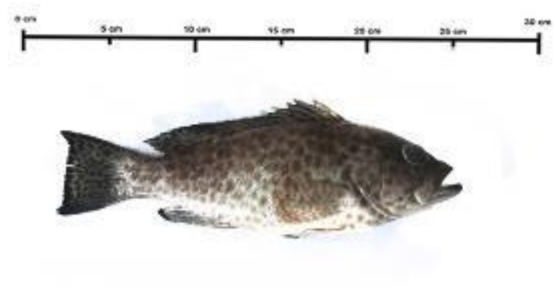
No.	Vernacular name	Scientific name	Uses	Pictures
69.	*Njen Papap (2)*	*Cynoglossus arel* (Bloch & Schneider, 1801)	Sold fresh. Commonly steamed or as *masak sambal*.	
70.	*Njen Patin*	*Pangasius hypophthalmus* (Sauvage, 1878)	Sold fresh, commonly cooked with *tempoyak* (preserved durian) or in bamboo (*pansuh*).	
71.	*Njen Perambang*	*Ilisha elongata* (Bennett 1830)	Sold fresh, dried, or salted. Commonly cooked as *masak sambal* or roasted.	

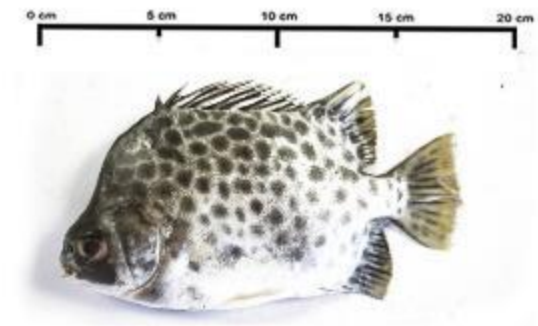
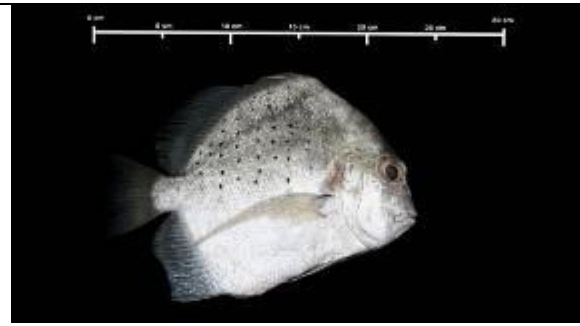
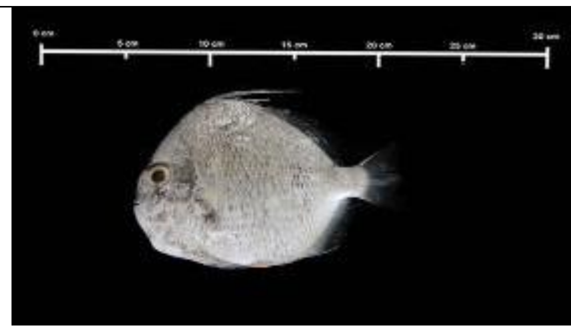
No.	Vernacular name	Scientific name	Uses	Pictures
72.	*Njen Perangiang*	*Chirocentrus dorab* (Forsskål, 1775)	Sold fresh or smoked. Preparation for *pipos* for consumption after giving birth.	
73.	*Njen Perechong*	*Proteracanthus sarissophorus* (Cantor, 1849)	Sold fresh. Usually fried.	
74.	*Njen Piras*	*Setipinna breviceps* (Cantor, 1849)	Sold fresh. Preparation of *umai*. The most favorite fish for making *umai*. Sometimes also fried.	

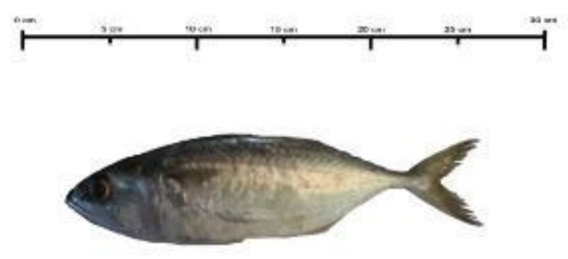
No.	Vernacular name	Scientific name	Uses	Pictures
75.	*Njen Pisang-pisang*	*Lutjanus madras* (Valenciennes , 1831)	Sold fresh. Commonly fried.	
76.	*Njen Pitin*	*Equulites leuciscus* (Günther, 1860)	Sold fresh. Commonly fried.	
77.	*Njen Puau*	*Leiocassis micropogon* (Bleeker, 1852)	Rarely sold and infrequently consumed. It is toxic and has to be detoxified.	

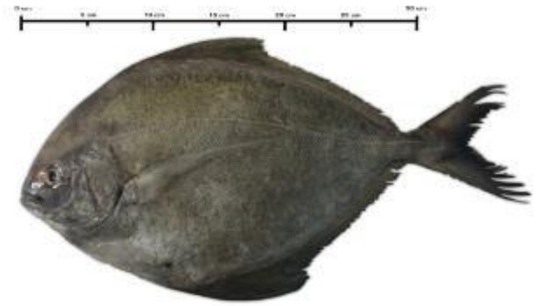
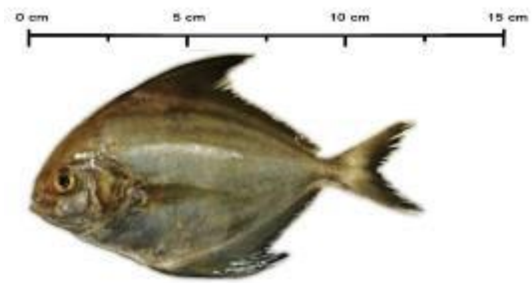
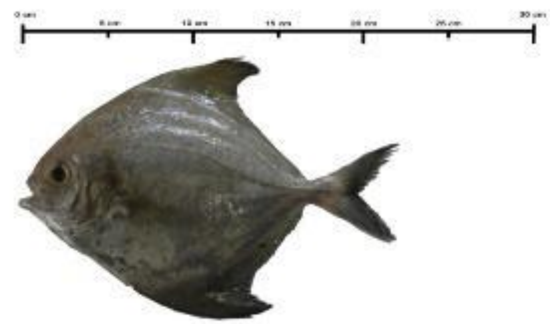
No.	Vernacular name	Scientific name	Uses	Pictures
78.	*Njen Puqoq*	*Otolithoides biauritus* (Cantor, 1849)	Sold fresh, dried or salted. Favorite fish; dried or salted, fried or cooked as curry.	
79.	*Njen Puqoq Bap*	*Panna perarmatus* (Chabanaud, 1926)	Sold fresh, dried or salted. Favorite fish for the Ba'ie people. Commonly fried or cooked as curry.	
80.	*Njen Puqoq buluh*	*Panna microdon* (Bleeker, 1849)	Sold fresh, dried, or salted. Favorite fish. Commonly fried or cooked as curry.	

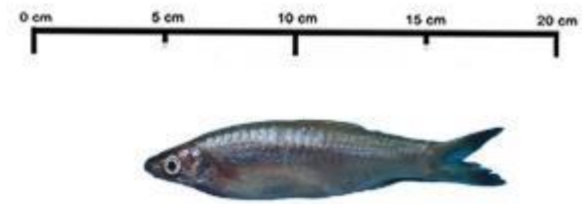
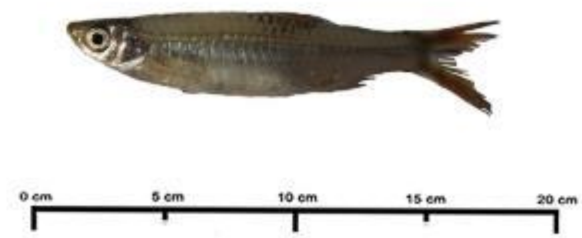
No.	Vernacular name	Scientific name	Uses	Pictures
81.	*Njen Puqoq jarang gigi*	*Chrysochir aureus* (Richardson, 1846)	Sold fresh, dried or salted. Favorite fish. Commonly fried or cooked as curry. The flesh is the thickest of all *puqoq*.	
82.	*Njen Puqoq mitem*	*Dendrophysa russelii* (Cuvier, 1829)	Sold fresh, dried or salted. Favorite fish. Commonly fried or cooked as curry.	
83.	*Njen Puran*	*Platax orbicularis* (Forsskål, 1775)	Sold fresh, commonly fried or cooked as curry.	

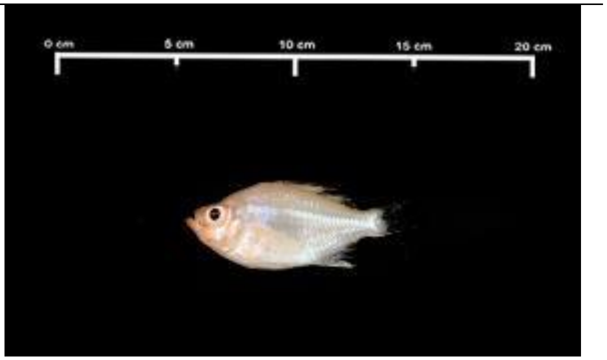
No.	Vernacular name	Scientific name	Uses	Pictures
84.	*Njen Qapau*	*Epinephelus sexfasciatus* (Valenciennes, 1828)	Sold fresh. Fish with one of the highest price tags; in huge demand for seafood restaurants. Commonly fried, *masak sambal,* or curry.	
85.	*Njen Qapau*	*Cephalopholis boenak* (Bloch, 1790)	Sold fresh. Fish with one of the highest price tags; in huge demand for seafood restaurants. Commonly fried, *masak sambal,* and curry.	
86.	*Njen Qapau*	*Epinephelus areolatus* (Forsskål, 1775)	Sold fresh. Fish with one of the highest price tags; in huge demand for seafood restaurants. Commonly fried, *masak sambal,* and curry.	

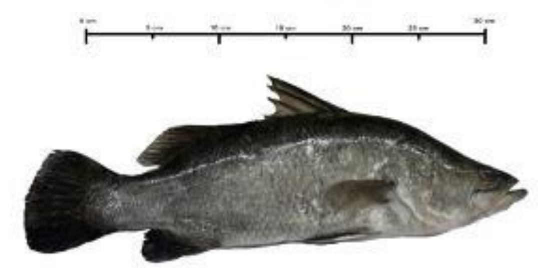
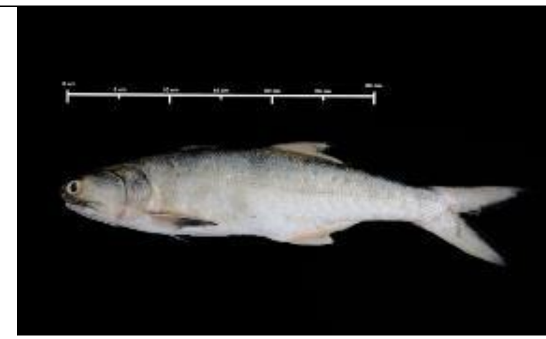
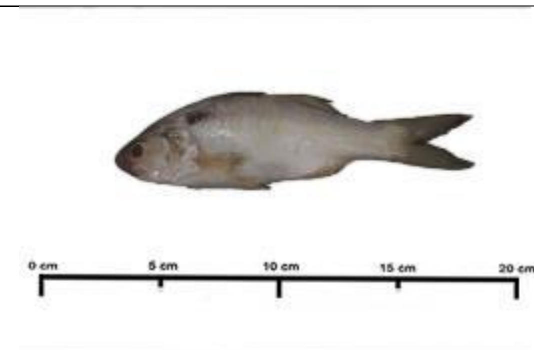
No.	Vernacular name	Scientific name	Uses	Pictures
87.	*Njen Qitang*	*Scatophagus argus* (Linnaeus, 1766)	Sold fresh. Commonly cooked as curry, spicy-sour, or sometimes cooked with coconut milk.	
88.	*Njen Qitang manai*	*Drepane punctata* (Linnaeus, 1758)	Sold fresh. Commonly cooked as curry, spicy-sour, or sometimes cooked with coconut milk.	
89.	*Njen Qitang re'du*	*Ephippus orbis* (Bloch, 1787)	Sold fresh. Commonly cooked as curry, spicy-sour, or sometimes cooked with coconut milk.	

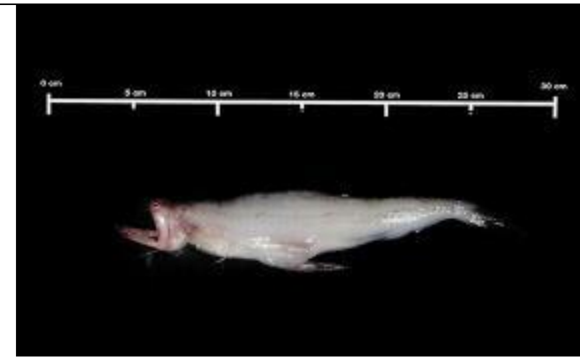
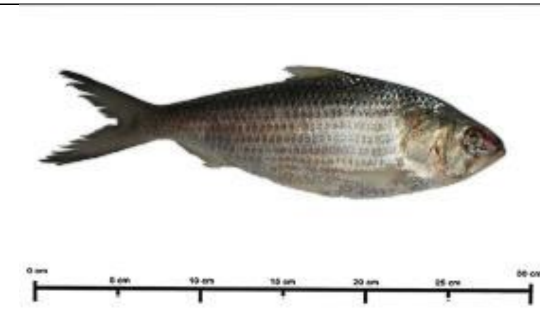
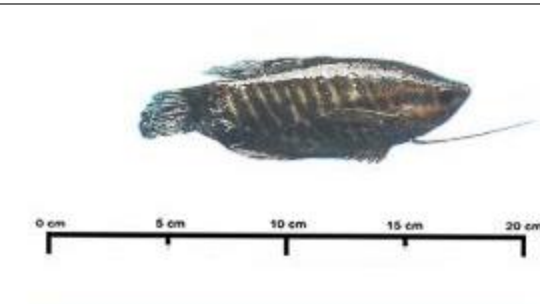
No.	Vernacular name	Scientific name	Uses	Pictures
90.	*Njen Quasi*	*Anodontostoma chacunda* (Hamilton, 1822)	Sold fresh. Commonly fried or cooked with turmeric.	
91.	*Njen Reman manai*	*Rastrelliger kanagurta* (Cuvier, 1816)	Sold fresh and salty. Commonly fried. Abundant and always available in markets.	
92.	*Njen Reman re'du*	*Rastrelliger brachysoma* (Bleeker, 1851)	Sold fresh and salty. Commonly fried. Abundant and always available in markts.	

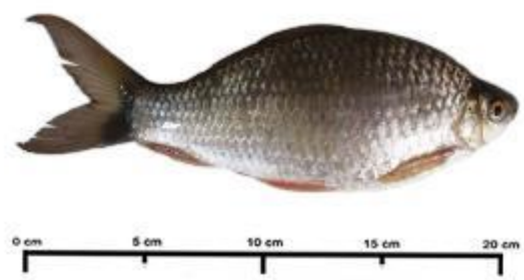
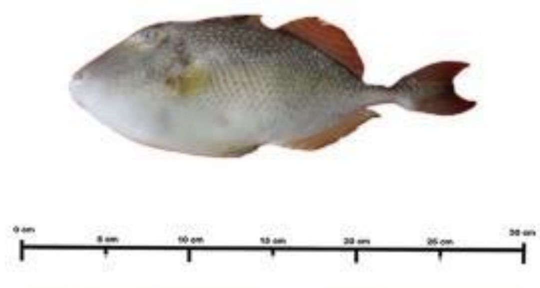
No.	Vernacular name	Scientific name	Uses	Pictures
93.	*Njen Ruay*	*Parastromateus niger* (Bloch, 1795)	Sold fresh, unaffordable fish around 20-35 MYR/ kg. It is given three names according to the life stages and size. Used to prepare *umai raway*. The stomach is used to prepare *tagik* (preserved in glass bottle).	
	Njen burus	*Parastromateus niger* (Bloch, 1795)	Sold fresh, common size of black pomfret. Commonly cooked as *masak sambal*, steam, or as wrap inbanana leaves.	
	Njen pelapi'	*Parastromateus niger* (Bloch, 1795)	Sold fresh, relatively difficult to find in markets. *pindang* (steamed and mixed with *tupie*)	

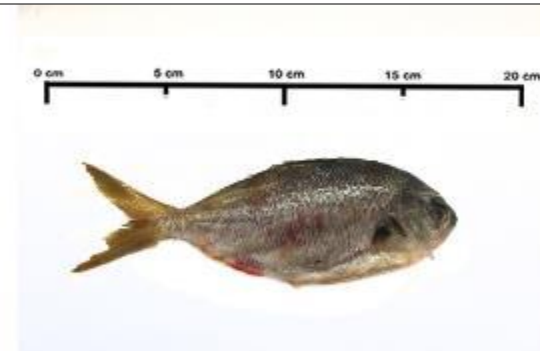
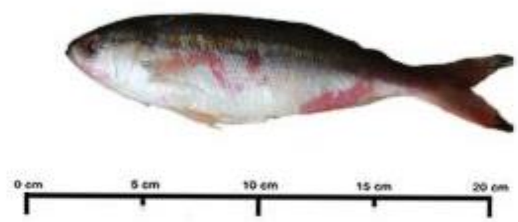
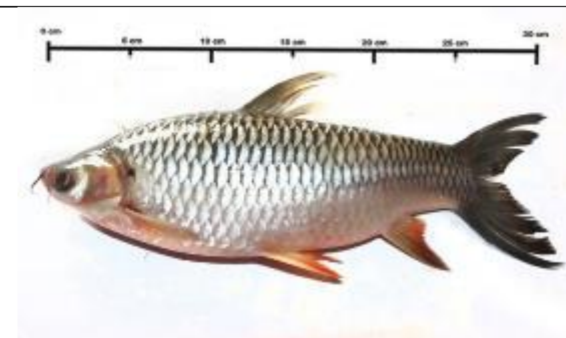
No.	Vernacular name	Scientific name	Uses	Pictures
94.	*Njen ruay mapuq*	*Pampus chinensis* (Euphrasen, 1788)	Sold fresh. Pricey fish around 20 MYR/kg. commonly fried, cooked as curry, or *masak sambal.*	
95.	*Njen Sebeled (1)*	*Rasbora* sp. 1	Sold fresh, commonly fried or fried as *cucur* (snacks)	
	Njen Sebeled (2)	*Rasbora* sp. 2	Sold fresh, commonly fried or fried as *cucur*	

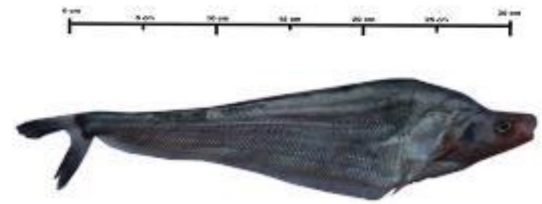
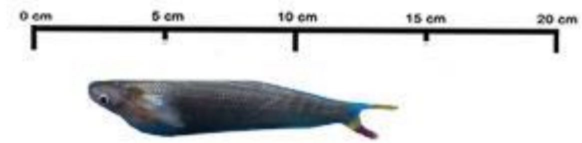
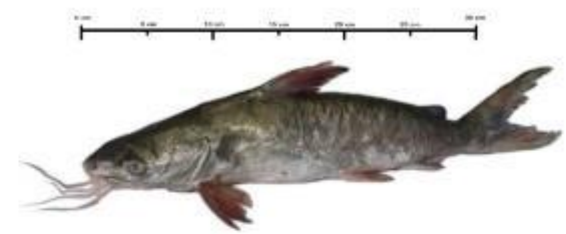
No.	Vernacular name	Scientific name	Uses	Pictures
96.	*Njen Selayar*	*Istiophorus platypterus* (Shaw, 1792)	Sold fresh. Un-affordable fish though frequently cought. Commonly fried or cooked as curry.	
97.	*Njen Selelung*	*Ambassia vachellii* (Richardson, 1846)	Sold fresh, dried, or smoked. Commonly fried.	
98.	*Njen Seleped*	*Ambassis nalua* (Hamilton, 1822)	Sold fresh, dried, or smoked. Commonly fried.	

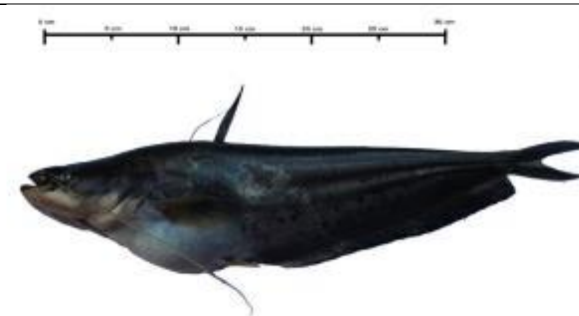
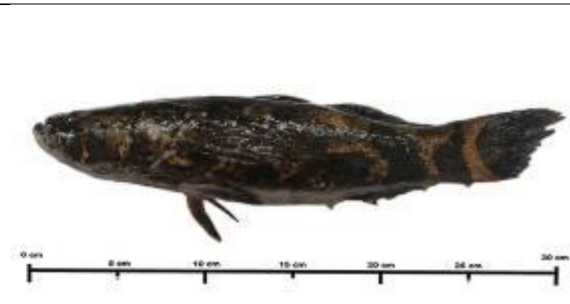
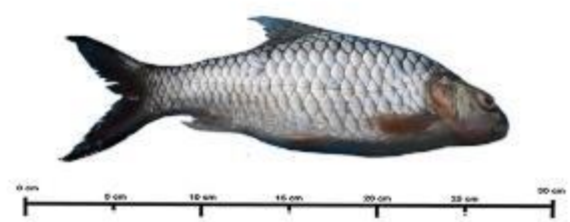
No.	Vernacular name	Scientific name	Uses	Pictures
99.	*Njen Selusong rat*	*Lates calcarifer* (Bloch, 1790)	Sold fresh. Unaffordable fish around 35 MYR/kg. Commonly steamed, head preferred and cooked as curry.	
100.	*Njen Senangin*	*Eleutheronema tetradactylum* (Shaw, 1804)	Sold fresh. Commonly cooked as curry, cooked with turmeric, or fried.	
101.	*Njen Senangin Tanda*	*Polydactylus sextarius* (Bloch & Schneider, 1801)	Sold fresh. Commonly cooked as curry, cooked with turmeric, or fried	

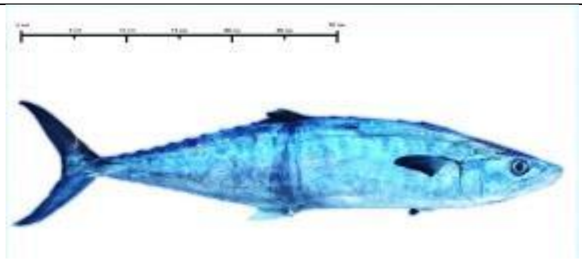
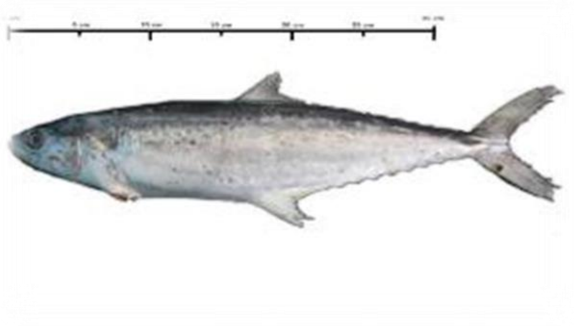
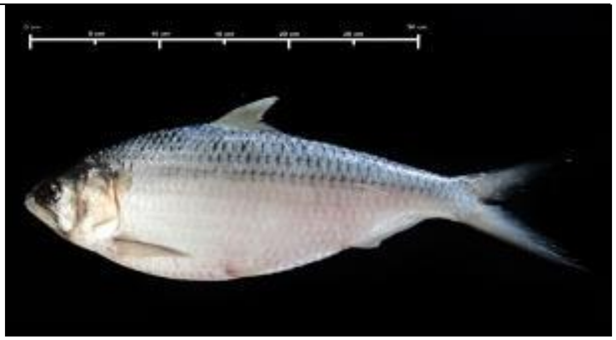
No.	Vernacular name	Scientific name	Uses	Pictures
102.	*Njen Sepelu'*	*Harpadon nehereus* (Hamilton, 1822)	Sold fresh. Commonly cooked as soups, fried as *cucur*, smoked, or boiled with ginger.	
103.	*Njen Sepered*	*Tenualosa macrura* (Bleeker, 1852)	Sold fresh or wet salted. Commonly fried or cooked as *masak sambal.*	
104.	*Njen Sepet*	*Trichopodus pectoralis* (Regan, 1910)	Sold fresh or sometimes alive. Commonly fried.	

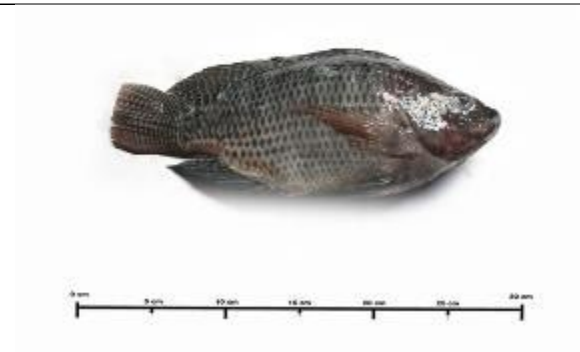
No.	Vernacular name	Scientific name	Uses	Pictures
105.	*Njen Seqael*	*Plotosus canius* (Hamilton, 1822)	Sold fresh. It is toxic and requires treatment before cooking. Commonly cooked with coconut milk, curry, or *masak sambal.*	
106.	*Njen Seruay*	*Barbonymus gonionotus* (Bleeker, 1849)	Sold fresh, commonly steamed and cooked as soup.	
107.	*Njen Sezau rat*	*Abalistes stellaris* (Bloch & Schneider, 1801)	Sold fresh, needs special treatment to remove the thick skin. Commonly roasted, cooked with coconut milk, or cooked as curry.	

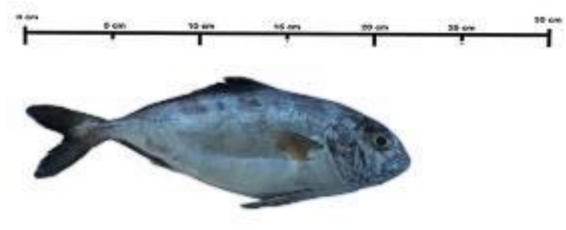
No.	Vernacular name	Scientific name	Uses	Pictures
108.	*Njen Sulet Kuning*	*Caesio cuning* (Bloch, 1791)	Sold fresh. Commonly fried or cooked with tumeric.	
109.	*Njen Sulet merah*	*Pterocaesio chrysozona* (Cuvier, 1830)	Sold fresh. Commonly fried or cooked with tumeric.	
110.	*Njen Sultan*	*Leptobarbus hoevenii* (Bleeker, 1851)	Sold fresh. Commonly steamed or cooked as soup.	

No.	Vernacular name	Scientific name	Uses	Pictures
111.	*Njen Supaq*	*Kryptopterus parvanalis* (Inger & Chin, 1959)	Sold fresh, unaffordable fresh water fish at 25 MYR/ kg. Commonly steamed or cooked as soups.	
	Njen Selesi (juvenile of supaq)	*Juvenile of Kryptopterus* parvanalis (Inger & Chin, 1959)	Sold fresh or commonly cooked as *cucur*.	
112.	*Njen Taoq*	*Osteogeneiosus militaris* (Linnaeus, 1758)	Sold fresh or smoked**.**	

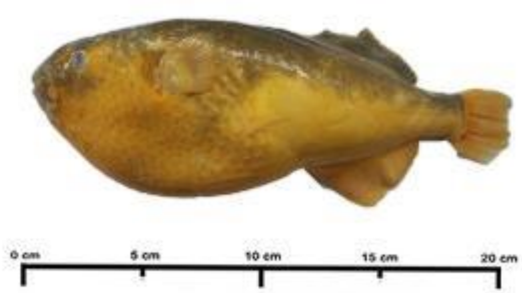
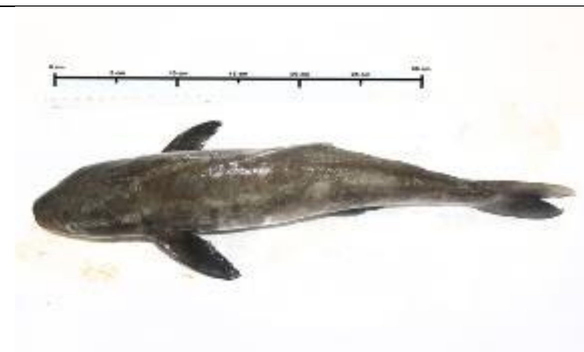
No.	Vernacular name	Scientific name	Uses	Pictures
113.	*Njen Tavai*	*Wallago leerii* (Bleeker, 1851)	Sold fresh. Commonly cooked inside bamboo (*pansuh*). Appears in the folklore connected with the origin of *Segan*.	
114.	*Njen Tebengor*	*Oxyeleotris marmorata* (Bleeker, 1852)	Sold fresh. Commonly found around settlement areas.	
115.	*Njen Tenges*	*Barbonymus schwanenfeldii* (Bl eeker, 1854)	Sold fresh, commonly steamed or cooked as soup. Sometimes also fried.	

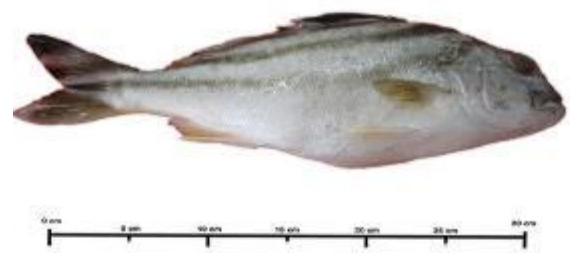
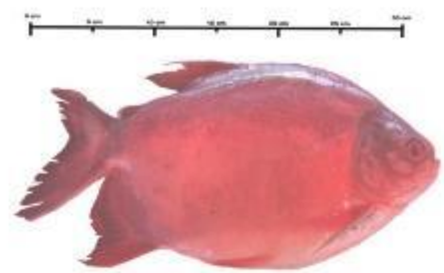
No.	Vernacular name	Scientific name	Uses	Pictures
116.	*Njen Tengiriq batang*	*Scomberomorus commerson* (Lacepède, 1800)	Sold fresh, smoked, or salted. Commonly fried, cooked with turmeric, or as curry. Preparation of *pipos* that is consumed after giving birth.	
117.	*Njen Tengiriq papan*	*Scomberomorus guttatus* (Bloch & Schneider, 1801)	Sold fresh, smoked, or salted. Commonly fried, cooked with turmeric, or as curry. Preparation of *pipos* that is consumed after giving birth.	
118.	*Njen Terupbok*	*Tenualosa toli* (Valenciennes, 1847)	Sold fresh or salted following Kuching culture. Commonly fried.	

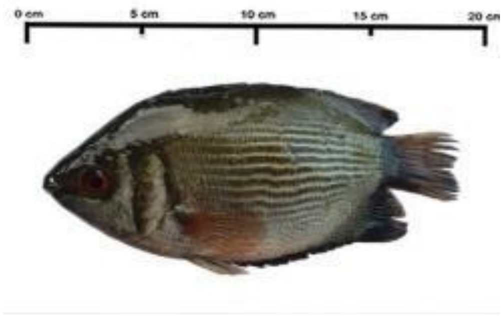
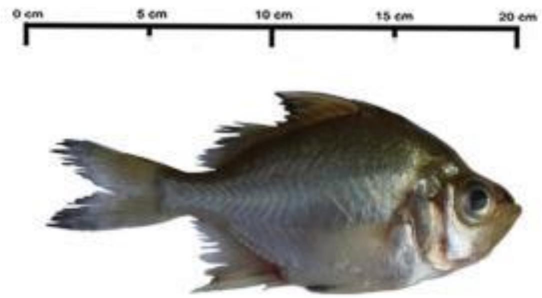
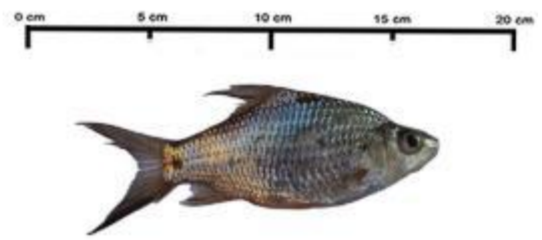
No.	Vernacular name	Scientific name	Uses	Pictures
119.	*Njen Tilan*	*Mastacembelus erythrotaenia* (Bleeker, 1850)	Sold fresh. Rarely consumed by Ba'ie people.	
120.	*Njen Tilapia Mila*	*Oreochromis* sp.	Sold fresh. Commonly fried.	
121.	*Njen Tilapia mitem*	*Oreochromis mossambicus* (Pet ers, 1852)	Sold fresh. Commonly fried.	

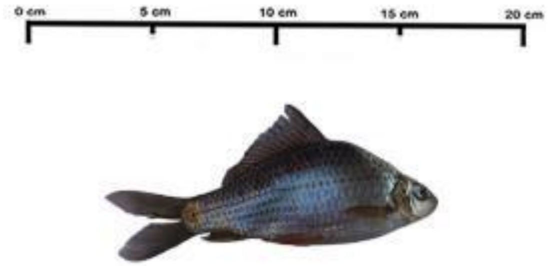
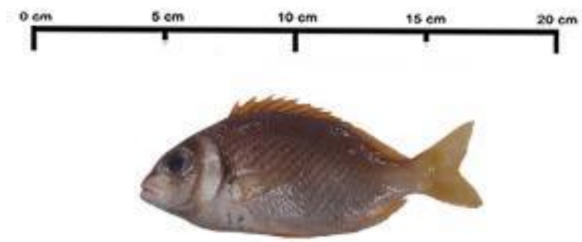
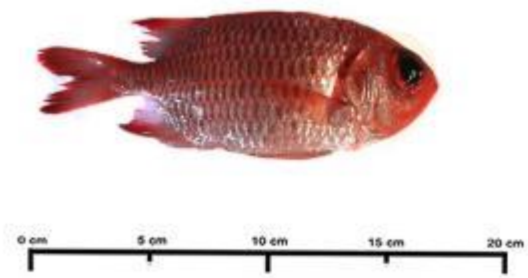
No.	Vernacular name	Scientific name	Uses	Pictures
122.	*Njen Timah Mapuq*	*Lepturacanthus savala* (Cuvier, 1829)	Sold fresh. Usually cooked as curry.	
123.	*Njen Timah Qunieng*	*Trichiurus lepturus* (Linnaeus, 1758	Sold fresh. Commonly cooked as curry.	
124.	*Njen Tiqas*	*Seriolina nigrofasciata* (Rüppell, 1829)	Sold fresh. Commonly fried, cooked as *masak sambal.*	

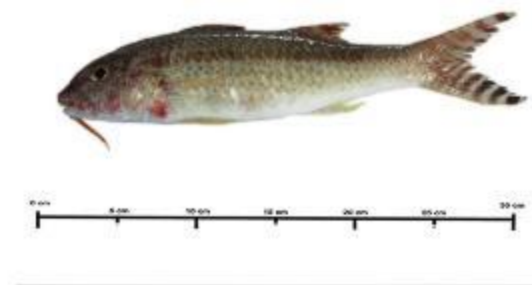
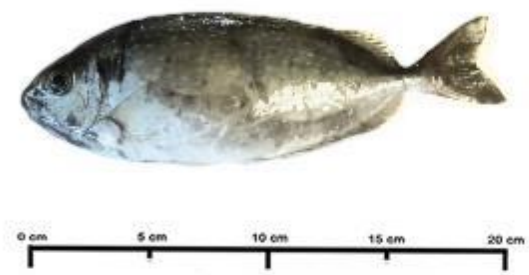
No.	Vernacular name	Scientific name	Uses	Pictures
125.	*Njen Tuqol*	*Euthynnus affinis* (Cantor, 1849)	Sold fresh or smoked. Commonly fried, cooked with turmeric, cooked as curry or with coconut milk. Abundant and always available in market.	
126.	*Njen Tuqol Mitem*	*Euthynnus sp.*	Sold fresh or smoked. Commonly fried, cooked with turmeric, cooked as curry or some times cooked with coconut milk. Abundant and always available in market.	
127.	*Njen Tuqol Selaseh*	*Auxis thazard* (Lacepède, 1800)	Sold fresh or smoked. Commonly fried, cooked with turmeric, cooked as curry or some times cooked with coconut milk. Abundant and always available in market.	

No.	Vernacular name	Scientific name	Uses	Pictures
128.	*Njen Tuqol Sisiq*	*Thunnus tonggol* (Bleeker, 1851)	Sold fresh or smoked. Commonly fried, cooked with turmeric, cooked as curry and some times cooked with coconut milk. Abundant and always available in market.	
129.	*Njen Tuted Kuning*	*Xenopterus naritus* (Richardson, 1848)	Sold fresh. Commonly cooked with turmeric or cooked as curry. It is toxic and requires special treatment before cooking.	
130.	*Njen Udun*	*Rachycentron canadum* (Linnaeus, 1766)	Sold fresh. Commonly cooked as *masak sambal* or cooked with turmeric.	

No.	Vernacular name	Scientific name	Uses	Pictures
131.	*Njen Ulau titoq*	*Datnioides polota* (Hamilton, 1822)	Sold fresh. Commonly consumed by *Iban* and sometimes reared as pet.	
132.	*Njen Uweng batu*	*Terapon theraps* (Cuvier, 1829)	Sold fresh; commonly steamed or boiled with ginger.	
133.	*Njen X1*	*Piaractus brachypomus* (Cuvier, 1818)	Sold fresh. Possibly introduced fish. unknown in Ba'ie culture.	

No.	Vernacular name	Scientific name	Uses	Pictures
134.	*Njen X2*	*Helostoma temminckii* (Cuvier, 1829)	Sold fresh. Unknown in Ba'ie culture.	
135.	*Njen X3*	*Parambassis* sp.	Sold fresh. Unknown in Ba'ie culture.	
136.	*Njen X4*	*Cyclocheilichthys apagon* (Valenciennes, 1842)	Sold fresh. Unknown in Ba'ie culture.	

No.	Vernacular name	Scientific name	Uses	Pictures
137.	*Njen X5*	*Osteochilus microcephalus* (Valenciennes, 1842)	Sold fresh. Unknown in Ba’ie culture.	
138.	*Njen X6*	*Lutjanus* sp.	Sold fresh. Unknown in Ba’ie culture.	
139.	*Njen X7*	*Myripristis hexagona* (Lacepède, 1802)	Sold fresh. Unknown in Ba’ie culture.	

No.	Vernacular name	Scientific name	Uses	Pictures
140.	*Njen X8*	*Upeneus tragula* (Richardson, 1 846)	Sold fresh. Unknown in Ba’ie culture.	
141.	*Njen X9*	*Siganus canaliculatus* (Park, 1797)	Sold fresh. Unknown in Ba’ie culture.	

Summary

The Ba'ie folklore shows the cultural importance accorded to the *duyan* (*Durio zibethinus* L.) fruit. Other folklores such as the name reason for 'Vaie Segan' also show the relation between Ba'ie people and the history of the place in relation to the fishing culture. In the Ba'ie culture, *balau* (*Metroxylon sagu* Rottb.) seems to be of high cultural importance, mainly because of its indirect connection to the Ba'ie culture. *Balau* seems to be the secret behind the successful fishing culture, as its product helps in overcoming sea sickness. Nine out of 141 fishes were not identified in the Ba'ie culture indicating their recent introduction into Ba'ie ecosystem and culture. Apart from use as food, the Ba'ie Segan people also use five fishes for medicinal purposes. The study also notes that four fishes have been identified by the community as toxic, and people have developed appropriate TK to detoxify them. *Njen tavai* [*Wallago leerii* (Bleeker, 1851)] is of high cultural importance to the people as it is closely related with the legend of origin of *Segan*. The story of *segan* and its misinterpretation highlights the need for usage of appropriate language to interpret the names in non-ethnocentric perspective.

Chapter 6 Ba'ie ethnotaxonomic and nomenclatural system of fishes

Introduction

General principles in ethnotaxonomic systems of the world proposed by Berlin et al. (1973) has provided a broad framework to understand the ethnotaxonomic (folk classification) and nomenclatural systems of biological diversity in indigenous communities. Derived using both traditional knowledge (TK) mechanisms (morphology, ecology, utility, and chemical compounds), as well as linguistic mechanisms (metaphors and metonymies), these systems are meeting grounds of both TK and indigenous languages (Evans 1997; Turpin 2013; Franco and Narashiman 2009; Kakudidi 2004). This study has recorded a total of 141 fish species and also elucidated the TK and linguistic mechanisms behind their names. There are nine fishes which are unknown in the Ba'ie culture; although these fishes were available in markets, during interviews, participants could not recognise them. They are: *Myripristis hexagona* (Lacepède, 1802), *Upeneus tragula* (Richardson, 1846), *Siganus canaliculatus* (Park, 1797), *Piaractus brachypomus* (Cuvier, 1818), *Helostoma temminckii* (Cuvier, 1829), *Parambassis* sp., *Barbonymus schwanenfeldii* (Bleeker, 1854), *Osteochilus microcephalus* (Valenciennes, 1842), and *Lutjanus* sp. It could be safely assumed that these fishes might have been introduced recently and the Ba'ie people were not consuming them traditionally. Apart from that, 92 out of 141 names were un-analysable primary lexemes simply referring to the genera of fishes. There are also four unknown meanings for the secondary lexemes that are supposed to describe the higher taxa to which the category is affiliated (Berlin et al. 1973). The unknown meanings of these fishes could be considered as indicative as the loss of TK among Ba'ie people.

6.1 Transcription of Ba'ie fish names

Studies in folk languages have become difficult to document, as indigenous communities do not have the transcription guidelines and annotation of their own spoken language. A words list book of Ba'ie language without any standard transcription of Ba'ie language has been published by Dewan Bahasa dan Pustaka Kuala Lumpur in 2014. Similarly, Kamus Ibrahim (Saad 1971), a manual published by Encik Ibrahim bin Saad too did not have adequate transcriptions. This makes works written in Ba'ie language susceptible to confusion and misunderstanding with respect to pronunciation as well as consistency of words.

Asmah (1983) had identified 20 consonants, six vowels, and five diphthongs occurring in the Ba'ie language. Whereas, Blust (1974) has mentioned 23 consonants, four vowels, and five diphthongs. In 1992, Ghani (1992) documented 23 consonants, seven vowels, and five diphthongs from the Ba'ie language. It was not possible for this study to provide a general understanding of the Ba'ie phonemes, due to the limitation of words used as fish names. However in this study, transcription of the Ba'ie fish name is provided to help both the Ba'ie people as well as the academic community to define and conduct research related to the Ba'ie language and TK. Using International Alphabetic Standard (IPA), the transcriptions of Ba'ie fish names follows the work of Ghani (1992) (Appendix 3).

6.2 Classification of Ba'ie living things

The Ba'ie people classify their living things using the Unique Beginner terms such as *te'dai* (plants) and *semeszav* (animal). The word *te'dai* refers to plant (noun) as well as grow (verb). The younger generation confuse between both applications of the word *te'dai*, and have begun using the term *te'dai mene'dai* which denotes *tumbuh-tumbuhan* (a group of plants) in Malay. Reduplication is rarely found in Ba'ie language, and this mechanism is probably picked up from standard Malay which uses the mechanism to form new words, convey plurality, and intensification (Nadarajan 2006). In this example, youngsters try to define plants using *te'dai* (singular) and its reduplication *te'dai mene'dai* to form the plural form.

Documenting the term *semesav* (animal) required considerable efforts from the researcher. For more than three fourth of field work in Bintulu, the animal kingdom was named with *haiwan* by the elders and youngers. *Haiwan* is the word from standard Malay meaning 'group of animals', and the Ba'ie language, at this stage seemed to lack a proper Unique Beginner term. Participants generally recalled cat as *seng*, fowl as *sezau*, and deer as *pazau*. However when the question comes to recalling the unique beginner term for animals, participants tend to recall the category below the unique beginner level, mostly the Genera. Participants' ability to recall from memory a word shows their familiarity with it, as well as its importance and salience in their culture. Only the continuous and appropriate utilisation and practice of language could conserve the word in the human thought process (Newman and Ratliff 2001).

Eventually, an interview with Encik Kapeh bin Hosen lead the researcher to the word *semesav* which is the Ba'ie equivalent for Unique Beginner. Encik Kapeh is an 81 years old elder from Bintulu, of Bruneian-Ba'ie parentage. However he is popular for high proficiency in Ba'ie and its culture. The study of Newman and Ratliff (2001) suggest that at times, the last speakers of a language may not be the original members of the community. Individual desire and support from social group are important factors determining language vitality and one's own affinity towards a given language. And it is not surprising to note that in some cases, the last speakers of languages are known to be multilingual.

It was challenging to elucidate the Ba'ie categorisation of living things. Apart from the limitation on the source of knowledge, the elders seemed uncertain while explaining the classification system. Two elders stated that they never asked their parents about how the Ba'ie people classify plants and animals which is not a surprise as categorisation is a natural phenomenon where an individual acquires it spontaneously without realisation. Elders had differing opinions that the animals were classified based on the size into *azeng* (big) and *disiq* (small), or on the basis of kinship relationships such as brother, sister, and family to determine the groups. *Azeng* animals include *sapiq* (cow) and *pazau* (deer) whereas *seng* (cat) and *sezau* (chicken) are included in the *disiq* animal category. Likewise, the classification of *njen* (fish), also included *azeng* fishes and *disiq* fishes. The elders could not confirm the level of classification of living things further.

This study also came across four unknown meanings in secondary lexeme for the fish names *qeret ba'em*, *jamah sew*, *jamah seliday*, and *jamah luleng*. *Qeret* is the life form of shark, whereas *jamah* refers to *Carangidae*. During interviews, participants were able to distinguish these fishes from others using the life form or generic epithets (*qeret* and *jamah*), yet did not know the meanings behind the name. Conceptualization and categorisation of living things are the basic knowledge required for species management, derived from the relationship between human beings and the living things over a long period of time. For instance, the classification system of rain forests of the *Riberenos* community in Peruvian Amazonia has helped the community to conserve the Amazonia rain forest, inventory it, as well as manage the wildlife (Halme and Bodmer 2006). Likewise, a recent study from Ghana shows the Akan bird nomenclature is as efficient as the formal nomenclatural system and can be utilised for planning conservation of birds (Deikumah, Konadu, and Kwafo 2015).

6.3 TK mechanisms used by Ba'ie people to name and classify their fishes

This study comes across four TK based mechanisms viz., ecological, morphological, quality, and utility used by the Ba'ie people to name their fishes (Kakudidi 2004). Ecological mechanisms used refer to the distribution or the abundance of the species. Morphological features include structure, forms, colours, and any other shape of the species. Quality refers to features that are characteristic to, but yet difficult to be explain such as taste, sound, etc. Utility signifies the use value attached to a particular taxa by human beings. A total of 141 taxa have been reported using ecological (8), morphological (50), quality (6), and utility (1) mechanisms (Appendix 3).

Ecology

In the Ba'ie culture, eight fishes are named on the ecological basis, directly referring to the natural resources. There are eight names recorded in the study:

(1) *Qeret karang* [*Atelomycterus marmoratus* Anonymous [Bennett], 1830)]

Qeret means shark (genus) and *karang* means coral (species), this *qeret* is found among corals.

(2) *Aked* [*Saurida tumbil* Bloch, 1795)].

Aked means 'stick to something'; a fish attached to the substratum.

(3) *Nyaked* (*Oxyeleotris* sp.)

Nyaked is similar to *aked,* but means 'attached to something'.

(4) *Nyaked rat* [*Platycephalus indicus* (Linnaeus, 1758)]

Rat (sea); marine fish attached to something

(5) *Bulan sungai* [*Tenualosa macrura* (Bleeker, 1852)]

Bulan means moon and *sungai* means river; a riverine species belonging to the *Bulan* Genera.

(6) *Selusong rat* [*Lates calcarifer* (Bloch, 1790)]

Selusong is the genus name; marine species of the genus *Selusong*.

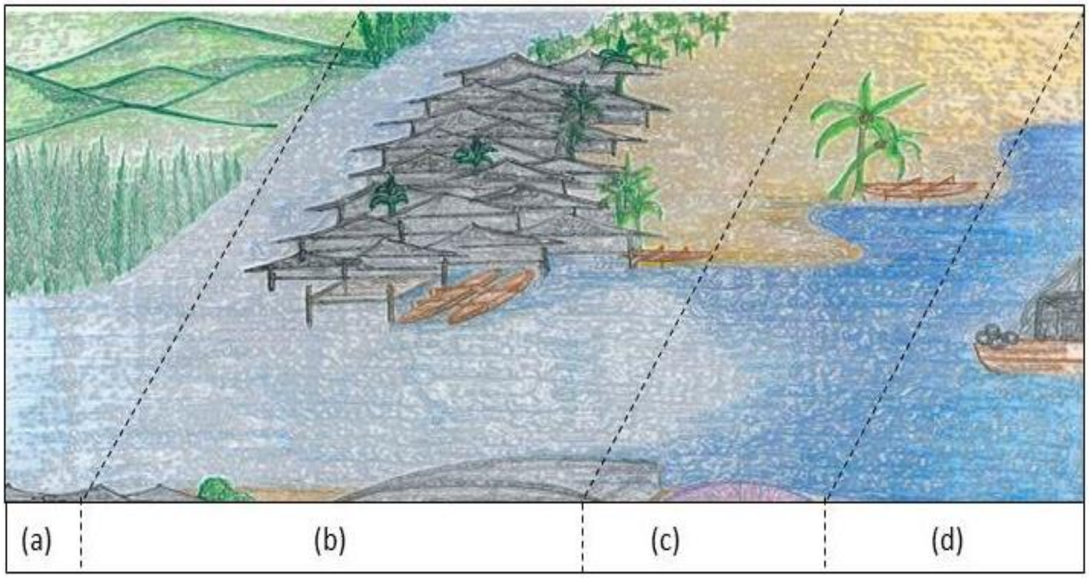
(7) *Sezau rat* [*Abalistes stellaris* (Bloch & Schneider, 1801)]

Sezau means fowl; marine fowl

(8) *Uweng batu* [*Terapon theraps* (Cuvier, 1829)]

Uweng is the genus name and *batu* means reef; a reef species of the uweng genus

The Ba'ie recognise four aquatic ecosystems (Figure 6.1) such as *uut* (upstream of river), *paya* (estuarine), *rat* (sea) and *laot dalam* (Ocean) as well as four ecological niches such as *karang* (coral), *rat* (sea), *sungai* (river), and *batu* (reef). These names indicate the availability of fishes in their habitat. A fish available in any of these niches would be tagged with the corresponding epithet. Naming on the basis of ecology showcases the detailed traditional ecological knowledge involved in labelling (Silvano, do Amaral, Oyakawa 2000).



(a) *uut*; (b) *paya*; (c) *rat*; and (d) *laot dalam*

Figure 6.1 Author's rendering of the Aquatic ecosystem categories of Ba'ie people

Morphology

According to Hunn (1982), morphological characters such as colour and size are encoded in an organism's salience. Morphological categories have become easy sources of recognition and classification among groups of *Mugilidae, Serranidae, Pomatomidae, Scombridae, and Scianidae* in Atlantic forest coast in Amazon (Begossi et al. 2008). Ba'ie people use colour, size and resemblance to other entities to name their fish diversity. Fifty fish species have been named on the basis of their morphological characters. *Mila* (red), *mitem* (black), *qunieng* (yellow), and *mapuq* (white) are the most used colour terms in fish names. Sometimes they also use other unrelated elements to highlight the colour. Example: *njen kelapa* [*Lactarius lactarius* (Bloch & Schneider, 1801)], where *kelapa* (coconut) is used to highlight the white colour of the fish.

Qeret ta'del [*Sphyrna lewini* (Griffith & Smith, 1834)], *njen nyipa* [*Muraenesox cinereus* (Forsskål, 1775)], *njen pai manoq titieq* [*Aetobatus ocellatus* (Kuhl, 1823)], *njen selayar* [*Istiophorus platypterus* (Shaw, 1792)] are some examples of using unrelated elements to highlight the morphological characters. *Ta'del* is one unique aspect of the Melanau culture, where two stems used to be tied with rope on the front and back sides a girl child's head to flatten her head. The community believed that a girl with flat head is pretty. Although this culture is not followed anymore, *Qeret ta'del* shows the cultural importance of 'flat head' among Melanau people and, how it is reflected in the folk taxonomy of fishes. Other living things such as *nyipa* (snake) and *kepbabeg* (butterfly) have also been used in fish names, on the basis of the similarity in appearance (Fig. 7.2) Non-living things are also used by Ba'ie people to name fishes such as *njen selayar* [*Istiophorus platypteru* (Shaw,1792)] and *njen jamah qapek* [*Alectis indica* (Rüppell, 1830)]. *Selayar* means sail and *qapek* means axe. People from Sarawak and Indonesia generally refer to the fish *Istiophorus platypterus* (Shaw, 1792) by the Malay term *layaran pasific* (Malay), *layar* (Sarawak), *layaran* (Indonesia) that has the same meaning as *selayar* in Ba'ie. *Alectis indica* (Rüppell, 1830) has a distinguishable head profile and a dorsal region that is more curved than the ventral, as a result of which the head and body profile resemble an axe.

(a) *(b)*

Fig 7.2 (a) *njen nyipa* [*Muraenesox cinereus* (Forsskål, 1775)] and (b) *njen pai kepbabeg* [*Gymnura poecilura* (Shaw, 1804)]

Ba'ie people use *re'du* (female) and *manai* (male) words to differentiate two different species that are similar in appearance. *Re'du* represents round and big shape while *manai* is used to refer to a oval and sturdy profile. For example, *njen reman re'du* [*Rastrelliger brachysoma* (Bleeker, 1851)] and *njen reman manai* [*Rastrelliger kanagurta* (Cuvier, 1816)]; *njen qitang re'du* [*Ephippu orbis* (Bloch, 1787)] and *njen qitang manai* [*Drepane punctata* (Linnaeus, 1758)]. Similarly, a case study in Maltese Island showed the usage of male and female words to distinguish two closely related plant species (Santayana, Pieroni, and Puri 2010). The authors give an example of *xpakkapietra* taxa that refer to six unrelated species. The community recognises male *xpakkapietra* as one with elongated prostate stem, whereas female *xpakkapietra* is bushy. In traditional medicine, these symbols indicate the utilitarian factor; male *xpakkapietra* is used for curing blood diseases and female is used to cure urine related diseases. Ellen (2004) reports that gender identity used in ethnotaxonomic system of Nuaulu community is a reflection of the direct relationship between culture and nature. However, according to Descola and Pálson (2004), although it is shown to be important in some communities, it may not be important for others. Using gender for naming a species and the precise mechanisms is not yet fully understood, and the available evidences as of now do not support a universal pattern.

Quality

Six fishes have been named using the mechanism of 'quality' *njen bengetot* [*Ilisha pristigastroides* (Bleeker 1852)], *njen ipot ba'* [*Toxotes jaculatrix* (Pallas, 1767)], *njen pai manoq* [*Rhinoptera javanica* (Müller & Henle, 1841)], *njen pai manoq titieq* [*Aetobatus ocellatus* (Kuhl, 1823)], *njen pai tunggul* [*Himantura uarnacoides* (Bleeker, 1852)], and *njen luey* or *njen da'i* [*Pseudolais micronemus* (Bleeker, 1846)]. When *Ilisha pristigastroides* (Bleeker 1852) is caught, it makes a 'tot' sound, which is used to distinguish it from other fishes. Fisherman who usually hook or net this fish in the traditional manner could hear this sound, as they get an opportunity to catch it alive. Nowadays, fishermen mostly use bottom trawls where a large and heavy net is dragged on the sea floor for several days, leading to depletion of fish stock. If *Ilisha pristigastroides* (Bleeker 1852) is caught and found in dead condition, the 'tot' sound can be observed. Thus, bottom trawling is not only harmful for the ecosystem and biodiversity, but also degrades the traditional knowledge on the fish.

Njen ipot ba' [*Toxotes jaculatrix* (Pallas, 1767)] is common estuarine fish in Kemena river that preys on insects by blowing an 'arrow' of water from its mouth. *Ipot* means coconut fibre and *ba'* means water; Ba'ie people could not explain the relation between coconut fibre and the fish, but define *ipot* as the sound produced when water is shot. Swimming style is also used to name *njen pai manoq* [*Rhinoptera javanica* (Müller & Henle, 1841)] and *njen pai manoq titieq* [*Aetobatus ocellatus* (Kuhl, 1823)], as these rays swim like *manoq* (bird). *Njen pai tunggul* [*Himantura uarnacoides* (Bleeker, 1852)] has very a hard tail with thorns like *tunggul* (stumps). And the *njen luey* or *njen da'i* [*Pseudolais micronemus* (Bleeker, 1846)] feeds on *da'i* or *tahi* which means shit. Newmaster et al. (2006) has classified those examples under behavioural mechanism and argue that this mechanism is produced as a result of long term historical relationship between human beings and animal/plants.

Utility basis

Only one name is noted to be coined using utility mechanism: *Jamah panau* [*Atule mate* (Cuvier, 1833)] which means 'fish of the genus of *jamah* that is caught by *panau* technique'.

6.4 Lexical semantics of Ba'ie fish names

Evans (1997) proposed the term sign metonymies to represent the polysemy mechanism used by an indigenous community of Australia to name the flora and fauna. The phenomenon arises when lexemes denoting a different entity/phenomenon are used to name a plant or animal. This mechanism could be divided into homonymy, valuable parallel pattern, metaphor, metonymy, and more complex connections (Evans 1997). Recently, Turpin (2013) had identified the semantic extension in *Kyetetye* flora fauna terms, and highlighted many difference types of metaphor and metonymy. The lexical semantics of Ba'ie fish names have been elucidated by using both Evans (1997) and Turpin (2013) as models (Appendix 3).

Metaphor in Ba'ie fish names

In the Ba'ie fish taxonomy, a total 17 fishes were found to be named on the basis of their resemblance with other entities including animals, and inanimate objects. According to Turpin (2013), visual metaphors are based on the visual similarity of the denotatum with some others species or things. In Ba'ie, the visual metaphors are mostly based on the shape, colour, and behaviour.

Shape based metaphor

Twelve out of the seventeen species were named on the basis of their similarity to animals, as in examples (1-4). In the other examples, metaphorical names arise on the basis of the resemblance with the other inanimate objects, mostly related to fishing.

(1) *Chiloscyllium punctatum* (Müller & Henle, 1838) is known as *qeret teteq asang mapuq* (*qeret*=shark, *teteq*=lizard *asang*=gills *mapuq*=white). The fish is shaped like a lizard.

(2) *Gymnura poecilura* (Shaw, 1804) is known as *njen pai kebabeq* (*njen*= fish, *pai*= fish, *kebabeg* (butterfly). The fish resembles a butterfly.

(3) *Muraenesox cinereus* (Forsskål, 1775) is known as *njen nyipa* (*njen*= fish, *nyipa*= snake). The fish shape resembles a snake.

(4) *Abalistes stellaris* (Bloch & Schneider, 1801) is called as *njen sezau rat* (*njen*= fish, *sezau*= chicken, *rat*= sea). The fish mouth resembles fowl and is commonly found in the sea.

(5) *Sphyrna lewini* (Griffith & Smith, 1834) is called as *qeret te'dal* (*qeret*= shark, *te'dal*= flatted head). The fish has a head flat as the *te'dal*.

(6) *Sphyraena barracuda* (Edwards, 1771) is called as *njen alu-alu* (*njen*= fish, *alu-alu*= traditional pestle). The fish body is long and cylindrical resembling the traditional pestle.

(7) *Alectis indica* (Rüppell, 1830) is known as *njen jamah qapek* (*njen*= fish, *jamah*= carangidae *qapek*= axe). The fish shape resembles an axe.

(8) *Panna microdon* (Bleeker, 1849) is *njen puqoq buluh* (*njen*= fish, *puqoq*= *Panna* sp., *buluh*= bamboo). The fish is long, like a bamboo.

(9) *Istiophorus platypterus* (Shaw, 1792) is called as *njen selayar* (*njen*= fish, *selayar*= sail). The fish resembles the shape of a sail.

(10) *Scomberomorus commerson* (Lacepède, 1800) is called as *njen tengiriq batang* (*njen*= fish, *tengiriq*= *Scomberomorus* sp., *batang*= log). The fish is long and cylindrical like a log.

(11) *Scomberomorus guttatus* (Bloch & Schneider, 1801) is known as *njen tengiriq papan* (*njen*= fish, *tengiriq*= *Scomberomorus* sp., *papan*= board). The fish is compressed and resembles a board.

(12) *Pastinachus stellurostris* (Last, Fahmi & Naylor, 2010) is called as *njen pai bendiraq* (*njen*= fish, *pai*= rays, *bendiraq*= flag). The dorsal fins resemble maritime flags.

Colour based metaphor

Apart from shape, seemingly unrelated entities such as moon and coconut have also been used to represent the colour of fish.

(13) *Megalops cyprinoides* (Broussonet, 1782) is called as *njen bulan* (*njen*= fish, *bulan*= moon), meaning a fish that is as white as a moon.

(14) *Tenualosa macrura* (Bleeker, 1852) is *njen bulan sungai* (*njen*= fish, *bulan*= moon, *sungai*= river, meaning a fish as white as moon and commonly found in the river.

(15) *Lactarius lactarius* (Bloch & Schneider, 1801) is called as *njen kelapa* (*njen*= fish, *kelapa*= coconut). The fish is as white as coconut flesh.

Behavioural metaphor

Similarity in behaviour or activity is used to coin Ba'ie fish names.

(16) *Rhinoptera javanica* (Müller & Henle, 1841) is called as *njen pai manoq* (*njen*= fish, *pai*= rays, *manoq*= bird). The fish has a swimming style resembling a bird in flight.

(17) *Aetobatus ocellatus* (Kuhl, 1823) is called as *njen pai manoq titieq* (*njen*= fish, *pai*= rays, *manoq*= bird, *titieq*= dot). The dotted fish has a swimming style like a bird in flight.

Metonymy in the Ba'ie fish names

Metonymy is the semantic phenomenon where the name of an entity is replaced with the name of something else to which it is culturally associated. Turpin (2013) has defined metonymy as a semantic extension that is based on the salient characteristics of the flora-fauna. This study identified 48 species names derived using metonymy mechanism. Ba'ie metonymy mechanisms used to name fishes include ophthalmoceptory (shape and colour), tactioceptory, procedural, ecological or spatiological, behavioural metonymy, sound metonymy, and diet metonymy, as described below.

a. Ophthalmoceptory (colour, shape, size, and pattern)

The most salient characters used in twenty three Ba'ie fish names are colour, shape, size and pattern.

Colour base:

(1) *Oreochromis mossambicus* (Peters, 1852) is called as *njen tilapian mitem*. *Mitem* refers to the black colour of fish.

(2) *Lepturacanthus savala* (Cuvier, 1829) is called as *njen timah mapuq*. *Mapuq* refers to the white colour fish.

(3) *Trichiurus lepturus* (Linnaeus, 1758) is known as *njen timah qunieng*. *Qunieng* refers to the yellow colour fish.

Shape and size based

(1) *Strongylura strongylura* (van Hasselt, 1823) is called as *njen jolong*, meaning cylindrical and long.

Pattern based

(1) *Carcharhinus amblyrhynchos* (Whiteley, 1934) is called as *qeret jalur mapuq* which refers to the pattern of *jalur* (stripes).

(2) *Polydactylus sextarius* (Bloch & Schneider, 1801) is known as *njen senangin tanda* as it has a *tanda* (mark) below the eyes.

b. Tactioceptory

(1) *Dasyatis zugei* (Müller & Henle, 1841) is called as *njen pai minyak.* The fish has an extremely smooth and oily surface (oil=*minyak*).

(2) *Himantura uarnacoides* (Bleeker, 1852) is known as *njen pai tunggul*, as it is a fish with nuchal thorns as hard as a tree stump.

c. Salient body metonymy

(1) *Priacanthus macracanthus* (Cuvier, 1829) is called as *njen mila azeng mata* (*njen*= fish, *mila*= red, *azeng*= big, *mata*= eyes). The fish has big eyes.

(2) Carangoides praeustus (Anonymous [Bennett], 1830) is known as *njen jamah iqoy qunieng* (*njen*= fish, *jamah*= *Carangidae*, *iqoy*= tail, *qunieng*= yellow). The fish has a yellow tail.

d. Procedural

Atule mate (Cuvier, 1833) is known as *njen jamah panau* (*njen*= fish, *jamah*= carangidae, *panau*= the traditional fishing technique). The fish is fished by the *panau* fishing technique.

e. Ecological or spatiological

Eight fish species were found to be named using ecological or spatial relationships with sea (*rat*), reef (*batu*), river (*sungai*) and coral (*karang*). The species of *selusong rat* [*Lates calcarifer* (Bloch, 1790)], *nyaked rat* [*Platycephalus indicus* (Linnaeus, 1758)], and *sezau rat* [*Abalistes stellaris* (Bloch & Schneider, 1801)] are commonly found in the sea. On the other hand, *bulan sungai* [*Tenualosa macrura* (Bleeker, 1852)] is commonly found in the river. *Njen uweng batu* [*Terapon theraps* (Cuvier, 1829)] and the *Qeret karang*

[*Atelomycterus marmoratus* (Anonymous (Bennett), 1830)] are commonly found in the coral region. The ecological characteristic of *njen aked* [*Saurida tumbil* (Bloch, 1795)] and *njen nyaked* (*Oxyeleotris* sp.) is that they are normally found stick to other fishes or things.

f. Behavioral metonymy

Toxotes jaculatrix (Pallas, 1767) is known as *njen ipot ba'* (*njen*= fish, *ipot*= blowing, *ba'*= water). The fish blows a jet of water to knock down insects.

g. Sound metonymy

Ilisha pristigastroides (Bleeker 1852) is called as *njen bengetot* (*njen*= fish, *bengetot*= "tot" sound). The fish will produce "tot" sound when trapped in the net.

h. Diet metonymy

Pseudolais micronemus (Bleeker, 1846) is called as *njen luey* or *njen dai* (*njen*= fish and *dai- tahi*= shit), meaning the fish that eats shit.

Summary

Of the 141 species documented, nine are not known in Ba'ie culture and hence carry no Ba'ie names. Ninety-two primary lexemes given as names were of un-analysable nature, referring only to the generic taxa. Meaning of four secondary lexemes of fishes viz. *qeret baem, jamah sew, jamah seliday,* and *jamah luleng* were also unknown, indicating loss of TK and language connected to them. It is understood that, 50 fishes are named on the basis of the morphological characters, eight species on the basis of ecological characters, six species after their quality, and utility is found applied in only one of the Ba'ie fish name. Lexical semantic analysis of the fish names show that least 17 Ba'ie fish names are derived using metaphors, while 48 are derived using metonymy. However, portmanteaus that were reported from Kanekes were not recorded from the Ba'ie community. This section proves that the Ba'ie nomenclatural system of fishes is derived using both traditional knowledge as well as linguistic mechanisms, further supporting their usability as indicators of the vitality status of both language and TK.

Chapter 7 Using Ethnotaxonomy to Assess Traditional Knowledge and Language Vitality of Ba'ie

Introduction

This section discusses the vitality status of Ba'ie traditional knowledge (TK) and language using the TraLaVi methodology developed by Franco et al. (2015). Language proficiency and bilingualism between Ba'ie language and Malay is assessed using the newly developed methodology. Status of Ba'ie TK on fishes is discussed along with the factors influencing its vitality. One key factor that determines sustenance of language, and TK is the social support system for their transmission in the community. This chapter provides a clear insight into the pattern of TK and language transmission happening within the Ba'ie community, and also the major sources from where TK is acquired.

7.1 Status of traditional knowledge and language vitality of Ba'ie people

The results show that the overall vitality status of Ba'ie traditional knowledge and language can be considered to be safe (0.836). This indicates that Ba'ie have been maintaining their traditional knowledge and language well. The cluster-wise analysis shows that the Ba'ie from Cluster 1 (0.899) have higher TraLaVi score than cluster 2 (0.773) (Table 7.1). From the assessment, it is found that there is a statistically significant difference between values of cluster 1 (C1) and Cluster 2 (C2) (Mann-Whitney test; $p<0.05$).

The difference in values between both the clusters indicate that people who culturally practice fishing might have more TK on fishing, fishes as well as are more familiar with their own ecosystem comprising of river and sea. The statistically significant difference between C1 and C2 also indicate that traditional occupation plays an important role in maintenance of TK and language; occupational shift towards non-traditional jobs force the candidates to acquire new skills and vocabulary. As a result, the priority is on making oneself fit to the new job role where TK and L1 proficiency may not be rewarding. This study also noted statistically significant difference between male and female groups (Mann-Whitney test; $p<0.05$) (

Appendix 6).

In the Ba'ie culture, it is not a customary practice to allow females to be involved in fishing. Generally, male members will go fishing while females focus on post-fishing activities such as smoking, drying, and marketing (Lyn 1999, Mbenga 1999). As a result, the male group tends to easily recognise the species of fishes on the basis of ecological, and the morphological features. The male group, especially from C1 can narrate stories about offshore fishing and experiences with the given fish species.

Table 7.1 Traditional Knowledge and language Vitality of Ba'ie people

Criteria	**C1**			**C2**		
	Male	**Female**	**Mean**	**Male**	**Female**	**Mean**
A. Bilingualism	25.0	25.0	25.0	18.3	18.3	18.3
B. Retrieval of Information	23.5	23.7	23.6	23.3	23.2	23.3
C. Knowledge Erosion	23.5	23.7	23.6	23.3	23.2	23.3
D. Visual Recognition	21.9	18.3	20.1	17.8	15.5	16.6
E. Knowledge Transmission	21.9	18.3	20.1	16.7	13.5	15.1
Mean value	115.9	108.9	112.4	99.5	93.7	96.6
TraLaVi	0.927	0.871	0.899	0.796	0.750	0.773

Female groups seem to know fewer fishes than the male groups. They tend to recognise easily those fishes generally caught by their husbands or the ones usually cooked by mothers at home. Yet, the female members can tell stories, recipes, and how to process the fish to produce varieties of foods. Although they do not know many species, their knowledge appears to be deeper. i.e., the male groups seem to possess TK on wide range of species, while the females tend to possess deep knowledge on relatively fewer species.

For example male members can mention about the yellow colour of *Setipinna breviceps* (Cantor, 1849) or *njen piras*, while the female group can provide lengthy explanation on the recipe of *umai* in which *S.breviceps* is an essential component. Studies from elsewhere also report this phenomenon where male members tend to be more knowledgeable in forest habitat and trees while women are more informed about home gardens, swidden field, and cultural changes (Caniago and Siebert 1998; Luoga, Witkowski, Balkwill 2000). Voeks (2007) emphasises on the important role of woman as reservoir of ethnobotanical knowledge in northeast Brazil. In the Ba'ie setting, although women are not directly engaged in offshore fishing or boating activities, they play an important role in fisheries management. Many researches have highlighted the important role of women in fisheries sector, as seen in Victoria Lake (Medard et al. 2001), West Africa (Bennett 2005), and Pacific region (Harpera et al. 2013). However, in the Ba'ie culture, fish and fishes are the most important component and despite the stratification of roles, it is safe to assume that fishes are common knowledge in the community. TraLaVi does not distinguish between active and passive knowledge and hence, the values could have been higher if the women group had at least passive remnant knowledge on the fishes.

Statistical analysis in each criterion using Mann-Whitney toward cluster and gender groups show that there is statistical difference between cluster 1 and cluster 2 in bilingualism. It indicates that occupational preferences plays important role in bilingualism. Significant difference is also shown in the visual recognition, both cluster and gender wise. Similarly a significant difference also found in knowledge transmission, both cluster and gender wise (

Appendix 5). The summary of the analysis could be seen below:

Table 7.2 Summary of the Mann-Whitney analysis in each criterion

Criterion	**Cluster wise**	**Sex wise**
A	0.000, $p<0.05$ significant	1.000, $p> 0.05$ not significant
B	0.285, $p> 0.05$ not significant	0.754, $p> 0.05$ not significant
C	0.352, $p> 0.05$ not significant	0.867, $p> 0.05$ not significant
D	0.003, $p<0.05$ significant	0.002, $p<0.05$ significant
E	0.003, $p<0.05$ significant	0.003, $p<0.05$ significant

The following section provides a compartmentalised idea about the traditional knowledge and language vitality scenario of the Ba'ie people.

7.1.1 Bilingualism in Ba'ie people

Bilingualism is purely defined as the ability to use two languages by an individual. Original Ba'ie speakers are normally proficient in one or more non-Ba'ie languages. In some cases a Ba'ie might be proficient in Ba'ie language, standard Malay as the lingua Franca, English, Iban and Kedayan. Some of them could even speak Malay Brunei. The ability to use two or more languages has been known from Bintulu for a long time; the environment, and the social as well as political setting plays an important role in determining the nature of Ba'ie bilingualism or multilingualism (Edris and Ghani 1992).

Based on the interview, all participants declared that they are very good in the Ba'ie language. About 39 respondents stated that they are 'very good' in Malay, eight respondents as 'good', 10 as 'moderate', and three as 'poor'. All participants who are good, moderate, and poor in Malay are above 40 years old. It indicates that younger generation might have higher level of proficiency in Malay due to the higher educational qualifications. Three of the respondents who were not able to mention complete list of the 25 fish name using Malay, gave up free-listing approximately after 10 names with 2 minutes timing. This indicates that the proficiency of any language could be reflected in the ability to free-list the species name in the respective language. This is because, people who are proficient in an indigenous language, and are expected to learn the culture as well as the environment where the language evolved (Parlakian and Sanchez 2006).

A correlation analysis was carried out between language proficiency and time taken in L1 and L2 (criteria A), and was found to have a negative correlation (-0.235) indicating weak relation between the two entities. This indicates that the Ba'ie people are unaware of the loss of Ba'ie language proficiency which is being gradually replaced by Malay. From the observation, it could be safely said that the Ba'ie people were unconsciously abandoning their L1 or in some cases L2 has even replaced L1 as their main language. Although the Ba'ie people assessed themselves as very good (5) in Ba'ie, the fact they faced difficulties to mention the fish names using Ba'ie language while easily free-listing the fish names in Malay supports the observation. Ideally, an individual who was born in an ecosystem, learned the language during childhood, and spoke the language as first language could be categorised as an ideal native speaker (Saniei 2011). Consequently, an individual born in Bintulu to Ba'ie parents and grew in Bintulu area must be proficient in Ba'ie language and be familiar with their ecology and culture. Nevertheless, in a wider context, humans are endowed genetically with the ability to learn languages according to the changing social relations (Unasho 2013).

Ghani (2006a) studied language shift and maintenance in Miriek and Bintulu (Ba'ie) communities, and considers the Ba'ie as a community who could successfully maintain their bilingualism between Malay and Ba'ie (Ghani 2006a; Ghani and Ridzuan 1992). However this study shows that people tend to unconsciously abandon their autochthonous language which could lead to language shift. Moelleken (1983) shows how complete shift in language results from increasing bilingualism in various domains of language use. The greatest evidence of language shift has been demonstrated by Maori people in New Zealand. Their language shift replaced their mother tongue by English in not less than one century, turning the community into a monolingual one in L2 (Benton 1991). Based on the bilingualism assessment, it could be inferred that the Ba'ie people successfully maintain their diglossic situation (mean score= 21.7 out of 25). However, the non-fishermen group C1, has lesser score (18.3) than the C2, the fishermen group (25.0). Furthermore, based on the statistical analyses, there is significant difference between cluster 1 and cluster 2 in bilingualism (Mann-Whitney test, $p<0.05$). This indicates that people from C1 are generally more adept in balancing between their L1 and L2.

Although the people tend to be successful bilinguals with confidence in their Ba'ie language proficiency, the results indicate language shift at the individual level especially in the non-fishermen group. In some cases, people from C1 who have very strong TK and L1 proficiency, attempted to translate Malay fish names into Ba'ie as they could not recollect the original Ba'ie names. People of C1 tend to mention the Ba'ie name first and then the Malay name. For example, *njen puqoq* is recollected first followed by its Malay name *ikan gelama*. Similarly, *qeret* is recalled first followed by *ikan yu*. This indicates that the Ba'ie of C1 have begun to use their L2, by building upon the Ba'ie TK acquired from their elders. However, people from the non-fishermen group C2 could mention the fish names in Malay easily compared to the Ba'ie names, as the L2 vocabulary is acquired from formal education and has replaced that of L1 in their thought process.

In this case, we could understand that bilingualism of Ba'ie people is influenced by both internal and external factors. Internal factors include: use of Ba'ie language in the family domain, the coastal ecosystem and traditional occupation. On the other hand, Malay as an external and politically powerful language also drives language shift in the non-fisherman group. Ba'ie people who have more connexion with outsiders may use Malay as the lingua franca in public or formal domain. Apart from that, non-fisherman group generally stay away from their traditions and are less concerned with the water ecology and fish. Fortunately, the community is still successful in balancing their L1 and L2.

7.1.2 Loss of meaning and loss of knowledge

Studies on ethnotaxonomy and nomenclatural system of species have helped to understand the relationship between human being and their biodiversity in many environments (Berlin et al. 1968; 1973; Berlin 1992). Interpretation of folk names of species could provide an insight into the TK and Language based mechanisms from which the respective names have been derived (Franco et al. 2015) Traditional knowledge mechanisms to name species such as morphology, ecology, utilitarian, as well as chemical compounds

(Kakudidi 2004, Hunn 1982) have facilitated human beings to classify, recognise, and utilise the plant and animals according to the respective culture.

Since plants and animals are named using L1, it can be said that when the language is lost, the species names and their meaning are also lost, indicating a corresponding loss of traditional knowledge too (Franco et al. 2015). A study by Saynes-Vásquez et al. (2013) with the Zapotec people of Mexico has argued that ethnobotanical knowledge change can indicate cultural change. This study utilised ethnotaxonomic and nomenclatural system to gauge TK loss. When the community members could not elucidate the meaning behind the species name, that part of traditional knowledge was considered as lost. As per the general principles of classification and nomenclature, names of plants and animals can be divided into primary and secondary lexemes (Berlin et al. 1973). The primary lexemes are generally un- analysable, while secondary lexemes are mostly analysable and applied to denote a category of higher order.

In Ba'ie fish names, 92 out of 141 fish taxa have been tagged with un-analysable primary lexemes. In formal classifications of plants and animals, the primary lexeme represents the generic name, and the secondary lexeme represents the species name. In many cases the meaning behind the generic name of species could not be analysed (Balee 1989; Coley, Medin, and Atran 1997). However the very epithets used to tag folk generic names also represent traditional knowledge. Generally the Ba'ie people were able to correctly mention at least twenty fish names in L1. Approximately eighty percent of the names listed in Criteria B are un-analysable lexemes and whenever the secondary lexemes followed the primary lexemes, the Ba'ie people showed higher success rates in clarifying the meaning (93.67 %). The people were able to recognise the fish and link the lexemes with the traditional knowledge very well. Morphological characters such as colour and shape have become the most salient terms in Ba'ie fishe names. *Parastromateus niger* (Bloch, 1795) which is known as *ruay* has the generic name *ruay* and could be differentiated from *ruay mapuq* [*Pampus chinensis* (Euphrasen, 1788)]; *mapuq* means white. The Ba'ie language mostly uses the morphological feature of colour to label fishes.

However, some of fishes such as *njen sezau rat* and *njen ipot ba'* were commonly confused among the younger generation. Based on data collected from the control population (elders), *njen sezau rat* (chicken sea fish) and *njen ipot ba'* (blowing water fish) are named respectively based on the mouth shape and behavioural characters respectively. Yet, the younger usually define *sezau rat* based on the understanding that its flesh similar to that of chicken. On other hand, *ipot ba'* is identified as *ikan sumpit air*, its Malay name. Younger generation were also observed to change the fish name inappropriately. This directly highlights that TK survival depends on the transmission of the correct knowledge. *Priacanthus macracanthus* (Cuvier, 1829) is known among younger generation of Ba'ie as *njen Uji Rashid* referring to Uji Rashid, a Malaysian singer with big eyes. Naming plants and animals with the human names are indicative of its introducer (Mekbib 2007). However, it requires a cultural or historical relation with the community. In this case, Uji Rashid was only an actress who began her career in 1960, whereas the community had known the fish even before, rightly with a Ba'ie name. According to the elders, the real Ba'ie name of this fish is *njen mila azeng mata* (red big eyed fish) or *njen mila* (red fish), implying that red fish has big eyes. Application of Uji Rashid's name for this fish should have found its way into the community from the market where it was possibly applied to increase its commercial value.

Likewise, *Saurida tumbil* (Bloch, 1795) is a kind of lizard fish with an elongated and tubular body form. The fish is named with *butuh ba'ie* by the younger generation, meaning male genitals. The morphological feature of fish indeed resembles the male genital. Yet the elders recognise the fish as *njen aked* derived from its ecology. The word *aked* means 'attached to something', indicating that the fish is found attached to the muddy bottom of the sea. Although both the names are essentially Ba'ie, the lexemes used by the younger generation are of recent origin where there is a loss of ecological knowledge. The elders are extremely fury with the changing of the fish name, because it had led to loss of TK behind the name. For the Ba'ie, there is a high susceptibility to cultural change and loss of TK due to rapid urbanisation of their ecosystem. However, it has been observed that the elders have been striving hard to pursue economic progress without abandoning their traditional knowledge.

In the case of traditional ethnobotanical knowledge loss in Zapotec- Mexico, the pathway is that education and urban life style caused cultural change leading to loss of ethnobotanical knowledge (Saynes-Vásquez et al. 2013). In the same way, Lasisi and Ekpenyong (2011) studied urbanisation and loss of traditional knowledge in Rumuodomaya in River State and study found a negative relation between urbanisation and traditional knowledge. However in the Ba'ie case, the ability to elucidate meanings of the Ba'ie fish name is quite high in both cluster 1 (fishermen) as well as cluster 2 (non-fishermen). Participants from cluster 1 are able to correctly elucidate meanings of 94.2 % of Ba'ie fish names compared to the 93% from cluster 2. This is still a healthy trend although people from Cluster 2 have changed the occupation. The knowledge has been sourced from their parents, relatives, friends, and hobbies. For the Ba'ie, Fishing is a passionate cultural activity that has been practiced since ages. Even the Ba'ie people who have taken up other professions normally practice fishing on weekend or after their working hours. It has been noted that there are a few community members who earn handsomely from their jobs in the offshore oil sector, yet chose to be part-time fishermen especially during *bubuk* [*Acetes indicus* (H. Milne Edwards, 1830)] season.

7.1.3 Visual recognition

Visual stimuli have been widely used in ethnobiological research to obtain ethnobiological information. Visual stimuli help people to recall specific information of interest to the researcher or respondent contextually (Albuquerque et al. 2014). Generally, visual stimuli could be both *in-situ* and *ex-situ* in nature. The *in-situ* methods include transect, walking in the woods and home garden sampling, while *ex-situ* methods include exhibiting fresh plant materials, voucher specimens, and photographs. Some researchers also used fresh picked plants, drawing, tools, toys or furniture (Albuquerque and Ramos 2008). Under ideal situations, *in-situ* methods perfectly assist the people to recognise given objects, due to the actual condition, ecological character, and other hidden features which could not be observed in the *ex-situ methods* stimuli (Thomas, Vandebroek, and Damme 2007). However the ideal method also warrants ideal conditions such as time, financial support and informant comfortability. Due to these limitations, *ex-situ* methods emerged as alternatives. In Ethnobotany, use of photographs is known to be more effective in assisting plant recognition (Ngunyen 2003), whereas use of dry voucher specimens is relatively more difficult to recognise. Usages of fresh plant species are extremely difficult for the researcher due to the very little specimen longevity (Thomas, Vandebroek, and Damme 2007). In linguistics, photographs have been used as visual stimuli to elicit information, notably in urban situation (Deklin and Aung Si 2014).

In this study, photographs were used to assist the respondent to recollect their ethnobiological knowledge regarding the 25 culturally important of Ba'ie fishes that was compiled through interview with elders (control data). The fishes are: *njen ruay* [*Parastromateus niger* (Bloch, 1795)], *njen tengiriq batang* [*Scomberomorus commerso* (Lacepède, 1800)], *njen tengiriq papan* [*Scomberomorus guttatus* (Bloch & Schneider, 1801)], *njen buleng* [*Nemapteryx macronotacantha* (Bleeker 1846)], *njen gagog* (*Arius* sp.), *njen taoq* [(*Osteogeneiosus militaris* (Linnaeus, 1758)], *njen bageng* [*Arius maculatus* (Thunberg, 1792)], *njen jamah biasa* [*Atule mate* (Cuvier, 1833)], *njen piras* [*Setipinna breviceps* (Cantor, 1849)], *njen seqael* [*Plotosus canius* (Hamilton, 1822)], *njen Pai* (rays), *qeret* (sharks), *njen Puqoq* [*Otolithoides biauritus* (Cantor, 1849)], *njen reman manai* [*Rastrelliger kanagurta* (Cuvier, 1816)] and *njen reman re'du* [*Rastrelliger brachysoma* (Bleeker, 1851)], *njen tavai* [*Wallago leerii* (Bleeker, 1851)], *njen bibeq* [*Pampus argenteus* (Euphrasen, 1788)], *njen luey* [*Kryptopterus kryptopterus* (Bleeker, 1851)], *njen kelapa* [*Lactarius lactarius* (Bloch & Schneider, 1801)], *njen lata'* [*Lobotes surinamensis* (Bloch, 1790)], *njen selusong rat or asiew* [*Lates calcarifer* (Bloch, 1790)], *njen terupbok* [*Tenualosa toli* (Valenciennes, 1847)], *njen bengetot* [*Ilisha pristigastroides* (Bleeker 1852)], *njen gilau* [*Clarias nieuhofii* (Valenciennes, 1840)], *njen qapau* [*Cephalopholis boenak* (Bloch, 1790)], *njen tuqol* [*Euthynnus affinis* (Cantor, 1849)], *njen alu-alu* [*Sphyraena barracuda* (Edwards, 1771)]. A total 100 of photographs depicting these culturally salient fishes were displayed as visual stimuli.

Based on the interview with participants of both the clusters, it is understood that all participants were able to clearly identify the fish photographs. The photographs showed the left and right sides of the entire fish body; in some cases, the head profile photographs of some fishes were also taken separately. A ruler or pen was placed by the side to provide an idea of scale, as size of fish is an important character in identification. The photographs were taken from the fresh specimens landed in markets such as *Pasar Utama Bintulu*, *Pasar Nelayan Kampung Baru* and *Pasar ABF*. These multi-colour photographs were displayed on a 10.1 tablet to the participants. The results shows that there is a statistically significant difference between participants from cluster 1 and cluster 2 in their ability to recognise the fishes from the photographs (Mann-Whitney test; $p<0.05$). These results show that people from cluster 1 are more capable in recognising the fishes than people from cluster 2. Certainly, being fishermen, participants from cluster 1 have more knowledge of fish, while people from cluster 2 have less knowledge on fish due to their less interaction with the fishes.

Interestingly, the study also found significant difference between male and female respondents toward visual recognition of fish using photographs (Mann-Whitney test; $p<0.05$). The women folk show less mean ranking rather than the male groups. In Wayanad, Western Ghats-India, García (2006) reported that the tribal mother group were unable to recognise wild food plants through photographs. Some other researchers have also reported unsuccessful application of photographs as visual stimuli due to lack of opportunities to receive feedback from other stimuli such as smell and feel (Case et al. 2006). In their study in Northeast Thailand, Wester and Yongvanit (2006) highlighted that the capability of the community to recognise the plant was also influenced by the characteristics of plants, and photographs sometimes lack the diagnostic features that are otherwise felt or smelled in the specimens. In the Ba'ie case, although females have lesser score of visual recognition when compared to male members, females from cluster 1 still show higher score than the females from cluster 2. This indicates that the acquisition of fish knowledge also plays an important role in recognising the fish photograph, as women folk from Cluster 1 had more opportunities to interact with wider range of fishes brought home by their fishermen husbands. It is clear that *in-situ* stimuli are the best way to help people recognise their biological diversity, and wherever it is impossible, it is advisable to employ multiple *ex-situ* stimuli such as photographs and preserved specimens. Usage of photographs alone proved to be a limitation. However, it should be borne in mind that unlike plants that could be pressed into herbarium specimens, preserving fish specimens and carrying them during fieldwork is not feasible.

7.1.4 Support for Traditional knowledge transmission

Transmission of TK between individuals, as well as from one generation to another is an important factor that determines its sustainability. Transmission of TK includes three major elements: knowledge distribution pattern, knowledge acquisition, and knowledge dissemination (Takako 2003). The TK on the 25 culturally salient fishes of Ba'ie are distributed throughout the community, which was the primary reason behind their high degrees of salience in the free-listing exercise. The community members collect these fishes, consume them, and have easy access to them both through the fishermen as well as through the local markets, as expected from any fishing community. There is ample TK involved throughout the long chain of activities from fishing to distribution, marketing, processing or preparing quality food. TK acquisition in the Ba'ie normally starts in the early stage of child hood as seen elsewhere (Berghoefer, Rozzi, and Jax 2010; Ruddle 1993; García 2006). The knowledge is acquired as the children play and interact with the surrounding environment and their peer group approximately from the 6-7 years age group onward. At this age, the children start consuming fish and consciously interact with the fishes through their environment. The Ba'ie people normally reside close to the river basin and are in direct contact with the fishermen. Approximately 60% of female participants acquired the knowledge of the fish right from their six years onward when their mother began sharing the knowledge as she cooked it. Similarly, in this same age group, the boys acquire knowledge on the fishes from their mother.

Based on the statistical analysis using Mann-Whitney test, it is found that there is significant differennce between both cluster and gender groups (Mann-Whitney test, $p < 0.05$). It indicates that occupational preferences also plays important role in knowledge transmission. Participants from cluster 1 (fishermen) stated that their first acquisition of TK on fishes knowledge were through interpersonal interaction among individuals as well as interaction with their parents and grandparents while indulging in daily activities. However the skills and knowledge are further honed or added via social process of interaction with other individuals and social groups.

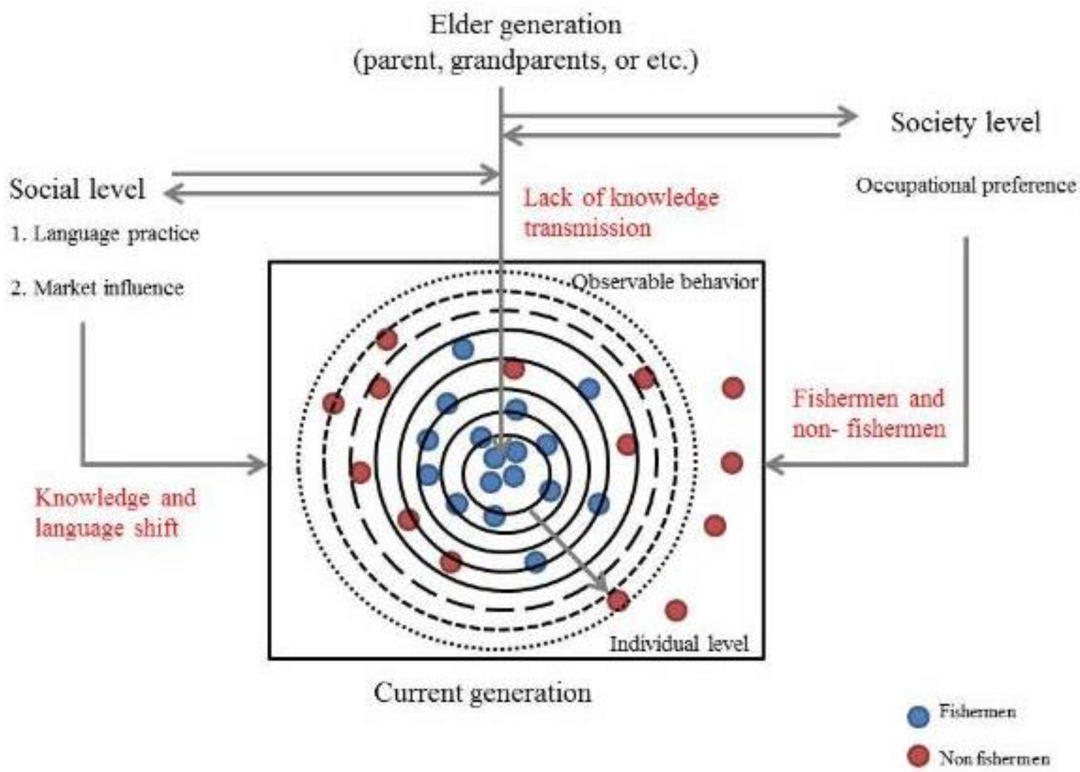


Figure 7.1 Loss of knowledge model in Ba’ie community

Takako (2004) defined three models of traditional ecological knowledge (TEK) loss triggered by (1) lack of learning opportunities, (2) lack of observable behaviour, and (3) absence of effective transmission. Based on these three factors, loss of knowledge in Ba’ie case could be seen schematised as in Figure 7.1.

In the Ba’ie community, traditional knowledge and language transmission are supported by both internal and external factors at the individual, social, and society levels with elders play an important role. Cristancho and Vining (2009) defined TK transmission as a part of the socialisation process where shaping and scaffolding become two major components of knowledge acquisition. Knowledge which has been acquired in individual during his/her childhood is further shaped and scaffolded by the social groups based on norms, taboos, values, or culture of group. In Ba’ie, children might acquire knowledge on *njen ruay* [*Parastromateus niger* (Bloch, 1795)] from their parents, as a kind of edible fish. The parents might also transmit the cultural importance of the fish which has been consumed by their ancestors. When the children grow up, they might look around their environment and accumulate knowledge through observation as well as by interacting with family members, peer-groups, or the other social elements. Generally the Ba'ie children will interact with the fishermen returning from fishing, or when the fish is processed (loading, shorting, grouping, or selling). When the boys are around 9 or 10 years old, the parents would let them involve in minor fishing activities. Gradually, the male kids are allowed to venture into the sea. The interviews show that the first experience of sea fishing occurred around nine years of age. In this group (C1) interpersonal relationship with family, environment and other social group members become the three major source of TK acquisition (Figure 7.1).

Dominant external factors could be seen in respondents from C2 who gave varied replies about the source of knowledge as parents (31 %), market (53 %), TV (3 %), school (1 %), books (1%) and other fishermen or other friend (11%). For the criterion E, respondents from C2 could successfully answer 66.53 % of the fish names, with 499 correct recognitions, 102 (13.6%) failed recognitions, 107 (14.27%) wrongly recognised, and 42 (5.6%) recognised by using another language. Market becomes the main source of knowledge for non-fishermen groups; however parents and other fishermen as social mechanisms also play important roles in in TK transmission. Knowledge on shark and rays are acquired from the television, and although people from this cluster might know these fishes, they may not have consumed them.

Dissemination of TK refers to the entire set of activities undertaken to communicate the knowledge. Participants from both cluster 1 and cluster 2 agreed that knowledge about 25 culturally salient fishes of Ba'ie should be disseminated to their next generation. A total of 58 respondents (96.67 %) were married and involved in transmission of TK to their children through oral means as well as through their daily activities. Citing from their personal experiences, participants from cluster 2 also specified that TK could not be acquired through formal education. About 20 people from cluster 2 also reported an increase in their awareness level about loss of their after participating in the interview. The Ba'ie understand that as a Ba'ie member who are originally fishermen, the younger generation must be knowledgeable of their culture and environment which should also be transmitted from the elders to the next generation. During the interviews, traditional mechanisms in transmission such as taboos, folklores, medicinal procedures, or any other mechanisms were rarely recorded or cited. It is noted that less than 10 % of respondents were obtaining the TK on the 25 culturally salient fishes from folklores and taboo. Most of the respondents stated that the knowledge is mostly transmitted through recipes as food. It indicates that some knowledge might have been lost and the people largely unaware of it.

7.2 Role of markets in knowledge transmission

From the values of TraLaVi and its criteria, it is understandable that Ba'ie individuals who have moved away from the traditional profession of fishing would require support to revitalise their TK and language vitality; the TraLaVi score for cluster C2 is still safe (0.773), but close to the vulnerable status. A noticeable external factor that plays an important role in this particular group is the markets, with their profound influence on knowledge transmission. More than half of ethnobiological knowledge of the respondents from C2 is acquired from market (53%). From the interviews, it was understood that besides Malay and Melanau, there are also Chinese, Iban, and Sambas people from Indonesia working in the *Pasar Utama Bintulu*, *Pasar Kampung Baru*, and *Pasar ABF*. In these markets, people trade fish thereby indirectly sharing the TK and language which is not preventable. People who migrated from different places, with different knowledge and skills will adapt to new ecosystems while influencing each other. Not only the sellers, the buyers can also directly and indirectly influence people's knowledge and language. In Tamil Nadu, Rengasamy et al. (2003) reported that farmers acquired a lot of knowledge from markets. Market is a site of social interaction (Watson and Studdert 2006) deep rooted in the society, its history, and culture (Tumbuan, Kawet, Shiratake 2006). Two common phenomena directly influencing TK and language noted in this study are: (1) grouping order of fishes and (2) modification of fish names based on market language.

Grouping order of fishes is the classification of fishes based on market knowledge. The knowledge and language accompanying market activities is referred to as market language and market knowledge. In the local markets, the terms *satu tompok, ikan campur* and *ikan satu Malaysia* have been used to group species of fishes for retail trading. *Satu tompok* is a cluster of fishes put together in a plate, bucket, or simply heaped together and sold together for a bargainable price (Figure 7.2). Although in some cases the grouping consists of similar species, in many cases the sellers pool in different species due to the limitation of resources or for clearing the stock. However it could trigger knowledge confusion in the individuals who acquire knowledge from the market, as the grouping indirectly gives an impression that these fishes are related to each other and have similar cultural and culinary properties.

Figure 7.2 Example for *Satu tompok* of fishes in *Pasar Utama Bintulu*

Similarly, ikan campur (mixed fish) and ikan satu Malaysia (One Malaysia) are two other common terms used to represent mixes sale of fish. Sellers mixing the fishes in group at times also mix accidentally trapped one sin the trawl along with the target fish. At times, such groupings are marketed with catchy phrases sourced from contemporary mainstream discourses.

An unique name for a group of fishes generally consisting of four different species viz., *Osteogeneiosus militaris* (Linnaeus, 1758) or *njen taoq*, *Nemapteryx macronotacantha* (Bleeker 1846) or *njen buleng*, *Arius* sp. or *njen gagog*, and *Arius maculatus* (Thunberg, 1792) or *njen bageng* are sold as *ikan proton saga* meaning *proton saga* fish. Proton saga is a car brand, produced by Proton Malaysia Ltd. Generally, these fishes grouped together have big profile of head, black and silvery skin and have resemblance to the appearance of proton saga. Although these fishes are also included in the 25 culturally salient fishes of Ba'ie with specific Ba'ie names as *taoq* [*Osteogeneiosus militaris* (Linnaeus, 1758)], *gagog* (*Arius* sp.), *buleng* [*Nemapteryx macronotacantha* (Bleeker1846)], and *begeng* [*Arius maculatus* (Thunberg, 1792), the younger people especially from C2 face difficulties in recognising them. They tend to recall them as *njen proton saga* indicating knowledge and language erosion influenced by the market dynamics. Such improper knowledge and erroneous transmission of knowledge could replace the existing knowledge acquired from the elders, in the absence of strong knowledge transmission mechanisms.

Table 7.3 Traditional Knowledge sources for cluster 2 (For criterion E)

	Sources					
Recognition	Parents	Market	TV	School	Other fishermen	Book
Correct	31.0	53.0	3.0	1.0	11.0	1.0
Half marking	7.1	31.0	31.0	7.1	19.0	4.8
Wrong	2.8	57.9	4.7	4.7	21.5	8.4

Knowledge transmission patterns analysed for Criterion E, especially from C2 shows that market plays an important role in knowledge and language acquisition. Markets had provided 53 % of correct knowledge while they have also contributed to 57.9% of the total wrong knowledge cited. Besides, markets had also replaced 31 % of fish names with names from languages other than Ba'ie. Table 8.2 suggests that parents contribute to highest percentage of correct knowledge than market, TV, school, other fishermen, and books. Whereas, sources such as TV, schools, books, and other fishermen scored half ratings for name, indicating that TV, schools, books and other fishermen might be able to transmit correct knowledge, but in Allochthonous languages (Table 7.3). Interestingly, part-time fishermen from C2 who do not practice fishing as a profession also exhibit incomplete and erroneous transmission of TK and language.

Summary

The traditional knowledge and language vitality status of Ba'ie can be considered as safe (0.83) as per the TraLaVi scale. Thus, it could be said that the Ba'ie people are a bilingual community, balancing their autochthonous and allochthonous language proficiencies. Fortunately, fishermen who practice the traditional occupation of fishing are still able to successfully maintaining their TK and language (TraLaVi= 0.899) through their occupation and work culture. These individuals also influence the TK and language of non-fishermen group through interactions. The participants from non-fishermen group with their different occupational preferences, have an inherent lack of opportunity to acquire TK and vocabularies that are otherwise readily available to those of C1, indicating the reason for their relatively lower score (0.773). TK transmission plays an important role in supporting the vitality of Ba'ie language and TK. When both the clusters are considered together, parents as an internal factor become the primary sources of correct forms of TK and language for the Ba'ie (65%). Markets as external factor also play an important role in Knowledge and Language transmission, with their influence much higher for cluster 2. However, it should be noted that markets also influence the population by transmitting wrong Traditional Knowledge along with mixed vocabularies sourced from various Allochthonous languages, as well as contemporary popular discourse. For the Ba'ie from Cluster 2, TK is transmitted primarily through market (53%), TV (3 %), school (1 %), books (1%) as well as other fishermen and friends (11%). The results show that although the Ba'ie language and TK can be considered as safe for the moment, adequate *sui-generis* and participatory mechanisms have to be evolved to revitalise language and TK vitality in the section of the population that has adapted themselves to new non-traditional occupations. To salvage their language, the Ba'ie language should be used in all communication domains.

Chapter 8 Language Vitality of the Ba'ie people

Introduction

Ethnolinguistics deals with the relationship between languages and cultures. The following sub chapter discusses the language vitality of Ba'ie people using the UNESCO Language Vitality and Endangerment (LVE) framework (UNESCO 2003). The discussion also highlights the pros and cons of using LVE in relation to the TraLaVi method discussed in the previous chapters.

8.1 Language Vitality of Ba'ie people

The LVE is a framework developed for assessing language vitality (Lewis 2006). The assessment is based on six criteria of language vitality and state of endangerment, two criteria of language attitude and one criterion of urgency for documentation (UNESCO 2003). The multiple criteria are necessitated by the the complex situation where a language is situated. This tool requires collaborative action from researchers, linguists, supporting language revival efforts. The survey was conducted using open ended questionnaire, observations, and interviews, with the same sixty participants (clusters 1 & 2) who had collaborated for the TraLaVi interviews. The results are compartmentalised according to the respective factors, as below:

8.1.1 Factor 1: Intergenerational Language Transmission

Vitality of language is affected by levels of transmission between generations (Fishman 1991); when a language is transmitted efficiently from the elder generation to younger, it indicates that generations are using the language. A language which is used by all generations without any interruption of language transmission can be considered as safe, while those with no speakers are extinct (UNESCO 2003). Factor 1 of LVE categorises a language into six, viz., safe, stable yet threatened, unsafe, definitely endangered, critically endangered, and extinct.

All participants declared that they speak Ba'ie language and had acquired the language from their parents, while at the same time also transmitting it to their children. Intergenerational transmission is well maintained in the home domain, since all of the respondents are original Ba'ie born to Ba'ie parents. All family members speak the language. Participants also declared that they are very good in Ba'ie language.

However, the Ba'ie are bilingual and sometimes even multilingual community since Malay is the lingua franca. Sarawak Malay, Iban language, Malanau language, Kedayan language, and sometimes Malay Brunei and English also become their third language.

All participants stated Malay (Sarawak Malay and standard Malay) as their second language with various level of proficiency. Thirty nine people consider themselves as very good in Malay, eight are good, 10 are moderate, and three are poor. Malay is used in formal domains such as education and working place. When Ba'ie children attain the school age, they start to learn structure of Malay language, although the vocabulary might be obtained before. Ghani's (2006b) research in Bintulu suggested that the Bintulu people are predominantly bilingual in Bintulu and Malay, with very few respondents declaring themselves as monolingual in Bintulu (3%) and monolingual in Malay (6%). Monolingualism is observed in Ba'ie individuals born to parents of inter-cultural marriage who chose to communicate in Malay (Ghani 2006b). Although participants in this study were born from original Ba'ie parents, they declared themselves as bilingual in Ba'ie as well as Malay.

Based on the UNESCO degrees of endangerment, multilingualism in the native language or one or more dominant language (s) has usurped certain important communication contexts. However, multilingualism alone cannot be a factor responsible for language loss. All of the participants stated that Ba'ie language is orally used in the home and family domain as a private communication language. They also admitted that Ba'ie language is used for daily communication with their peer group, such as friend and mates, and there is an incomplete transmission of language. Although the Ba'ie language is spoken by all generations, incomplete language transmission and limited use domains bring down the degree of stability to unsafe (4) for Factor 1.

8.1.2 Factor 2: Absolute number of speaker

Ba'ie is a language spoken by the Ba'ie people who inhabit the Mouth of Kemena River in Bintulu, Sarawak Malaysia. Based on information obtained from the Department of Statistics Malaysia, total population of Bintulu is 183,892 (Department of Statistics Malaysia 2010), dominated by Iban (41%), Chinese (21%), Melanau (12%) and Malay (10%) as well as 14 % are Bidayuh, Indian, Non-Malaysia citizen and other indigenous group (Figure 8.1). If we consider the number of Ba'ie speakers based on this data, total Ba'ie speakers are not more than 23 thousand people since Ba'ie people might have been considered within the Melanau group. It is always difficult to determine the absolute number speakers for any speech community as the language, human population, and knowledge are dynamic. The speaker size of Ba'ie language could be considered as small with less than 100.000 speakers (Krauss 1992), which places the language at risk.

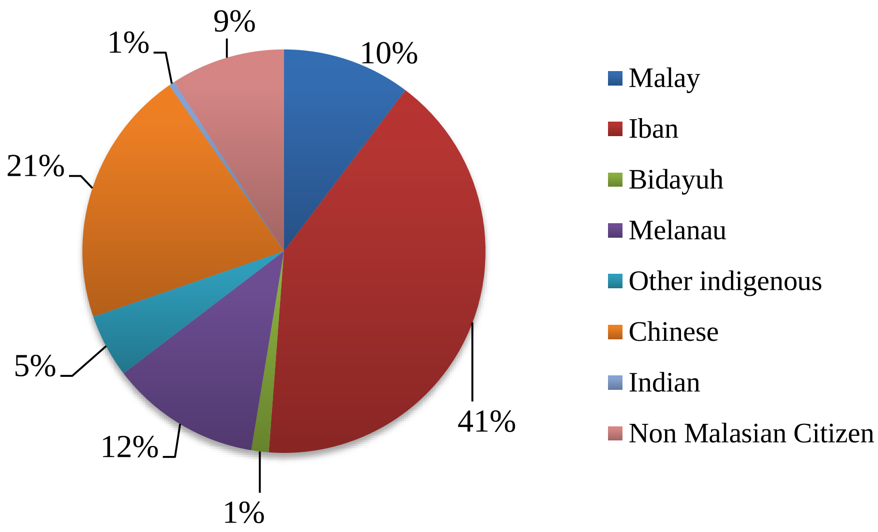


Figure 8.1 Bintulu population portion in race basis

An Alliance for Linguistic Diversity (2015) project classifies Bintulu language as vulnerable based on evidence study by Ghani (2006b), while according to data from the Language Atlas of the Pacific Area it could be threatened (Wurm and Hattori 1981). However, the number of speakers alone could not identify the vitality of language, and other factors might also cause language death even in languages with larger number of speakers. The best evidence comes from Ravindranath and Chon (2014) who worked on language diversity in Indonesia- they argue that there is no correlation between number of speakers and the vitality of language. This case study from the Javanese language shows that although it is spoken by over than 80 million speakers, the language is at risk. From their analyses, the trend of language use seems to be more important than number of speakers. Similarly in Nigeria where Yorùbá is spoken by 30 million speakers, risk of the language endangerment has already occurred due to the language attitudes, economic factors, political situations, global information, and religious issues (Fabunmi and Salawu 2005). The small population of Ba'ie language makes it 'unsafe' as per Factor 2 of LVE.

8.1.3 Factor 3: Proportion of Speakers to the Total Group Population

On the basis of the available data and self-assessment of the community, an attempt was made to determine the proportion of speakers within the population. In the interviews, the minimum percentage was given by three participants as 60%, three people stated 70%, 21 people stated 75%, 11 people stated 80%, 10 people stated (85%), four people stated 90%, seven people stated 95%, and the maximum percentage of 100% was given by one person. As a result, it could be said that the 80% (average value) of total Ba'ie people in Bintulu are Baie speakers. Based on the UNESCO criteria, Ba'ie language falls into the unsafe category (4) where nearly all speak the language.

8.1.4 Factor 4: Trends in Existing Language Domain

In detail, this study defines seven language use domains of Ba'ie as: (1) family and home domain, (2) social interaction, which includes contact with neighbourhood ethnic groups, (3) trading activities, (4) customs which cover food and fishing activities, (5) religious activities, (6) education, and (7) work place. The result of the interview is provided in Figure 8.1:

Table 8.1 The language use domain of Ba'ie language

Domain	**Frequency**				
	Never	**Seldom**	**Sometimes**	**Frequently**	**Mostly**
Home	-	-	-	26	34
Social	-	6	18	23	13
Trading	3	4	46	4	3
Custom	1	5	7	8	39
Religion	-	4	51	3	2
Education	26	34	-	-	-
Work place	1	8	22	5	24

Ba’ie language is the private language used mostly in family or home domain. In the social level, the Ba’ie people tend to use it less frequently since they have to interact with the other ethnic groups of different language. In this case, Malay as the communication language rises up as the solution for information exchange purposes. Similarly in trade, Ba’ie people use Malay to communicate, sell, and buy their needs in store, stall, or traditional market. Since the customers might be Chinese, Malay, Indonesian, Iban, etc., Malay serves as the lingua franca.

The Ba’ie people widely use their language in customary domain such as food and fishing. In many activities related to food and fishing, a Ba’ie will use the Ba’ie language to communicate with his/her children, relatives, and friends. Six respondents narrated an interesting example to highlight the relevance of Ba’ie in the customary domain and its irreplaceability. Ba’ie people are popular for their traditional fishing method called “*panau*” (please refers to Chapter 6). In Malay, *panau* refers to a skin disease called *malassezia* (Leeming and Notman 1987). In this case, the information about *panau* must be transmitted in the context of the Ba’ie language, failing which Panau can be equated with the disease instead of fishing. This also shows that replacing an indigenous language that is specific to the ecosystem with a different one can lead to inappropriate knowledge generation.

Being their L1, Ba’ie language plays an important role in knowledge acquisition in the community. Usage of Ba’ie terms in all existing domains would help the community to strongly adapt to new domains including formal education system. Introduction of Ba’ie language at least in the primary school level should be considered. For instance, the Ba’ie fish names could be used in the classroom along with their Latin and English names to help the student in identifying the fish.

Before the British rule (1841-1962), Sarawak was ruled by the Sultan of Brunei when native people such as Melanau (includes Melanau Bintulu or Ba’ie), and Kedayan inhabiting river sides embraced Islam. Other ethnic groups such as Sihan, Kelabit and Penan embraced Christianity during the James Brooke dynasty. In the Sihan community, the language use in religious domain shows a decreasing situation (Mohamed and Hashim 2012). They argue that the situation is triggered by the limitation of Bible in the native language, and the people tend to use bible which is translated into Iban language. Thus, Iban assumes the role of most important language in the Sihan community. However in the case of Ba'ie, the people sometimes use Ba'ie languages in their religious ceremonies. Although they use Arabic for prayers, the other activities such as meetings, talks, or religious discussion requires usage of Ba'ie language, especially in the villages. However in higher level occasions such as in Friday prayers and Hari Raya occasions held in Assyakirin Mosque (biggest Mosque in Bintulu), Malay is the communication language.

Ba'ie people seldom use Ba'ie language in their education domain and some of them stated that Ba'ie language is never used in their formal learning process. Malay has become the instruction medium along with English at times. Moreover, the school text books use either Malay or English with no text books available in Ba'ie. In many cases, it is shown that indigenous communities exposed to school environments in L2 exhibit a negative impact towards their native language. Girin (2002) pointed out formal schooling as the single most important government action which intervenes with language vitality. UNESCO argues that indigenous communities require culturally rooted appropriate educational systems for conserving their culture while respecting their language rights (King and Schielmann 2004). Good practices in indigenous education should ideally include participation and decision making, pedagogy and methodology, indigenous knowledge, curriculum, languages of instruction, teacher training, materials, and assessment and evaluation.

The condition is similar in workplace language use too. Formally, the working place requires Malay or English as communication tool. In the case of Ba'ie, 30 of 60 respondents are fishermen who normally use Ba'ie language in their working place, and the remaining 30 work in companies. The response for use of Ba'ie language in work place is varied; one person stated never, 8 people seldom use the language, 22 people sometimes, 5 people frequently used the language, and 24 respondents mostly used Ba'ie. People who used Ba'ie in the work place mostly belonged to the fishermen group (cluster 1). This highlights the strong ties between native languages and traditional occupations.

Of all the seven domains, Ba'ie is mostly used in home, social, and custom domains, whereas in trading and religion, it is on medium level of use. Lowest level of use occurs in the domains of education and work place. Based on the results, Ba'ie comes under grade (4) of Factor 4 and can be considered as 'unsafe'. The study shows that language use is compartmentalised with Malay becoming the primary language in official domains such as government, work place, and educational institutions, while Ba'ie use is limited to social domains following the general trend exhibited by other bilingual and multilingual communities.

8.1.5 Factor 5: Response to New Domain and Media

Ba'ie language is not sociable towards new domains of use. During the interviews, 43 people stated that language is used in few new domains (1) and 17 people stated that the language is not used in any new domain (0). There are few websites, blog, and facebook pages established by the community members using Ba'ie language such as: Bintulu dictionary (http://skutevo.fr.yuku. com/topic/233/Melanau-Bintulu-Vaie-Segan-Dictionary#.Vi3dn24atHA), Kamus Bahasa Bintulu (https://www. facebook.com/groups/kamusbahasavaie/) and *sejarah Bintulu* (https://www. facebook.com/groups/2950426 93864589/). The study also noted that in late 1990s, there used to be a radio station in Bintulu where Ba'ie language was used for broadcasting frequently. However the situation doesn't exist anymore with the radio station switching to Malay and English. Based on the community self-assessment and the author's observation, Ba'ie language falls into the minimal degree (1).

8.1.6 Factor 6: Material for language education and literacy

As of now, only two books have been recorded as the ones written in Ba'ie language: "*Kamus Bahasa Bintulu*" written by Ibrahim Saad (unpublished officially) and "*Daftar Kata Bahasa Va'ie- Bahasa Melayu*" published by Dewan Bahasa dan Pustaka Kuala Lumpur (2014). Participants also voiced their opinion that Ba'ie people have very limited written material for language education and literacy in L1. At least 43 people stated that a partial orthography is known to the community, and some material is being written. Although a few respondents stated that they knew about the Ba'ie dictionary, very few have accessed it. As a result, Ba'ie language can be considered as one with minimal material available.

The following two criteria represent the attitude of the government and the community towards the language. The government and institutional attitudes and policies influence language vitality to a great extent. Although mere conference of legal status do not guarantee the language will be maintained for long term, governments should confer legal status to all indigenous languages as it enhances language pride (UNESCO 2003).

8.1.7 Factor 7: Official Attitudes and Dominant/ Minority Language Policy

In Malaysia, Malay and English received more attention for education since the British colonial period. English is used by the elite speakers, whereas Malay is used widely by the masses (Pennycook 1998). After independence of Malaysia, Malay became the national and official language of Malaysia. Thus, it becomes a politically powerful language and the preferred medium of education (Puteh 2010). In Malaysia where not less than 141 indigenous languages are recognised, only Iban and Kadazandusun languages have been fortunate to receive the best governmental attention (Omar 1981). The attention of Dewan Bahasa dan Pustaka Malaysia also seems to go to Malay as the national language. However Malaysia is now a supporter of Indigenous peoples rights which include culture and language rights (United Nation 2002) which requires Malaysia to support, protect, and implement the doctrine of indigenous rights in their policy and regulations.

In February 2013, a seminar on Ba'ie language organized by Dewan Bahasa dan Pustaka Cawangan Sarawak and Pejabat Ahli Dewan Undangan Negeri (ADUN) was held in Bintulu. The seminar aimed to bring together the linguists, researchers, and community members to document and conserve the Ba'ie language (Borneo post 2013). Although it might be the beginning of a positive trend, since Ba'ie use is confined largely to the private domain, it meets the criteria for differentiated support (4) as per Factor 7.

8.1.8 Factor 8: Community Member's Attitudes toward Their Own Language

The Ba'ie people admit that they have immense language pride as speakers of an unique language. All participants (100%) stated that they value Ba'ie and wish to see the language promoted. The people equate Ba'ie with their identity, as only a Ba'ie could speak the language. Language appears to be an inherited feature for them. Thus, the community members' positive attitude towards Ba'ie might help in the maintenance of their language. As a result the Ba'ie language falls into grade 5 for Factor 8.

8.1.9 Factor 9: Language Amount and Quality of Documentation

Based on the community's self-assessment, all respondents (100%) stated that the Ba'ie language has been inadequately documented. Only a few grammatical sketches, short wordlists, and fragmentary text exist. Moreover, there are no audio and video recordings, even in unusable quality. Although based on the observation, a few of books and literature have been found to exist; the documents are not widely accessible to the community. Thus, most people consider their language as an exclusively orally transmitted one without any written documentation or recording. As a result, Ba'ie language can be considered as 'inadequate' as per Factor 9.

Over all, the result of LVE assessment is tabulated as follows:

Table 8.2 The UNESCO Language Vitality and Endangerment of Ba'ie language

Factor	Degree	Statement
1. Intergenerational Language Transmission	4 (Unsafe)	Unsafe. All Ba'ie members speak it as the first language. Yet, there is an incomplete transmission happening, that too in specific domains only.
2. Absolute Number of Speaker	23000	Small population, at risk.
3. Proportion of Speaker within the Total Population	4 (Unsafe)	Nearly all (80%) speak the Ba'ie language
4. Trends in Existing Language Domain	4 (Unsafe)	1. Malay has become the primary language for official communication purposes. 2. Ba'ie language is used in social domains 3. The Ba'ie are bilinguals 4. The Ba'ie people conclude that Malay is the language of social and economic opportunity
5. Response to New Domain and Media	1 (minimal)	The Ba'ie language is used only in a few new domains.

Factor	Degree	Statement
6. Material for Language Education and Literacy	1 (little material)	Orthography document is known to the community and some material is being written.
7. Governmental and Institutional Language Attitudes and Policies, Including Official Status Use	4 (Differentiated support)	1. Malay is the national language 2. Government has recognised Ba'ie language 3. The Ba'ie language is most often used in private domain
8. Community Member's Attitudes toward Their Own Language	5 (most)	All community members value their language and wish to see it promoted.
9. Amount and Quality of Documentation	1 (inadequate)	Only a few grammatical and short word list documentation of Ba'ie language are available, there is no audio and video recording of Ba'ie language.

Of the nine criteria (Table 8.2), intergenerational transmission, proportional number of speakers, trends in existing language domain and language attitudes (government and community) toward Ba'ie languages returned higher ratings as per the LVE framework. Although number wise the Ba'ie can be considered as a small group, the proportion of number of speakers to the total population indicates that the people strongly use the language. Lower levels of degree are recorded for the Ba'ie language's response to new domain, material for language education and literacy, and amount and quality of documentation. If the Ba'ie people continue to show immense pride toward their language and government also supports them to promote the language, the negative effect of absence of language documentation, little material for education and literacy, and lukewarm response to new domain could be mitigated. As such, the values for LVE overall indicate an 'unsafe' nature for Ba'ie.

8.2 Relevance of Using Tralavi (Franco et al. 2015) and UNESCO Language Vitality and Endangerment Assessment (UNESCO 2003)

Language shift and language death in ethnic groups have become a topic of serious concern among linguists, educationalists, anthropologists and ethnobiologists. Advancements in the field of Biocultural Diversity (Maffi 2005) has produced evidences of cause, process, symptoms, and implication of language loss (Fishman 1991, Krauss 1992, Moore et al. 2002, Sutherland 2003, Lewis 2006). Various gains have been made in the field of language vitality assessment. Fishman (1991) assessed language endangerment in eight levels based on Graded of Intergenerational Disruption Scale (GIDS). Lewis and Simon (2009) categorised vitality of languages into five levels from extinct to living, on the basis of the population size. Loh and Harmon (2005) proposed the global index of BCD to assess interrelationship between language, culture and biodiversity in any region. UNESCO (2003) also defined nine criteria of language vitality and endangerment based nine factors.

Traditional Knowledge and Language Vitality (TraLaVi) index has been designed to reveal the status of traditional knowledge and language vitality using ethnotaxonomic system in the given community (Franco et al. 2015). Pilot study with the Kanekes people indicates that the method could be used to rapidly assess the status of traditional knowledge and health of the language. People with higher scores of TraLaVi represent higher TK depth and proficiency in their autochthonous language and vice versa. The pilot testing also demonstrates the usability of ethnotaxonomic system of food plants as an indicator to assess Traditional Knowledge and language vitality.

In the Ba'ie community, ethnotaxonomy of fishes were used to assess their traditional knowledge and language vitality. The TraLaVi results show that they are in safe category (0.836). Whereas, UNESCO's (2003) LVE assessment indicates that the Ba'ie language could be unsafe. The LVE assessment gives ample attention to both the community and external support such as governmental institution and policy. Whereas TraLaVi focuses on the individual and his/her capability in identifying, retaining and transmitting Lexemes as the proxy for TK and Language vitality. So, the difference in the results from both these assessment tools are bound to happen. The TraLaVi method suggests that although the

Ba'ie language is spoken by relatively smaller number of speakers, the ability of the community to maintain their language despite contact with different languages is surprisingly high. Legere (2007) criticised the UNESCO assessment and suggested that the factors of language vitality indicator needed prioritisation, especially with the intergenerational L1 transmission and language attitude factors, where TraLaVi excels. In the first criteria (criteria A) of TraLaVi, the methodology clearly considers the position of L1 and L2. Based on the criterion, the methodology values higher proficient level of L1 and also pays attention to the bilinguals who could maintain their bilingualism since knowledge and languages are dynamic. Criteria B and C also elucidate the competency of the people in their traditional knowledge and language (L1) through the ethnotaxonomic system. TraLaVi gauges the strength of Language and TK within the population, whereas LVE situates language in the larger political context.

Both TraLaVi (Franco et al. 2015) and LVE (UNESCO 2003) use similar concepts in intergenerational language transmission. The TraLaVi method shows that the Ba'ie people receive knowledge from their parents and transmit them to children via traditional mechanisms. Yet, the incomplete knowledge transmission is reflected in the erroneous identification of the species in Criteria D and E of TraLaVi. The participants from cluster 2 (non-fishermen) tend to mix their knowledge with non-Ba'ie elements without even being aware of it while also transmitting it erroneously. This is a key factor that might not be captured by a superficial index that relies on questioning, as participants are bound to rate their transmission rates as high without realising the ground truth. In the LVE, it is assumed that even though a language is spoken in most contexts by all generations with unbroken intergenerational transmission, multilingualism involving one or more dominant language(s) would usurp certain important communication contexts. At the LVE assessment, it is the incomplete intergenerational transmission and limitation of language use domain that pushes the vitality level of Ba'ie language to the unsafe category. Of these two factors, only the former one is factored in the TraLaVi.

Furthermore, when we analyse the Ba'ie community separately based on their occupational preference, it can be found that People from cluster 1 (fishermen; 0.899) have higher TraLaVi scores than people from cluster 2 (non-fishermen; 0.775), Although both scores indicate safe levels, people who are not involve in fishing activities might be gradually abandoning their language and TK which could bring down the status of traditional knowledge and language vitality from safe into vulnerable in future. This intra-communal dynamics is captured and factored well in TraLaVi. Peters' (2014) research with the Shangri-La language using the LVE, argues that people from urban area might have underestimated their native language proficiency unlike the rural population. Urban populations are normally affected by politically powerful L2 through education, government policy, or any occupational preference than the rural communities. Similarly in the Ba'ie case, if the non-fishermen cluster is considered as one with higher influence of urbanisation, then their language vitality might be gradually reduced, or even lead to L1 abandonment in the near future.

Summary

Based on the results of LVE assessment, Ba'ie language could be classified as unsafe, largely due to the small population. The language also shows unsafe levels in intergenerational language transmission, proportion of speaker to total population, existing language domain use trend, response to new domain, documentation of materials for language education, literacy and documentation. Despite this, the language might be safe due to favourable attitudes of the community and government towards the language and its use. The TraLaVi values also indicated a 'safe' status for the community's Language and TK. However, a careful look shows that the TraLaVi has captured the internal dynamics of language and TK vitality by indicating a possible erosion of TK and Language Vitality in the individuals who have moved away from the traditional practice of fishing. This provides valuable inputs for policy developers and community members who aim to conserve their language and TK. The study recommends that adequate participatory measures should be developed to revitalise the language and TK within the community members who move towards non-traditional occupations so that economic progress is achieved without loss of Biocultural Diversity.

Chapter 9 Conclusions

The suitability of the novel methodology of using ethnotaxonomic and nomenclatural systems to assess traditional knowledge (TK) and language vitality was demonstrated adequately in the pilot study with the Kanekes people itself. Therefore, the study was replicated in detail with the Ba'ie Segan people of Bintulu in Sarawak, Malaysia. The ethnotaxonomic systems of plants and animals are based on traditional knowledge (ecological, morphological, quality, and utility features) which are acquired, accumulated, and transmitted through language. Language also plays an important role in labeling the plant and animal names, as explained by the various linguistic mechanisms revealed in this study.

The Kanekes ethnotaxonomic system starts with the unique beginners of *tatangkalan* (plants) and *sasatoan* (animals) and employs the TK mechanisms of ecology (51), morphology (177), quality (39), and utility (51) to identify and tag the food plants. The Kanekes also use linguistic mechanisms such as metaphors (109), metonymy (189), and ten unique portmanteaus for denoting food plants. The study shows that vitality status of traditional knowledge and language of Kanekes people could be safe (0.98), and a strong informal education system and cultural restrictions could be the two major factors behind this. Independently, inner Kanekes who are culturally considered as the 'pure' Kanekes show marginally higher TK and language vitality (0.99) than outer Kanekes (0.9725). Although the difference is insignificant, it shows that the methodology is reliable to assess the traditional knowledge and language vitality of the community.

The core study with the Ba'ie people from Sarawak Malaysia confirms that Ba'ie Segan people are still maintaining and practicing their TK and language. Their folklores show the cultural importance of *duyan* (*Durio zibethinus* L.) and *tavai* [*Wallago leerii* (Bleeker, 1851)], and the history related to the community. *Balau* (*Metroxylon sagu* Rottb.) is of high cultural importance to the community, as the plant is cited and used frequently by the community as a staple food as well as side dish. The study also documents the utilisation of 141 fish species by the Ba'ie people for food purposes. The study also records the use of five fish species for medicinal purposes, and four fish species identified as toxic for which the people have developed appropriate TK on detoxification. However, nine fishes were not recognised by the Ba'ie people, indicating lack of knowledge regarding the fishes, as they might have been lately introduced to community, and hence the fishes were not traditionally consumed by the Ba'ie people. The fishes are: *Myripristis hexagona* (Lacepède, 1802), *Upeneus tragula* (Richardson, 1846), *Siganus canaliculatus* (Park, 1797), *Piaractus brachypomus* (Cuvier, 1818), *Helostoma temminckii* (Cuvier, 1829), *Parambassis* sp., *Barbonymus schwanenfeldii* (Bleeker, 1854), *Osteochilus microcephalus* (Valenciennes, 1842), and *Lutjanus* sp. Ninety two of 141 names were un-analysable primary lexemes and four names had unknown meanings for the secondary lexemes that were supposed to describe the higher taxa to which the category is affiliated. This indicates that the Ba'ie people have either lost their TK or have abandoned their language related to them. The Ba'ie ethnotaxonomic system starts with *te'dai* (plants) and *semesav* (animals) as unique beginners. The Ba'ie people use ecology (8), morphology (50), quality (6), and utility (1) features of TK to name their fish species. They also use linguistic mechanisms such as metaphors (18) and metonymy (48) to generate fish names. The results adds strength to the notion that ethnotaxonomic systems are derived using both traditional knowledge and linguistic mechanisms.

The present study thus argues in support of the hypothesis that the vitality of language and traditional knowledge of a community related to biodiversity is reflected in the community's taxonomic and nomenclatural systems. Using ethnotaxonomy as a proxy, the study finds that the traditional knowledge and language vitality status of Ba'ie could be considered as safe (0.83). Independently, people who are involved in fishing activities show higher vitality scores (0.899) than those who are not involved in fishing activities (0.773), and the statistical analysis using Mann-Whitney test; $p<0.05$ shows that there are significant difference between these two distinct groups. For criteria D and E too, there are significant differences between cluster and gender groups. For the criteria D, fishermen group are able to recognise the 25 culturally salient fishes better than people who are not involved in fishing activities, as the traditional occupation gives them more opportunity to practice and gain more knowledge regarding the fish. On the other hand, people who are not involved in fishing, tend to put less priority on the fishes. Although the TK and language are still maintained by the non-fishermen group, shift towards non-traditional occupation creates lack of opportunity to acquire TK besides effecting incomplete transmission of TK from elders. Looking from the gender perspective, the results show that the female group have lesser knowledge of the 25 culturally salient fishes of Ba'ie. This might be a limitation of visual recognition through photographs, which was not received positively by the female group as it offers limited scope for tactile and olfactory feedback; in the Ba'ie culture, females are not involved in offshore fishing activities, yet they play important roles in managing and processing the fish into quality food.

The Ba'ie people are bilingual and generally proficient with their autochthonous language. However the study found that the people either tend to shift their language or, are unconsciously abandoning the Ba'ie language. Generally, retrieval of information on TK and language shows a good trend as understood from their ability to elucidate the meaning behind the names. However, there are few names that indicate the knowledge erosion occurring in the transmission pathway between the elder and younger generations, as understood by the mismatched information between both generations, For instance, *njen sezau rat* (Chicken sea fish) is named after its morphological similarity with the beak of domestic fowls. While the older generation had no trouble in deciphering the right meaning, the younger generation often provided the literal meaning that its flesh tastes like that of domestic fowls.

Intergenerational transmission of TK and language showed significant difference both cluster and gender wise. However, the main focus of the knowledge transmission is on the mechanisms and from where the people acquire, transmit, and disseminate the TK using their own language. Specifically, the transmission of TK and language in the fishermen groups indicates a healthy trend. The people from this group tend to acquire their knowledge from their parents and grandparents (internal factor) through daily activities since their parents were also fishermen. On the other hand, people who are not involved in fishing have an external diverse source base for their information including markets, parents/ grandparents, TV, books and school, as well as peers. The breakdown of the results place markets as the major source of knowledge on fishes, for the non-fishermen group. The analysis shows the negative and positive influence of markets for the community, since markets could provide correct information, wrong information, as well as grey information due to the ‘mixed-culture’ phenomenon existing in markets. Local markets are not only a place to sell and buy economically important commodities, but also important elements in knowledge dissemination; they could also reveal the history, economic, and socio cultural dynamics of the interacting communities.

The scores of non-fishermen group indicate that their language vitality is close to the vulnerable condition and might require adequate interventions in the near future. The Language Vitality and Endangerment (LVE) assessment also places the Ba’ie language in the ‘unsafe’ category. The present study thus proves the usability of ethnotaxonomic and nomenclatural systems as indicators of traditional knowledge and language vitality. However, the traditional knowledge and language vitality assessment uses a micro level approach that considers the community dynamics, whereas LVE (UNESCO 2003) being a macro level approach could not capture the intra-communal dynamics. Hence, both TraLaVi and LVE could be used in a complementary manner to gain a clearer picture of the language vitality scenario in any community.

While the thesis has demonstrated that the vitality of language and traditional knowledge is reflected in the community’s taxonomic and nomenclatural systems, this study should be only considered as the starting point, as there is tremendous scope for future studies. Malaysia and Indonesia have very few studies dealing with ethnotaxonomy, and advancing the theoretical gains of this study to these Biocultural diversity rich countries could help in salvaging TK and languages. The methodology developed for the study includes only five criteria and in future, the possibility of including more criteria should be considered. In its present state, TraLaVi is only relevant to bilingual communities and future studies should develop it further to address multilingualism.

References

Adnan N. and Othman N. 2012. “The Relationship between Plants and Malay Culture”. *Procedia- Social Behavioural Sciences* 42: 231-241.

AIPP, IWGIA, FORUM-ASIA. ASEAN’s indigenous people. 2010. Chiang Mai: Asia Indigenous Peoples’ Pact (AIPP), the International Work Group for Indigenous Affairs (IWGIA) and Asian Forum for Human Rights and Development (FORUM-ASIA); [http://www.iwgia.org/iwgia_files_publications_files0511_ASEAN_BRIEFING_PAPER_eb.pdf].

Albuquerque U.P., Josivan S.S., Juliana L.A.C., Rosemary S.S., Taline C.S., Romulo R.N.A. 2013. The Current Status of Ethnobiological Research in Latin America: gaps and perspectives. *Journal of Ethnobiology and Ethnomedicine*. Doi: 10.1186/1746-4269-9-72.

Albuquerque U.P., Luiz Vital F.C., Reinaldo Farias P.L., Rômulo Romeu N.A. 2014. *Methods and Techniques in Ethnobiology and Ethnoecology ed.* Humana Press: ISBN: 978-1-4614-8635-0 (Print) 978-1-4614-8636-7 (Online).

Albuquerque U.P. and Ramos M.A. 2008. *Current Topics in Ethnobotany,* ed. Research Signpost: India. ISBN: 978-81-308-0243-5.

Alliance for Linguistic Diversity. 2015. “Bintulu.” Retreived October 5, 2015 (http://www.endangeredlanguages.com/lang/bny)

Anonby EJ. 2006. "Bāhendayal: Bird Classification in Southern Luri (Iran)." *Journal of Ethnobiology* 26 (1): 1-35. doi: 10.2993/02780771(2006)26[1:BBCISL]2.0.CO;2.

Asmah H.O. 1983. *The people of Malaysia and their languages*. Dewan Bahasa dan Pustaka. Kuala Lumpur.

Babcock T.G. 1974. “Indigenous Ethnicity in Sarawak.” *Sarawak Museum Journal, special issue* 43: 191-202.

Bala P. 1985. “Indigenous Medicine and the State in Ancient India”. *Ancient Science of Life* 5(1): 1-4

Balee W. 1989. “Nomenclatural Patterns in Ka'apor Ethnobotany.” *Journal of Ethnobiology* 9 (1): 1-24.

Bastardas-Boada A. 2002. “World Language Policy in the Era of Globalization: Diversity and Intercommunication from the Perspective of 'Complexity’”. *Noves SL. Revista de Sociolingüística* http://www.gencat.cat/llengua/noves *Teoria i metodologia. Estiu.*

Bastardas-Boada A. 2007. “Linguistic sustainability for a multilingual humanity”. *Glossa, II (1 & 2)*:180-202.

Bauer L. 1992. *Introducing Linguistic Morphology*. Edinburgh University Press: United Kingdom.

Begossi A., Clauzet M., Figueiredo J.T., Garuana L., Lima R.V., Lopes P.F., Ramires M., Silva A.L., Silvano R.A.M. 2008. “Are Biological Species and Higher- Ranking Categories Real? Fish Folk Taxonomy on Brazil’s Atlantic Forest Coast and in tha Amazon.” *Current Anthropology* 49(2): 291-306.

Benard H.R. 1992. “Preserving Language Diversity.” *Human Organization* 51 (1): 82-89.

Bennett E. 2005. “Gender, fisheries and development.” *Marine Policy* 29 (5): 451–459.

Benton R. 1991. *The Mäori Language: Dying or Reviving*. New Zealand Council for Educational Research: Wellington.

Berghoefer U., Rozzi R., Jax K. 2010. “Many Eyes on Nature: Diverse Perspectives in the Cape Horn Biosphere Reserve and Their Relevance for Conservation.” *Ecology and Society* 15(1): 18.

Berlin B. 1992. *Ethnobiological Classification: Principles af categorization of plants and animals in traditional societies*. Priceton University Press: Pricenton NJ.

Berlin B., Dennis E.B., and Peter H.R. 1966. “Folk Taxonomies and Biological Classification.” *Science* 154 (3746): 273-275. doi: 10.2307/1719317.

———. 1968. “Covert Categories and Folk Taxonomies.” *American Anthropologist* 70 (2): 290-299. doi: 10.2307/671117.

———. 1973. “General Principles of Classification and Nomenclature in Folk Biology.” *American Anthropologist* 75 (1): 214-242.

Berlin E.A., Berlin B. 2005. “Some Field Methods in Medical Ethnobiology”. *Field Methods* 17 (3): 235–268. doi: 10.1177/1525822X05277532

Berkes F. Colding J., Folke C. 2000. "Rediscovery of Traditional Ecological Knowledge as Adaptive Management." *Ecological Applications* 10 (5): 1251-1262. doi:10.1890/ 1051-0761(2000)010[1251:ROTEKA]2.0.CO;2.

Bisset N.G. 1972. “The Asian species of Strychnos. Part I. Strychnos as a source of the drug lignum colubrinum (snake-wood)”. *Lloydia* 35 (2): 95-116.

Blaxter L., Hughes C., Tight M. 2006. *How to Research (3rd edn)*. Buckingham: Open University Press.

Blust R.A. 1974. *The proto-north Sarawak vowel deletion hypothesis*. PhD’s thesis University of Hawaii. Honolulu, Hawaii.

Boas F., and Powell J.W. 1966. *Introduction to Handbook of American Indian Languages plus Indian Linguistic Families of America North of Mexico*. niversity of Nebraska Press: United Kingdom.

Bolton R., Curtis A., Thomas L. 1980. “Nepali color terms: Salience in a listing task”. *Journal of the Steward Anthropological Society* (12): 309–21.

Borneo Post. 2013. “107 peserta menyertai Seminar Bahasa Vaie 2013.” Retrieved October 11, 2015 (http://www.theborneopost.com/2013/02/07/107-peserta-menyertai-seminar-bahasa-vaie-2013/).

Bostoen K. 2007. “Bantu Plant Names as Indicators of Languistic Stratigraphy in the Western Province of Zambia.” *Selected Proceedings of the 37th Annual Conference on African Linguistics, ed. Doris L. Payne and Jaime Pena 16-29*. Somerville, MA: Cascadilla Proceeding Project.

Butrica J.L. 2002. “The Medical Use of Cannabis among the Greeks and Romans”. *Journal of Cannabis Therapeutics* 2(2): 51-70

Caniago I. and Siebert S.F. 1998. “Medicinal plant ecology, knowledge and conservation in Kalimantan, Indonesia.” *Economic Botany* 52 (3): 229–250.

Case R.J., Franzblau S.G., Wang Y., Chob S.H., Soejarto D.D., Pauli G.F. 2006. “Ethnopharmacological evaluation of the informant consensus model on anti-tuberculosis claims among the Manus.” *Journal of Ethno-pharmacology* 106 (2006): 82-89.

Cashdan E. 2001. “Ethnic diversity and its environmental determinants: Effects of climate, pathogens, and habitat diversity”. *American Anthropology*100: 968–991.

Chen B., Nakama Y., Yogi T., Ichwandi I. 2010. “Agroforestry by Baduy Community in Banten Province, Indonesia.” *The Science Bulletin of the Faculty of Agriculture. University of the Ryukyus* 57: 17-30.

Civitello L. 2008. *Cuisine and Culture: a History of Food and People* 2nd edition. New Jersey: Jhon. Wiley& Sons, Inc.

Clarke G. 2001. “From ethnocide to ethnodevelopment? Ethnic minorities and indigenous peoples in Southeast Asia”. *Third World Quarterly* 22(3):413–36.

Clement D. 1998. “The Historical Foundations of Ethnobiology (1860-1899)”. *Journal of Ethnobiology* 18(2): 161-187.

Coley J.D., Medin D.L., Atran S. 1997. “Does rank have its privilege? Inductive inferences within folkbiological taxonomies.” *Cognition*: 73–112.

Conklin H. 1954. “Section of Anthropology: An Ethnoecological Approach To Shifting Agriculture”. *Transactions of the New York Academy of Sciences* 17 (2): 133-142.

Costa-Neto EM, and Magalhães HF. 2007. "The Ethnocategory" Insect"in the Conception of the Inhabitants of Tapera County, São Gonçalo Dos Campos, Bahia, Brazil." *Anais da Academia Brasileira de Ciências* 79 (2): 239-249.

Cote´ P., Tittler R., Messier C., Kneeshaw D.D., Fall A., Fortin M.J. 2010. “Comparing different forest zoning options for landscape-scale management of the boreal forest: Possible benefits of the TRIAD.” *Forest Ecology and Management* 259 (2010) 418–427.

Cotton C.M. 1996. *Ethnobotany: Principles and Applications*. John Wiley & Sons, Chichester: New York; 1996.

Crain J.B. 1978. “The Dayeh of Sabah, East Malaysia: Aspects of Marriage and Social Exchange.” PhD dissertation: Cornell University. Ann Arbor: University Microfilms.

Cresswell J.W. and Plano C.V.L. 2011. Designing and conducting mixed method research. 2nd. Sage: Thousand Oaks, CA.

Cristancho S.V.J. 2009. “Perceived intergenerational differences in the transmission of traditional ecological knowledge in two indigenous groups from Colombia and Guatemala.” *Culture Psychology* 15:229.

Currie T.E. and Mace R. 2009. Political complexity predicts the spread of ethnolinguistic groups. *Proceedings of the National Academy of Sciences* 106: 7339–7344.

Currie T.E. and Mace R. 2012. "The Evolution of Ethnolinguistic Diversity." *Advances in Complex Systems* 15 (01n02).

Deikumah J.P., Konadu V.A., and Kwafo R. 2015. “Bird naming systems by Akan people in Ghana follow scientific nomenclature with potentials for conservation monitoring.” *Journal of Ethnobiology and Ethnomedicine* 11 (75).doi: 10.1186/s13002-015-0062-y.

Deklin L.F. and Aung Si. 2014. “Ex-situ Documentation of Ethnobiology”. *Language documentation and conservation* 8: 788–809.

Department of Statistic Malaysia. 2010. *Population and Housing Census of Malaysia*. Department of Statistics: Malaysia.

Descola P. and Pálsson G. 2004. *Nature and Society ed.* Routledge: New York.

Dewan Bahasa dan Pustaka Kuala Lumpur 2014. *Daftar Kata Bahasa Vaie- Bahasa Melayu.* Dewan Bahasa dan Pustaka Kuala Lumpur: Kuala Lumpur.

Dickin S.K., Schuster-Wallace C.J., Elliott S.J. 2014.”Mosquitoes and vulnerable spaces: Mapping local knowledge of sites for dengue control in Seremban and Putrajaya Malaysia”. *Applied Geography* 46: 71-79

Dinas Sosial. 1999. *Informasi Pembinaan Kesejahteraan Sosial Masyarakat Baduy di Kabupaten Lebak*. Cabang Dinas Sosial Propinsi Dati I Jawa Barat: Kabupaten Lebak.

Dixit U. and Goyal V.C. 2011. “Traditional Knowledge from and for elderly”. *Indian Journal of Traditional Knowledge* 10 (3): 429-438.

Edris A. and Ghani B.A.A. 1992.”The Influences of the Sociocultural Environment and other languages on the Bintulu Dialect: An Overview.” *Sarawak Museum Journal 153* (64): 343-355.

Ellen R.F. 2004. *The cognitive geometry of nature: a contextual approach.* Routledge: New York.

Evans N, and Levinson S.C. 2009. “The myth of language universals: Language diversity and its importance for cognitive science.” *Behavioral and Brain Sciences* 32: 429–492. doi:10.1017/S0140525X0999094X

Evans N. 1997. “Sign Metonymies and the Problem Flora- Fauna Polysemy in Australian Linguistics”. In Darrell Tryon Michael Walsh, eds. Boundary rider: essay in honour of Geoffrey O’ Grady, 133-153. *Pacific Linguistics* C-136: 133-153.

Eyssartier C., Ladio A.H., Lozada M. 2008. “Cultural Transmission of Traditional Knowledge in two populations of North-western Patagonia”. *Journal of Ethnobiology and Ethnomedicine* 4(25): page? . doi:10.1186/1746-4269-4-25

Fabunmi F.A and Salawu A.S. 2005. “Is Yorùbá an Endangered Language?” *Nordic Journal of African Studies* 14(3): 391–408.

Fishman J.A. 1991. *Reversing Language Shift*. Multilingual Matters Ltd: Clevedon UK.

Foley R.A. 2004. *The evolutionary ecology of linguistic diversity in human populations. Traces of Ancestry: Studies in Honour of Colin Renfrew, ed* Jones M. McDonald Institute, Cambridge: UK).

Ford R.I. 2011. *History of Ethnobiology*. In Ethnobiology. Edited by Anderson EN, Pearsall D, Hunn E, Turner N eds. John and Sons, Inc: Canada pp. 15-26.

Franco F.M. and Narasimhan D. 2009. "Plant Names and Uses as Indicators of Knowledge Patterns." *Indian Journal of Traditional Knowledge* 8 (4): 645-648.

Franco F.M., Ghani B.A.A, Hidayati S. 2014. “Biocultural importance of the Tanying [Koompassia excelsa (Becc.) Taub.] tree for the Berawan of Loagan Bunut, Sarawak, Malaysia”. *Indian Journal of Traditional Knowledge* 13 (1): 63-69.

Franco M.F., Hidayati S., Ghani B.A.A, Malancon B.R. 2015. “Ethnotaxonomic systems can reflect the vitality status of indigenous languages and traditional knowledge”. *Indian Journal of Traditional Knowledge* 14 (2): 175-182.

Franco M.F. and Narasimhan. 2012. *Ethnobotany of the Kodh, Poraja, Gadaba and Bonda of the Koraput Region of Odisha, India*. New Delhi D.K. Printworld.1st edition.

Fraser J., Teixeira W., Falcão N., Woods W., Lehmann J., Junqueira A.B. 2011. “Anthropogenic soils in the Central Amazon: from categories to a continuum.” *Area* 43 (3): 264–273. doi: 10.1111/j.1475-4762.2011.00999.x

García G.S.C. 2006. “The mother – child nexus knowledge and valuation of wild food plants in Wayanad, Western Ghats, India.” *Journal of Ethnobiology and Ethnomedicine* 2:39 doi:10.1186/1746-4269-2-39

Garibaldi A. and Turner N. 2004. “Cultural Keystone Species: Implications for Ecological Conservation and Restoration.” *Ecology and Society* 9 (3):1[online] URL: http://www. ecologyand society. org/vol9/iss3/art1

Garna J. 1973. *Kasepuhan Sinaresmi: Studi Kepemimpinan Tradisional di Sukabumi (Banten) Selatan*. Universitas Pajajaran: Bandung.

______. 1987. *Orang Baduy*. Universiti Kebangsaan Malaysia: Bangi.

Gavin M.C., Botero C.A., Bowern C., Colwell R.K., Dunn M., Dunn R.R., Gray R.D., Kirby K.R., McCarter J., and Powell A. 2013. "Toward a Mechanistic Understanding of Linguistic Diversity." *BioScience* 63 (7): 524-535.

Ghani B.A.A, Ridzuan A.A.A. 1992. “Language Shift Among the Orang Miriek of Miri Sarawak.” In Martin P.W. (ed). Shifting Paterns of Language Use in Borneo. *Borneo Research Council Precedings*. Series 3:131-145.

Ghani B.A.A. 1992. “The Bintulu Dialect- An Introduction”. *Sarawak Museum Journal* 153, (64): 321-341.

Ghani B.A.A. 2006(a). “Maintenance and Shift in a Language of Sarawak: A Study of Bintulu”. *In Reflections of Borneo River: Essays in Honour of Professor James T.Clooins, Book I, edited by Chong S, Harun K, & Alas Y*. Indonesia, 111-134: STAIN Pontianak Press.

______. 2006(b). “The Concept of Language Shift and Maintenance.” Reflection in Borneo Rivers Essay in Honour of Professor James T. Collins: Book 1 page 111-123.

Girin F. 2002. *Using language economics and education economics in language education policy*. Strasbourg: Council of Europe, Language Policy Division. www.coe.int/t/dg4/linguistic/Source/GrinEN.pdf

Given L.M. 2008. *The SAGE Encyclopedia of Qualitative Research Methods*. Sage Publications, Inc: California.

Gorenflo L.J., Romaine R., Mittermeier R.A., and Walker-Painemilla K. 2012. "Co-Occurrence of Linguistic and Biological Diversity in Biodiversity Hotspots and High Biodiversity Wilderness Areas." *Proceedings of the National Academy of Sciences* 109 (21): 8032-8037.

Gotzone G. and Puri R.K. 2011. “Smelling the monsoon: Senses and traditional weather forecasting knowledge among the Kenyah Badeng farmers of Sarawak, Malaysia”. *Indian Journal of Traditional Knowledge* 10 (1) SI: 21-30.

Gujral M.L., Saxena P.N., Mishra S.S. 1955. “An experimental study of the comparative activity of indigenous diuretics.” *Journal of the Indian Medical Association* 25(2): 49-51.

Halme K.J. and Bodmer R.E. 2006. “Correspondence between scientific and traditional ecological knowledge: rain forest classification by the non-indigenous riberen˜ os in Peruvian Amazonia”. *Biodivers Conserv* 16:1785–1801. DOI 10.1007/s10531-006-9071-4.

Hardison P. and Bannister K. 2011. *Ethics in Ethnobiology: History, International Law and Policy, and Contemporary Issues*. In Ethnobiology. Edited by Anderson EN, Pearsall D, Hunn E, Turner N. John and Sons, Inc: Canada pp.27-49

Harmon D. 1996. Losing species, losing languages: Connections between biological and linguisticdiversity. *Southwest Journal of Linguistics* 15:89–108

Harpera S., Zellera D., Hauzerb M., Paulya D., Sumailac U.R. 2013. "Women and fisheries: Contribution to food security and local economies." *Marine Policy* 29 (5): 451-459.

Harrison T. 1962. "Reviewed Work: *The White Rajahs: A History of Sarawak from 1841 to 1946* by Steven Runciman. "*Journal of Southeast Asian History* 3 (1): 160-165.

Harshberger J.W. 1896. "The Purpose of Ethnobotany." *Botanical Gazzete* 21: 146-154.

Hesse-Biber S.N. 2010. *Mixed methods research: Merging theory with practice*. New York, NY: Guilford.

Hidayati S, Franco MF, and Bussman R. 2015. "Ready for phase 5 - current status of ethnobiology in Southeast Asia." *Journal of Ethnobiology and Ethnomedicine:* 11-17.doi10.1186/s13002-015-0005-7

Hidayati S. 2013. *Ethnobotany Application Analysis of the Baduy People in Food Security*. Master thesis: Bogor Agricultural University.

Hobhouse H. 1992. *Seeds of Change: Five Plants that Transformed Mankind*. Papermac: London.

Holden C. 1991. "Endangered Languages." *American Association for the Advancement of Science* 251 (4990): 159. doi:10.1126/science.251.4990.159-c.

Hosking G. 2001. *Russia and the Russians: A History*. Penguin Press: New York

Houghton P.J. 1984. "Ethnopharmacology of some Buddleja species." *Journal of Ethnopharmacology* 11(3): 293-308.

Hudson A.B. 1970. "A note on Selako: Malayic Dayak and Land Dayak languages in Western Borneo." *Sarawak Museum Journal* 18 (36):301-318.

Hunn E. 1982. “The Utilitarian Factor in Folk Biological Classification.” *American Anthropologist* 84: 830-47.

Hunn E. 2007. “Ethnobiology in Four Phases”. *Journal of Ethnobiology* 27 (1): 1-10.

International Society of Ethnobiology (ISE). 2006. *The ISE code of ethics*. Accessed Jan 2014, http://ethnobiology.net/code-of-ethics/.

Iskandar J., Ellen R. 1999. “In Situ Conservation of Rice Land Races Among The Baduy of West Java.” *Journal of Ethnobiology* 19(1): 97-125.

Iskandar J. 1992. *Ekologi Perladangan di Indonesia: Studi Kasus dari Daerah Baduy, Banten Selatan, Jawa Barat*. Djambatan: Jakarta.

Kakudidi E.K. 2004. “Folk Plant Classification by Communities Around Kibale National Park, Western Uganda.” *African Journal of Ecology* 42 (1): 57-63.

Kaushanskaya M. and Marian V. 2009. “Bilingualism Reduces Native-Language Interference During Novel-Word Learning.” *American Psychological Association Learning, Memory, and Cognition* 35 (3): 829–83.

Khasbagan and Soyolt. 2008. "Indigenous Knowledge for Plant Species Diversity: A Case Study of Wild Plants' Folk Names Used by the Mongolians in Ejina Desert Area, Inner Mongolia, Pr China." *Journal of Ethnobiology and Ethnomedicine* 4 (1): 2.

Khiok A.L.P. and Ali A. 2014. *Marine Fishes Identification Sheet. Department of Fisheries Malaysia*. Ministry of Agriculture and Agro- Based Industry Malaysia.

Khiok A.L.P. and Gambang A.C. 2009. *Field Guide to Marine & Estuarine Fishes of Sarawak*. Fisheries Research Institute Bintawa: Kuching.

King L. and Schielmann S. 2004. *The Challenge of Indigenous Education: Practice and Perspectives*. United Nations Educational, Scientific and Cultural Organization: Paris.

Krauss M. 1992. “The World’s Language in Crisis”. *Language* 68: 4–10.

Kridalaksana H. 2001. *Kamus Linguistik. Edisi Ketiga*. Pustaka Utama: Jakarta.

Kroeger P.R. 1998. "The dialects of Biatah." *Paper presented at the Third Biennial International Conference of the Borneo Research Council, Pontianak, West Kalimantan*. To appear in Martin (ed.)

Lagoudakis H.S., Klitgaard B.B., Forest F., Francis L., Savolainen V., Williamson E.M., Hawkins J.A. 2011. "The Use of Phylogeny to Interpret Cross-Cultural Patterns in Plant Use and Guide Medicinal Plant Discovery: An Example from Pterocarpus (Leguminosae)". *PLoS ONE* 6 (7): e22275.doi:10.1371/journal.pone. 0022275

Langub J. 1987. "Ethnic Self-Labelling of the Murut or "Lun Bawang" of Sarawak." *Journal of Social Issues in Southeast Asia* 2(2): 289-299.

Lasisi R. and Ekpenyong A.S. 2011. "Urbanization and loss of traditional ecological knowledge (TEK): lessons from Rumudomaya Community in Rivers State." *Global Journal of African Studies* 1(1):54- 58

Lawrence A., Phillips O.L., Ismodes A.R., López M., Rose S., Word D., Farfan J. 2005. "Local values for harvested forest plants in Madre de Dios, Peru: Towards a more contextualised interpretation of quantitative ethnobotanical data". *Biodiversity and Conservation* 14: 45–79.

Leeming J.P. and Notman F.H. 1987. "Improved Methods for Isolation and Enumeration of *Malassezia furfur* from Human Skin." *Journal of clinical microbiology* 25 (10); 2017-2019.

Legere K. 2007. "Vidunda (G38) as an Endangered Language?" Selected Proceedings of the 37th *Annual Conference on African Linguistics*, ed. Doris L. Payne and Jaime Pena, 43-54. Somerville, MA: Cascadilla Proceeding Project

Lembaga pamarentah Baduy. 2012. 'Baduy". Unpublished report, available in the community office.

Lewis M.P., Simons G.F., and Fennig C.D(eds.). 2015. *Ethnologue: Languages of the World, Eighteenth edition*. Dallas, Texas: SIL International. Online version: http://www.ethnologue.com.

Lewis M.P. and Simons G.F. 2009. “Assessing Endangerment: Expanding Fishman’s GIDS, Draft: 11 Sept 2009. SIL International: http://www-01.sil.org/~simonsg/preprint /EGIDS.pdf

Lewis M.P. 2006. “Toward a categorization of endangerment of the world’s languages.” *SIL International*: http://www01.sil.org/silewp/2006/silewp 2006-002.pdf?

Loh J., Harmon D. 2005. “A Global Index of Biocultural Diversity.” *Ecological Indicator* 5: 231-241.

Luoga E., Witkowski E., Balkwill K. 2000. “Differential utilization and ethnobotany of trees in Kitulanghalo Forest Reserve and surrounding communal lands, Eastern Tanzania.” *Economic Botany* 54 (3): 328–343.

Lyn L. 1999. “What is fishing?” *Gender, globalisation and fisheries workshop* 6-12 May 2000. St. John's NF.

Maffi L. 2005. "Linguistic, Cultural, and Biological Diversity." *Annual Review af Anthropology* 34: 599-617.

Manne and Lisa L. 2003. “Nothing Has yet Lasted Forever: Current and Threatened Levels of Biological and Cultural Diversity”. *Evolutionary Ecology Research* (4): 517-527.

Marlina E. 2009. *Traditional Community of Baduy, West Jawa Toward Architecture Sustainability*.http://www.fab.utm.my/download/ConferenceSemiar/SENVAR52 004 SPS402.pdf. [1 November 2012].

May D. 2005. "Folk Taxonomy of Reef Fish and the Value of Participatory Monitoring in Wakatobi National Park, Southeast Sulawesi, Indonesia." *SPC Traditional Marine Resource Management and Knowledge Information Bulletin* 18: 18-34.

Mbenga C.A. 1999. “Informal power.” *Gender, globalisation and fisheries workshop* 6-12 May, 2000. St. John's NF.

Medard M., Sobo F., Ngatunga T., Chirwa S. 2001. “Women and Gender Participation in the Fisheries Sector in Lake Victoria.” *6th Asian Fisheries Forum*, Kaohsiung, Taiwan, 29 November, 2001

Medeiros P.M., Almeida A.L.S., Lucena R.F.P., Albuquerque U.P. 2008. "The role of visual stimuli in ethnobotanical surveys: An overview". *Research Signpost* 37/661 (2): 125-137.

Mekbib F. 2007. "Infra-specific folk taxonomy in sorghum (*Sorghum bicolor* (L.) Moench) in Ethiopia: folk nomenclature, classification, and criteria." *Journal of Ethnobiology and Ethnomedicine* 3:38

Michalopoulos S. 2007. "The Origins of Ethnolinguistic Diversity: Theory and Evidence". *American Economic Review* 102(4): 1508-39. http://www.cid. harvard. edu/neudc07/docs/neudc07s4p20_michalopoulos.pdf.

Microsoft. 2003. *Microsoft Excel [computer software]*. Redmond, Washington: Microsoft.

Moelleken W.W. 1983. "Language maintenance and language shift in Pennsylvania German: A comparative investigation." *Monatshefte* 75(2): 172-186.

Mohamed N. and Hashim N.H. 2012. "Language Vitality of the Sihan Community in Sarawak, Malaysia." *Kemanusiaan* 19 (1): 59-86.

Moore L.L., Manne, Brooks T., Burgess N.D., Davies R., Rahbek C., Williams P., Balmford A. 2002. "The Distribution of Cultural and Biological Diversity in Africa. *In: Proceeding of the Royal Society of London* B (269): 1645-1653.

Morris S. 1989." The Melanau: an ethnographic overview." *Sarawak Museum Journal* 60 (4): 181-188.

Moseley C. 2010. Atlas of the world's languages in danger. 3rd ed. UNESCO Publishing, Paris.

Mourao J., Araujo H., and Almeida F. 2006. "Ethnotaxonomy of Mastofauna as Practised by Hunters of the Municipality of Paulista, State of Paraiba-Brazil." *Journal of Ethnobiology and Ethnomedicine* 2 (1): 19 http://www.ethnobiomed.com /content/2/1/19.

Nababan A. 2003. "Pengelolaan Sumberdaya Alam Berbasis Masyarakat Adat." *Pelatihan Pengelolaan Lingkungan Hidup Daerah, Pusat Penelitian Lingkungan Hidup IPB. Bogor*.

Nadarajan S. 2006. “A Crosslinguistic Study of Reduplication.” *Arizona Working Papers in SLAT* (13): 39-54.

Navjot S. Sodhi N.S., Koh L.P., Brook B.W., Ng K.L. 2004. “Southeast Asian Biodiversity: an impending disaster”. *Trends in Ecology and Evolution*19 (12): 654-660.

Nedelcheva A. and Dogan Y. 2009. "Folk Botanical Nomenclature and Classification in Bulgarian Traditional Knowledge." *Plants and Culture: seeds of the cultural heritage of Europe*: 169-173.

Nettle D. and Romaine S. 2002. *Vanishing Voices*. Oxford Univ Press: New York.

Nettle D. 1998. "Explaining Global Patterns of Language Diversity." Journal of Anthropological Archaeology 17 (4): 354-374. doi:http://dx.doi.org /10.1006/jaar.1998.0328.

Newman P. and Ratliff M. 2001. *Linguistic Field Work eds*. The University Press Cambridge: United Kingdom.

Newmaster S.G. and Ragupathy S., Ivanoff R.F., and Nirmala C.B. 2006. "Mechanisms of Ethnobiological Classification." *Ethnobotany* 18 (1): 2.

Ngunyen M.L.T. 2003. “Comparison of Food Plants Knowledge Between Urban Vietnamese Living in Vietnam and in Hawai’i. “ *Economic Botany* 57: 15-32.

Nichols J. 1997. Chechen Phonology in P Daniels AS Kaye, ed. Phonologies of Asia and Africa, Bloomington: Eisenbrauns.

Nobumasa H., Shiro O., Yutaka M. 2010. “The Evolution of Irrigation Development in Monsoon Asia and Historical Lessons.” *20th Congress of the International-Commission-on-Irrigation-and-Drainage* in Lahore, Pakistan

Omar A.H.1981. "The roles of English in Malaysia in the context of National Language planning." *Paper presented at SEAMEO 16th Regional Seminar, RELC* Singapore 20-14 April, 229-250

Omar A.H. 1983. *The Malay people of Malaysia and their languages*. Dewan Bahasa dan Pustaka, Kuala Lumpur.

Pacific Policy Research Centre. 2010. *Successful Bilingual and Immersion Education Models/Programs*. Honolulu: Kamehameha Schools, Research & Evaluation Division.

Paniagua-Zambrana N.Y., Camara-Lerét R., Bussmann R.W., Macía M.J. 2014. "The influence of socioeconomic factors on traditional knowledge: a cross scale comparison of palm use in northwestern South America." *Ecology and Society* 19 (4): 9 http://dx.doi.org/10.5751/ES-06934-190409.

Parlakian R. and Sanchez S.Y. 2006. "Cultural Influences on early language and literacy teaching practices." *Zero to three* September 2006: 56- 57.

Pejabat Residen Bahagian Bintulu. "Latar Belakang Bintulu." Accessed Nov 2015, http://www.bintuluro.sarawak.gov.my/modules/web/pages.php?mod=webpage&sub=page&id=71.

Pennycook A. 1998. *English and the Discourses of Colonialism*. London: Routledge.

Permana R.C.E. 2006. *Tata Ruang Masyarakat Baduy*. Wedatama Widya Sastra: Jakarta.

Peters S. 2014. "Gyalthang Southern Khams Tibetan: A Case Study of Language Attitudes and Shift in Shangri-La." *Anthos* 6(1): 111-136.

Posey D.A. 1992. *The relation between cultural diversity and biodiversity*. In Biodiversity and International Law. Edited by S. Bilderbeek. IOS Press: Amsterdam pp. 44–47.

Pound L. 1914. *Blends: Their Relation to English Word. Amsterdam: Swets & Zeitlinger* (Reprint: Heidelberg: Carl Winter).

Powers S. 1874. "Aboriginal Botany". Proceedings of the California Academy of Sciences 373-379.

Pratiwi A.I. 2008. *Singkatan dan Akronim dalam Majalah Gadis tahun 2007*. Skripsi. Fakultas Ilmu Pengetahuan Budaya Universitas Indonesia: Jakarta.

Puteh A. 2010. "The Language Medium Policy in Malaysia: A Plural Society Model?" Review of European Studies 2 (2): 192-200.

Quinlan M. 2005. "Considerations for Collecting Freelists in the Field: Examples from Ethobotany". *Field Method* 17(3): 219–234.

Rahmanadia H. 2012. "Kosakata Warna dalam Bahasa Sunda Kanekes." *International Seminar "Language Maintenance and Shift II", July 5-6, 2012* page: 212-217.

Rahmania A. 2009. *Kata Sapaan dalam Masyarakat Baduy*. Skripsi. Fakultas Ilmu Pengetahuan Budaya Universitas Indonesia: Jakarta.

Rajamani L. and Marsh H. 2010. "Using parallel regional-and local-scale initiatives to inform conservation management of rare wildlife: A case study of the dugong Dugong dugon in Sabah, Malaysia." *Endangered Species Research* 13 (1): 17-23.

Ravindranath M. and Cohn A.C. 2014. "Can a Language with Millions of Speakers be EndangeRed?" *Journal of the Southeast Asian Linguistics Society* 7:64-75.

Ravishankar B. and Shukla V.J. 2007. "Indian Systems of Medicine: A brief profile." *The African Journal of Traditional, Complementary and Alternative medicines* 4 (3): 319 – 337.

Rengalakshmi R. 2005. "Folk Biological Classification of Minor Millet Species in Kolli Hills, India." *Journal of Ethnobiology* 25 (1): 59-70. doi: 10.2993/0278-0771(2005)25[59:FBCOMM]2.0.CO;2.

Rengasamy S., Devavaram J., Marirajan T., Ramavel N., Rajadurai K., Karunanidhi M., and Rajendra P.N. 2003. "Farmers' Markets in Tamil Nadu: increasing options for rural producers, improving access for urban consumers." *Environment & Urbanization* 15 (1): 25-34.

Roberts G. 2008. "Language and the free-rider problem: An experimental paradigm." *Biological Theory* 3(2):174-183. DOI: 10.1162/biot.2008.3.2.174

Robinson E.J.Z., Albers H.J., Busby G.M. 2013. “The Impact of Buffer Zone Size and Management on Illegal Extraction, Park Protection, and Enforcement.” *Ecological Economics* 92 (2013) 96–103.

Roozbeh K., Kari B.F., Yahaya S.R.B., Yusup S.H. 2014. “Traditional knowledge of orang asli on forests in peninsular Malaysia”. *Indian Journal of Traditional Knowledge* 13 (2): 283-291.

Ruddle K. 1993. *The transmission of traditional ecological knowledge*. Traditional ecological knowledge: concepts and cases. International Program on Traditional Ecological Knowledge, and International Development Research Centre: Ottawa.

Runciman S. 1960. *The White Rajahs: A History of Sarawak from 1841 to 1946*. Cambridge University Press: New York.

Saad I. 1971. *Kisah Bintulu*. Borneo Literature Bureau. Kuching.

Sandelowski M. 2000. ”Combining Qualitative and Quantitative Sampling, Data Collection, and Analysis Techniques in Mixed-Methods Studies.” *Research in Nursing and Health* 23:246–255.

Saniei A. 2011. “Who Is An Ideal Native Speaker?!” *2011 International Conference on Languages, Literature and Linguistics IPEDR vol.26 IACSIT Press, Singapore.*

Santayana P., Pieroni A., Puri R.K. 2010. *Ethnobotany in the New Europe: People, Health and Wild Plant Resources eds*. Manuel. Berghahn Books: United States.

Saynes- Vásquez A., Caballero J., Meave J.A., and Chiang F. 2013. "Cultural Change and Loss of Ethnoecological Knowledge among the Isthmus Zapotecs of Mexico." *Journal of Ethnobiology and Ethnomedicine* 9 (1): 40. doi: http://dx.doi.org/10.1186/1746-4269-9-40.

Selin H. 2003. *Nature across Culture, views in non-western cultures*, Kluwer Academic publishers: Manchester.

Silitoe P. 1983. *Roots of the Earth: The Cultivation and Classification of Corps in Papua New Guinea Highlands*. University of Manchester Press: Manchester.

Silvano R.A.M., do Amaral B.D., Oyakawa O.T. 2000. "Spatial and temporal patterns of diversity and distribution of the Upper Juruá River fish community (Brazilian Amazon)." *Environmental Biology of Fishes* 57: 25–35.

Simpson B.B. and Corner-Ogorzaly M.C. 1986. *Economic Botany*. McGraw Hill: London.

Sloan S., Jenkins C.N., Joppa LN, Gaveau DLA, Laurance WF. 2014. "Remaining natural vegetation in the global biodiversity hotspots." *Biological Conservation* 177: 12–24

SPSS Inc. Released 2008. *SPSS Statistics for Windows, Version 17.0*. Chicago: SPSS Inc.

Stepp J.R., Cervone S., Castaneda H., Lasseter A., Stocks G., and Gichon Y. 2004. "Development of a GIS for Global Biocultural Diversity". *Policy Matters* (13): 267-270.

Sutherland W.J. 2003. "Parallel Extinction Risk and Global Distribution of Languages and Species". *Nature* 423 (6937): 276-279.

Svanberg I., Luczaj L., Santayana M.P., Pieroni A. 2011. *History and Current Trends of Ethnobiological Research in Europe.* In Ethnobiology. Edited by Anderson EN, Pearsall D, Hunn E, Turner N eds. John and Sons, Inc. pp. 189-212

Tait M. and Kaufman T. 1994. *The Americas. Atlas of the World's Languages, eds Moseley C. Asher RE* . Routledge: New York.

Takako H. 2003. "Transmission Mechanism of Traditional Ecological Knowledge". *Policy Sciences*, 11 (1): 109-118.

Takako H. 2004. "Nature of Traditional Ecological Knowledge Loss: A Quantitative Approach". *Policy Sciences*, 11(2): 147-155.

Thomas E., Vandebroek I., Damme P.V. 2007. "What Works in the Field? A Comparison of Different Interviewing Methods in Ethnobotany with Special Reference to the Use Photographs."*Economic Botany* 61 (4): 376-384.

Tumbuan A., Kawet L., Shiratake Y. 2006. "Significance of Traditional Market and Supermarket Functions for Local Farmers and Consumers: A Case Study on

Marketing of Vegetables in Manado, North Sulawesi, Indonesia." *Bulletin of the faculty of agriculture saga* 92: 79-94.

Turpin M. 2013. "Semantic Extension in Kaytetye Flora and Fauna Terms". *Australian Journal of Linguistics* 33 (4): 488-518.

Unasho A. 2013. "Language as genes of culture and biodiversity conservation: The case of "Zaysite" language in southern region of Ethiopia." *International Journal of Modern Anthropology* 6: 13-36.

UNEP. 2003. "Report of the ad hoc technical expert group meeting on the potential Impacts of genetic use restriction technologies on smallholder Farmers, indigenous and local communities and farmers' rights." *Convention on Biological Diversity* 10-14 December 2003.

UNESCO Ad Hoc Expert Group on Endangered Languages. 2003. "Language Vitality and Endangerment." *Document submitted to the International Expert Meeting on UNESCO Programme Safeguarding of Endangered Languages* Paris, 10–12 March 2003

United Nations. 1992. "Conventional of Biological Diversity." Accessed June 2014, https://www.cbd.int/doc/legal/cbd-en.pdf

United Nations (UN). 2002. *State of the World's Indigenous Peoples*. Available: http://www.un.org /esa/socdev/unpfii/documents/2015/sowip2volume-ac.pdf

United Nations (UN). 2008. "United Nations Declaration on the Rights of Indigenous People." Accessed June 2014, http://www.un.org/esa/socdev/unpfii/ documents/DRIPS_en.pdf

Vaz J. and Agama A.L. 2013. "Seeking synergy between community and state-based governance for biodiversity conservation: the role of indigenous and community-conserved areas in Sabah". *Malaysian Borneo Asia Pacific View point*. 54(2):141–57.

Voeks R.A. 2007. “Are women reservoirs of traditional plant knowledge? Gender, ethnobotany and globalization in northeast Brazil.” *Singapore Journal of Tropical Geography* 28: 7–20. doi:10.1111/j.1467-9493.2006.00273.x.

Walker J.H. 2012. *Power and Prowess: The Origins of Brooke Kingship in Sarawak*. University of Hawai’I Press: North America.

Wandelt I. 2009. *Dictionary on Comprehensive Security in Indonesia: Acronym and Abbreviations*. Friedrich Ebert Stiftung (FES) Indonesia Office: Jakarta.

Watson S. and Studdert D. 2006. *Markets as sites for social interaction Spaces of diversity*. The Policy Press: Great Britain.

Welman F. 2011. *Borneo Trilogy Sarawak: Volume 2*. Booksmango, ISBN: 6162450899, 9786162450891.

Wester L., Yongvanit S. 2006. “Naming Consistency for Forest Plants in some Rural Communities of Northeast Thailand.” *Ethnobotany Research and Applications* 4: 203-212.

Wolverton S. 2013. “Ethnobiology 5: Interdisciplinarity in an Era of Rapid Environmental Change.” *Ethnobiology Letter* (4): 21-25.

Wurm S.A. and Hattori S. 1981. *Language atlas of the Pacific area* general editors. Canberra : Australian Academy of the Humanities in collaboration with the Japan Academy : Stuttgart, West Germany.

Wyndham F.S., Lepofsky D., Tiffany S. 2011. “Taking stock in ethnobiology: where do we come from? What are we? Where are we going?” *Journal of Ethnobiology* 31(1):110–27.

Young K. J. 2006. *Ethnobotony*: Infobase Publishing.

Zaini O. 1989. “Bahasa Melanau: suatu tanggapan awal.” *Sarawak Museum Journal Special Issue* 60 (61): 231-250.

Zariquiey R. 2014. “Name Types, Polysemy and Contrast Sets in Kakataibo Ethnobiological Nomenclature (Pano, Peru)”. *Journal of Ethnobiology* 34(2): 251-272.

Zent S. and Maffi L. 2009. "Final Report on Indicator No. 2: Methodology for Developing a Vitality Index of Traditional Environmental Knowledge (Vitek) for the Project. Global Indicators of the Status and Trends of Linguistic Diversity and Traditional Knowledge. Terralingua." *Global Indicators of the Status and Trends of Linguistic Diversity and Traditional Knowledge*, Terralingua, British Columbia, Canada.

Žuškin E., Lipozenčić J., Cvetković P., aMustajbegović J., Schachter N., Mučić-Pučić B., Neralić-Meniga I. 2008. "Ancient Medicine – a Review". *Acta Dermatovenerologica Croatica* 16(3):149-157.

Appendix

Appendix 1 Ethnotaxonomy of Kanekes food plants

No.	Vernacular name	Scientific name	Meaning	TK mechanism	Linguistic mechanism
1.	*Alpuket*	*Persea Americana* Mill.	-	Bahasa Indonesia	-
2.	*Antanan*	*Centella asiatica (L.) Urb.*	-	-	-
3.	*Areuy Amis Mata*	*Ficus montana* Burm.f.	*Areuy*: Vine *Amis*: sweet *Mata*: eyes	Morphology; quality	Metaphor, Metonymy (gustaoceptory)
4.	*Areuy Canar*	*Smilax leucophylla* Blume	*Areuy*: vine *Canar*: spine	Morphology	Metonymy (Texture)
5.	*Areuy Canar Bokor*	*Smilax macrocarpa* Blume	*Areuy*: vine *Canar*: spine *Bokor*: bowl	Morphology	Metonymy (texture), metaphor (shape)
6.	*Areuy Kacembang*	*Embelia ribes* Burm.f.	*Areuy*: vine *Kacembang*: kacembang	Morphology	-

7.	*Areuy Ki Koneng*	*Arcangelisia flava* (L.) Merr.	*Areuy*: vine *Ki*: woody *Koneng*: yellow	Morphology	Metaphor (strength), metonymy (Ophthalmoceptory)
8.	*Areuy Leuksa*	*Pipturus repandus* Wedd.	*Areuy*: vine *Leuksa*: *ngaleuksa* ceremony is the traditional ceremony to make *leuksa*, this *leuksa* will be given to government on the *Seba* ceremony	Morphology; utility	Metonymy (Procedural)
9.	*Areuy Palungpung*	*Merremia peltata* (L.) Merr.	*Areuy*: vine *Palungpung*: plump	Morphology	Metonymy (sound)
10.	*Awi Apus*	*Gigantochloa apus* (Schult. & Schult. f.) Kurz	*Awi*: bamboo *Apus*: erase	Morphology; utility	Metonymy (Procedural)
11.	*Awi Ater*	*Gigantochloa atter* (Hassk) Kurz	*Awi*: bamboo *Ater*: sound "ter"	Morphology; quality	Metonymy (sound)
12.	*Awi Bitung*	*Dendrocalamus asper* (Schult.) Backer	*Awi*: bamboo *Bitung*: big	Morphology	Metonymy (Ophthalmoceptory)
13.	*Awi Gede*	*Gigantochloa verticillata* (Willd.) Munro	*Awi*: bamboo *Gede*: big	Morphology	Metonymy (Ophthalmoceptory)

14.	*Awi Hideung*	*Gigantochloa atroviolacea* Widjaja.	*Awi*: bamboo *Hideung*: black	Morphology	Metonymy (Ophthalmoceptory)
15.	*Awi Mayan*	*Gigantochloa robusta* Kurz	*Awi*: bamboo *Mayan*: moderate	Quality	Metonymy (quality)
16.	*Balimbing*	*Averrhoa carambola* L.	-	-	
17.	*Balimbing Wuluh*	*Averrhoa bilimbi* L.	*Wuluh*	Bahasa Indonesia	-
18.	*Barahulu*	*Amomum maximum* Roxb.	*Bara*: some *Hulu*: head	Morphology	Metaphor (structure)
19.	*Bawang Beureum*	*Allium cepa* L.	*Bawang*: *Allium* sp. *Bereum*: red	Morphology	Metonymy (Ophthalmoceptory)
20.	*Bawang Bodas*	*Allium sativum* L.	*Bawang*: *Allium* sp. *Bodas*: white	Morphology	Metonymy (Ophthalmoceptory)
21.	*Beuka*	*Globba marantina* L.	Blooming	Ecology	Metonymy (Ophthalmoceptory)
22.	*Beungang*	*Neesia altissima* (Blume) Blume	Loosen	Morphology	Metonymy (Ophthalmoceptory)
23.	*Beunying*	*Ficus fistulosa* Reinw. ex Blume	-	-	-
24.	*Biksir*	*Durio zibethinus* L.	-	-	-

25.	*Binglu*	*Mangifera caesia* Jack	*Binglu*: name of disease Binglu is a skin rash similar to urticaria, sometimes caused by allergy as well.	Utility	Metonymy (human influence)
26.	*Bintatoet*	*Canthium horridum* Blume	*Toed*: sound given out when pain is felt	Morphology	Metonymy (sound)
27.	*Boled*	*Gymnopetalum scabrum* (Lour.) W.J. de Wilde & Duyfjes	long and big	Morphology	Metaphor (shape and size)
28.	*Bonteng*	*Cucumis sativus* L.	*Bon* -- *kebon*: garden *Teng* – *enteng*: light	Ecology	Metonymy (Ecological or spatiological)
29.	*Buncis*	*Phaseolus vulgaris* L.	-	Bahasa Indonesia	-
30.	*Cabe Rawit*	*Capsicum annuum* L.	*Cabe*: chili *Rawit*: bumpy finger	Morphology	Metaphor (texture)
31.	*Caliket*	*Chrysophyllum roxburghii* G.Don	*Liket*: sticky	Quality	Metonymy (palatability)
32.	*Calogor*	*Nephelium juglandifolium* Blume	*Logor*: baggy	Utility	Metonymy (Procedural)
33.	*Cangkuang*	*Pandanus furcatus* Roxb.	-	-	-
34.	*Cangkudu*	*Morinda citrifolia* L.	*Kudu*: unpleasant	Quality	Metonymy (taste)

35.	*Cariang*	*Homalomena pendula* (Blume) Bakh.f.	-	-	
36.	*Cau Abu*	*Musa paradisiaca* L.	*Cau*: banana *Abu*: ash	Morphology	Metonymy (texture)
37.	*Cau Ambon*	*Musa paradisiaca var. sapientum* (L.) Kunt.	*Cau*: banana *Ambon*: one of the islands in Indonesia	Ecology	Metonymy (Ecological or spatiological)
38.	*Cau Anggasa*	*Musa paradisiaca* L.	*Cau*: banana *Anggasa*: *Amomum dealbatum* Roxb.	Morphology	Metaphor (shape)
39.	*Cau Apu*	*Musa paradisiaca* L.	*Cau*: banana *Apu*: limestone	Morphology	Metaphor (color)
40.	*Cau Badak*	*Musa paradisiaca* L.	*Cau*: banana *Badak*: rhinoceros	Morphology	Metaphor (shape)
41.	*Cau Bangkunang*	*Musa paradisiaca* L.	*Cau*:banana *Bangkunang*: bangkunang	-	-
42.	*Cau Beleum*	*Musa paradisiaca* L.	*Cau*:banana *Beleum*: roasted	Utility	Metonymy (Procedural)
43.	*Cau Beusi*	*Musa paradisiaca* L.	*Cau*: banana	Morphology	Metonymy (strength)

			Beusi: iron		
44.	*Cau Bogo*	*Musa paradisiaca* L.	*Cau*: banana *Bogo*: *Channa gachua* (Hamilton, 1822)	Utility	Metonymy (Procedural)
45.	*Cau Bogo Jangkung*	*Musa paradisiaca* L.	*Cau*: banana *Bogo*: *Channa gachua* (Hamilton, 1822) *Jangkung*: tall	Morphology; utility	Metonymy (Procedural) and metonymy (Ophthalmoceptory)
46.	*Cau Emas*	*Musa paradisiaca* L.	*Cau*: banana *Emas*: gold	Morphology	Metaphor (color)
47.	*Cau Gejloh*	*Musa paradisiaca* L.	*Cau*: banana *Gejloh*: big	Morphology	Metonymy (Ophthalmoceptory)
48.	*Cau Gembor*	*Musa paradisiaca* L.	*Cau*: banana *Gembor*: spread story	Morphology	Metaphor (size)
49.	*Cau Haseum*	*Musa paradisiaca* L.	*Cau*: banana *Haseum*: sour	Quality	Metonymy (taste)
50.	*Cau Haseup*	*Musa paradisiaca* L.	*Cau*: banana *Haseup*: smoke	Morphology	Metaphor (Colour)
51.	*Cau Hoe*	*Musa paradisiaca* L.	*Cau*: banana	Morphology	Metaphor (size)

			Hoe: rattan (*Calamus* sp.)		
52.	*Cau Hurang*	*Musa paradisiaca* L.	*Cau*: banana *Hurang*: prawn	Morphology	Metaphor (color)
53.	*Cau Janten*	*Musa paradisiaca* L.	*Cau*: banana *Janten*: name of people	Morphology	Metonymy (Introducer)
54.	*Cau Jarum*	*Musa paradisiaca* L.	*Cau*: banana *Jarum*: needle	Morphology	Metaphor (size)
55.	*Cau Jebug*	*Musa paradisiaca* L.	*Cau*: banana *Jebug*: old pinang (*Areca catechu* L.)	Morphology	Metaphor (shape)
56.	*Cau Kepok*	*Musa acuminata* Colla	*Cau*: banana *Kepok*: sound “pok” “pok”	Utility	Metonymy (sound)
57.	*Cau Ketan*	*Musa paradisiaca* L.	*Cau*: banana *Ketan*: sticky rice	Morphology	Metonymy (palatability)
58.	*Cau Kulutuk*	*Musa balbisiana* var. *brachycarpa* (Backer) Häkkinen	*Cau*: banana *Kulutuk*: eagle	Utility	Diet Metonymy
59.	*Cau Lagadai*	*Musa paradisiaca* L.	*Cau*: banana *Lagadai*: name of banana	-	-

60.	*Cau Lampeneng*	*Musa paradisiaca* L.	*Cau*: banana *Lampeneng*: handkerchief	Morphology	Metaphor (size)
61.	*Cau Lubang*	*Musa paradisiaca* L.	*Cau*: banana *Lubang*: hole	Ecology	Metonymy (structure)
62.	*Cau Manjangan*	*Musa paradisiaca* L.	*Cau*: banana *Manjangan*: *Cervus timorensis* (Blainville, 1822)	Morphology	Metaphor (shape)
63.	*Cau Masakijo*	*Musa paradisiaca* L.	*Cau*: banana *Masakijo*: green when ripe	Morphology	Metonymy (Ophthalmoceptory)
64.	*Cau Muli*	*Musa paradisiaca* L.	*Cau*: banana *Muli*: name of banana	-	-
65.	*Cau Nangka*	*Musa paradisiaca* L.	*Cau*: banana *Nangka*: jack fruit	Quality	Metaphor (smell)
66.	*Cau Nipah*	*Musa paradisiaca* L.	*Cau*: banana *Nipah*: nipa palm (*Nypa fruticans* Wurmb)	Morphology	Metaphor (structure)
67.	*Cau Papan*	*Musa paradisiaca* L.	*Cau*: banana *Papan*: board/plank	Morphology	Metaphor (texture)
68.	*Cau Raja*	*Musa paradisiaca* L.	*Cau*: banana	Quality	Metaphor (taste)

			Raja: king		
69.	*Cau Raja Bulu*	*Musa paradisiaca* L.	*Cau*: banana *Raja*: king *Bulu*: feather	Morphology; quality	Metaphor (taste), metonymy (texture)
70.	*Cau Raja Sereh*	*Musa paradisiaca* L.	*Cau*: banana *Raja*: king *Sereh*: *Piper betle* L.	Morphology; quality	Metaphor (taste), metaphor (texture)
71.	*Cau Rejang*	*Musa paradisiaca* L.	*Cau*: banana *Rejang*: *Microhyla achatina* Tschudi, 1838	Morphology	Metaphor (size)
72.	*Cau Sabulan*	*Musa paradisiaca* L.	*Cau*: banana *Sabulan*: a month	Ecology	Metonymy (Calendrical)
73.	*Cau Selendang*	*Musa paradisiaca* L.	*Cau*: banana *Selendang*: large shawl	Morphology	Metaphor (size)
74.	*Cau Sepet*	*Musa paradisiaca* L.	*Cau*: banana *Sepet*: coconut fibre	Morphology	Metonymy (texture)
75.	*Cau Serebu*	*Musa paradisiaca* L.	*Cau*: banana *Serebu*: a thousand	Morphology	Metonymy (structure)
76.	*Cau Sisir*	*Musa paradisiaca* L.	*Cau*: banana	Morphology	Metaphor (structure)

			Sisir: comb		
77.	*Cau Susuh*	*Musa paradisiaca* L.	*Cau*: banana *Susu*: breast	Morphology	Metaphor (shape)
78.	*Cau tanduk*	*Musa paradisiaca* L.	*Cau*: banana *Tanduk*: horn	Morphology	Metaphor (shape)
79.	*Cau Tarali*	*Musa paradisiaca* L.	*Cau*: banana *Tarali*: Australia	Morphology	Metaphor (size)
80.	*Cecendet*	*Physalis angulata* L.	*Cecendet*: swelling disease that caused by infection and scar. It usually occurs after circumcision.	Utility	Metonymy (human influence)
81.	*Cereme*	*Phyllanthus acidus* Skeels	-	-	-
82.	*Ceuri*	*Garcinia dioica* Blume	*Ceuri* – ceurik: crying	Quality	Metonymy (human influence)
83.	*Cikur*	*Kaempferia galanga* L.	*Cik*: stunted	Morphology	Metaphor (size)
84.	*Coklat*	*Theobroma cacao* L.	*Cokelat*: brown	Bahasa Indonesia	Metonymy (Ophthalmoceptory)
85.	*Cokrom hejo*	*Solanum indicum* L.	*Cokrom*: eaten raw *hejo*: green	Morphology; utility	Metonymy (Ophthalmoceptory)

86.	*Cokrom kupa*	*Solanum melongena* L.	*Cokrom*: eaten raw kupa: *Syzygium polycephala* (Miq.) Merr. & L.M.Perry	Morphology; utility	Metaphor (shape)
87.	*Cokrom ungu*	*Solanum melongena* L.	*Cokrom*: eaten raw *Ungu*: purple	Morphology; utility	Metonymy (Ophthalmoceptory)
88.	*Dahu*	*Dracontomelon dao* (Blanco) Merr. & Rolfe	-	-	-
89.	*Dangdeur Apu*	*Manihot esculenta* Crantz	*Dangdeur*: cassava *Apu*: limestone	Morphology	Metaphor (color)
90.	*Dangdeur Cangkudu*	*Manihot esculenta* Crantz	*Dangdeur*: cassava *Cangkudu*: *Morinda citrifolia* L.	Morphology	Metaphor (shape)
91.	*Dangdeur Karet*	*Manihot carthaginensis* subsp. *glaziovii* (Müll.Arg.) Allem	*Dangdeur*: cassava *Karet*: *Hevea brasiliensis* (Willd. ex A.Juss.) Müll.Arg.	Ecology	Metaphor (behavioural)
92.	*Dangdeur Ketan*	*Manihot esculenta* Crantz	*Dangdeur*: cassava *Ketan*: sticky rice	Morphology	Metaphor (texture)
93.	*Dangdeur Koneng*	*Manihot esculenta* Crantz	*Dangdeur*: cassava *Koneng*: yellow	Morphology	Metonymy (Ophthalmoceptory)

94.	*Dangdeur Lampeneng*	*Manihot esculenta* Crantz	*Dangdeur*: cassava *Lampeneng*: handkerchief	Morphology	Metaphor (size)
95.	*Dangdeur Mentega*	*Manihot esculenta* Crantz	*Dangdeur*: cassava *Mentega*: butter	Quality	
96.	*Dangdeur Nangka*	*Manihot esculenta* Crantz	*Dangdeur*: cassava *Nangka*: *Artocarpus heterophyllus* Lam.	Morphology	Metaphor (color)
97.	*Dangdeur Roti*	*Manihot esculenta* Crantz	*Dangdeur*: cassava *Roti*: bread	Morphology	Metaphor (structure)
98.	*Dukuh*	*Lansium parasiticum* (Osbeck) K.C.Sahni & Bennet	*Dukuh*: assembly	Ecology	Metonymy (Ophthalmoceptory)
99.	*Gamas*	*Sechium edule* (Jacq.) Sw.		-	-
100.	*Gamet*	*Celosia argentea* L.	*Gamet* –jambret: snatch	Utility	Metonymy (Procedural)
101.	*Gedang*	*Carica papaya* L.	*Gedang*—gedag: shake	Utility	Metonymy (Procedural)
102.	*Gelam*	*Melaleuca cajuputi* Powell	*Gelam*—kabehelan: choking	Quality; utility	Metonymy (Procedural)
103.	*Gempol*	*Nauclea orientalis* (L.) L.	-	-	-
104.	*Gintung*	*Bischofia javanica* Blume	*Gintung*: Black teeth	Morphology	Metonymy (human influence)

105.	*Hajeli*	*Coix lacryma-jobi* L.	*Hejeli*—jejelan: piston	Utility	Metonymy (Procedural)
106.	*Hanggasa*	*Amomum dealbatum* Roxb.	-	-	-
107.	*Hantap*	*Sterculia rubiginosa* Vent.	-	-	-
108.	*Hantap Heulang*	*Sterculia macrophylla* Vent.	*Heulang*: eagle	Utility	Diet Metonymy
109.	*Hantap Manuk*	*Sterculia* sp.	*Manuk*: bird	Utility	Diet Metonymy
110.	*Harendong Leuweung*	*Bellucia pentamera* Naudin	*Harendong*: *Bellucia* sp. *Leuweung*: forest	Ecology	Metonymy (Ecological or spatiological)
111.	*Hareundang*	*Clidemia hirta* (L.) D. Don	-	-	-
112.	*Hawuan*	*Elaeocarpus floribundus* Blume	-	-	-
113.	*Hiris*	*Cajanus cajan* (L.) Millsp.	*Hiris—hiji-hiji*: pieces	Morphology	Metonymy (Ophthalmoceptory)
114.	*Honje Bereum*	*Etlingera solaris* (Blume) R.M.Sm.	*Bereum*: red	Morphology	Metonymy (Ophthalmoceptory)
115.	*Honje Biasa*	*Etlingera hemisphaerica* (Blume) R.M.Sm.	*Biasa*: ordinary	Ecology	Metonymy (Ecological or spatiological)
116.	*Huwi Bangban*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Bangban*: *Donax canniformis* (G.Forst.) K.Schum.	Morphology; utility	Metaphor (shape)

117.	*Huwi Bodas*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Bodas*: white	Morphology; utility	Metonymy (Ophthalmoceptory)
118.	*Huwi Curug*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Curug*: index finger	Morphology; utility	Metaphor (shape)
119.	*Huwi Dahong*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Dahong*—rahong: fissured land	Utility; ecology	Metonymy (ecological or spatiological)
120.	*Huwi Doro*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Doro*: long and cylindrical	Morphology; utility	Metaphor (shape)
121.	*Huwi Endog*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Endog*: egg	Morphology; utility	Metaphor (shape)
122.	*Huwi Gadung*	*Dioscorea hispida* Dennst.	*Huwi*: tuber *Gadung*—badung: stubborn	Utility	Metonymy (behavioural)
123.	*Huwi Hideung*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Hideung*: black	Utility; morphology	Metonymy (Ophthalmoceptory)
124.	*Huwi Kalapa*	*Dioscorea alata* L.	*Huwi*: tuber *Kelapa*: coconut	Utility	Metonymy (Procedural)
125.	*Huwi Ketan*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Ketan*: sticky rice	Utility; quality	Metaphor (texture)

126.	*Huwi Ki hiyang*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Ki Hiyang*: *Albizia procera* (Roxb.) Benth.	Utility; quality	Metaphor (strength), metonymy (Gustaoceptory)
127.	*Huwi Kiara*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Kiara*: *Ficus benjamina* L.	Morphology; utility	Metonymy (Behavioural)
128.	*Huwi Kumbili*	*Plectranthus rotundifolius* (Poir.) Spreng.	*Huwi*: tuber *Kumbili*: small, round, unifom and aggregate	Utility; morphology	Metonymy (Ophthalmoceptory)
129.	*Huwi Manis*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Manis*: sweet	Utility; morphology	Metonymy (taste)
130.	*Huwi Manjangan*	*Dioscorea alata* L.	*Huwi*: tuber *Manjangan*: *Cervus timorensis* (Blainville, 1822)	Utility; morphology	Metaphor (shape)
131.	*Huwi Mantang Bodas*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Mantang*: prohibition *Bodas*: white	Utility; morphology	Metonymy (Procedural and Ophthalmoceptory)
132.	*Huwi Mantang Bulawok*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Mantang*: prohibition *Bulawok*: look blue	Utility; morphology	Metonymy (Procedural and Ophthalmoceptory)

133.	*Huwi Mantang Dangdeur*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Mantang*: prohibition *Dangdeur*: cassava	Utility; morphology	Metonymy (Procedural) and metaphor (shape)
134.	*Huwi Mantang Kalapa*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Mantang*: prohibition *Kalapa*: coconut	Utility; morphology	Metonymy (Procedural)
135.	*Huwi Mantang Waluh*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Mantang*: prohibition *Waluh*: gourd	Morphology; utility	Metonymy (Procedural) and metaphor (shape)
136.	*Huwi Nangka*	*Ipomoea batatas* (L.) Lam.	*Huwi*: tuber *Nangka*: jack fruit	Morphology; utility	Metaphor (shape)
137.	*Huwi Patat*	*Maranta arundinacea* L.	*Huwi*: tuber *Patat*: *Phrynium pubinerve* Blume	Utility; morphology	Metaphor (shape)
138.	*Huwi Ramo*	*Dioscorea* sp	*Huwi*: tuber *Ramo*: fingers	Utility; morphology	Metaphor (shape)
139.	*Huwi Sawut*	*Dioscorea pentaphylla* L.	*Huwi*: tuber *Sawut*: hairy	Utility; morphology	Metonymy (structure)

140.	*Jaat*	*Psophocarpus tetragonolobus* (L.) DC.	*Jaat*—jahat: wicked	Ecology	Metonymy (Behavioral)
141.	*Jagong*	*Zea mays* L.	*Jagong*: corn	Quality	-
142.	*Jagong amis*	*Zea mays* L.	*Jagung*: corn *Manis*: sweet	Quality	Metonymy (Gustaoceptory)
143.	*Jahe*	*Zingiber officinale* Roscoe	-	-	-
144.	*Jambu Aer*	*Syzygium aqueum* (Burm.f.) Alston	*Jambu*: Guava *Air*: water	Quality	Metonymy
145.	*Jambu Batu*	*Psidium guajava* L.	*Jambu*: guava *Batu*: stone	Quality	Metonymy (palatability)
146.	*Jambu Bool*	*Syzygium malaccense* (L.) Merr. & L.M.Perry	*Jambu*: guava *Bool*: buttock	Morphology	Metaphor (shape)
147.	*Jambu Cingcalok*	*Syzygium aqueum* (Burm.f.) Alston	*Jambu*: guava *Cingcalok—cicing di legok* *Cicing*: stay *Legok*: concave place	Ecology	Portmanteau, metonymy (ecological or spatiological)
148.	*Jambu Mede*	*Anacardium occidentale* L.	*Jambu*: guava *Mede—kede*: southpaw	Ecology	Metonymy (human influence)

149.	*Jambu Samarang*	*Syzygium samarangense* (Blume) Merr. & L.M.Perry	*Jambu*: guava *Samarang*: Samarang city	Ecology	Metonymy (introducer)
150.	*Jatake*	*Bouea macrophylla* Griff.	-	-	-
151.	*Jengkol*	*Archidendron jiringa* (Jack) I.C.Nielsen	-	-	-
152.	*Jeruk Bali*	*Citrus maxima* (Burm.) Merr.	*Jeruk*: orange *Bali*: Bali province	Ecology	Metonymy (introducer)
153.	*Jeruk Garut*	*Citrus nobilis* Lour.	*Jeruk*: orange *Garut*: Garut city	Ecology	Metonymy (introducer)
154.	*Jeruk Gede*	*Citrus grandis* (L.) Osbeck	*Jeruk*: orange *Gede*: big	Morphology	Metonymy (Ophthalmoceptory)
155.	*Jeruk Nipis*	*Citrus aurantiifolia* (Christm.) Swingle	*Jeruk*: orange *Nipis*—ipis: thin	Morphology	Metonymy (Ophthalmoceptory)
156.	*Kacang Hejo*	*Phaseolus radiatus* L.	*Kacang*: bean *Hejo*: green	Morphology	Metonymy (Ophthalmoceptory)
157.	*Kacang Panjang*	*Vigna unguiculata* (L.) Walp.	*Kacang*: bean *Panjang*: long	Morphology	Metonymy (Ophthalmoceptory)
158.	*Kacang Suuk*	*Arachis hypogaea* L.	*Kacang*: bean *Suuk*: digging	Ecology	Metonymy (Procedural)

159.	*Kacang Tempe*	*Glycine max* (L.) Merr.	*Kacang*: bean *Tempe*: tempeh	Utility	Metonymy (Procedural)
160.	*Kadongdong Leuweung*	*Spondias pinnata* (L. f.) Kurz	*Kadondong*: *Spondias* sp. *Leuweung*: forest	Ecology	Metonymy (Ecological or spatiological)
161.	*Kadu*	*Durio zibethinus* L.	*Kadu*—kaduhung: regret	Quality	Metonymy (taste)
162.	*Kalapa Ading*	*Cocos nucifera* L.	*Kalapa*: coconut *Ading* : reddish	Morphology	Metaphor (color)
163.	*Kalapa Balida*	*Cocos nucifera* L.	*Kalapa*: coconut *Bali*: Bali province	Ecology	Metonymy (Introducer)
164.	*Kalapa Beureum*	*Cocos nucifera* L. var. *rubescens*	*Kalapa*: coconut *Bereum*: red	Morphology	Metonymy (Ophthalmoceptory)
165.	*Kalapa Caruluk*	*Cocos nucifera* L.	*Kalapa*: coconut *Caruluk*: *Arenga pinnata* (Wurmb) Merr.	Morphology	Metaphor (structure)
166.	*Kalapa Genjah*	*Cocos nucifera* L.	*Kalapa*: coconut *Genjah*: short	Morphology	Metonymy (Behavioural)
167.	*Kalapa Hejo*	*Cocos nucifera* L.	*Kalapa*: coconut *Hejo*: green	Morphology	Metonymy (Ophthalmoceptory)

168.	*Kalapa Koneng*	*Cocos nucifera* L.	*Kalapa*: coconut *Koneng*: yellow	Morphology	Metonymy (Ophthalmoceptory)
169.	*Kalapa Puyuh*	*Cocos nucifera* L.	*Kalapa*: coconut *Puyuh*: *Coturnix coturnix* (Linnaeus, 1758)	Morphology	Metaphor (size)
170.	*Kalapa Tawa*	*Cocos nucifera* L.	*Kalapa*: coconut *Tawa*: prayer	Morphology	Metonymy (Procedural)
171.	*Kalimborot*	*Lithocarpus* sp.	"*brot*": sound	Utility	
172.	*Kanas Beureum*	*Ananas comosus* (L.) Merr.	*Kanas*: pineapple *Bereum*: red	Morphology	Metonymy (Ophthalmoceptory)
173.	*Kanas Buaya*	*Ananas comosus* (L.) Merr.	*Kanas*: pineapple *Buaya*: crocodile	Morphology	Metaphor (texture)
174.	*Kanas Hejo*	*Ananas comosus* (L.) Merr.	*Kanas*: pineapple *Hejo*: green	Morphology	Metonymy (Ophthalmoceptory)
175.	*Kangkung air*	*Ipomoea aquatica* Forssk.	*Kangkung*: *Ipomoea repens* (L.) Lam. *Aer*: water	Ecology	Metonymy (Ecological or spatiological)
176.	*Kapundung*	*Baccaurea* sp.	*Kapundung*—pundung: anger	Morphology	Metaphor (color)

177.	*Katulampa*	*Elaeocarpus glaber* Blume	*Katulampa*: together	Ecology	Metonymy (Calendrical)
178.	*Kaweni*	*Mangifera odorata* Griff.	*Kaweni*—kawin jeung nini-nini *Kawin*: married *Jeung*: with *Nini-nini*: grand mother	Ecology	Portmanteau, metonymy (ecologicaly)
179.	*Kawung*	*Arenga pinnata* (Wurmb) Merr.	-	-	-
180.	*Kecapi*	*Sandoricum koetjape* (Burm.f.) Merr.	*Kecapi—kecap kana pipi* *Kecap*: speaking *Kana*: in *Pipi*: cheek	Quality	Portmanteau, metonymy (Procedural)
181.	*Kembang Sarengenge*	*Helianthus annuus* L.	*Kembang*: flower *Sarangenge*: sun	Morphology	Metaphor (shape and color)
182.	*Keras Tulang*	*Turpinia montana* (Blume) Kurz	*Keras*: strength *Tulang*: bone	Utility	Metonymy (procedural)
183.	*Ki Hiyang*	*Albizia procera* (Roxb.) Benth.	*Ki*: grand father *Hiyang—hayang*: desire	Quality	Metaphor (strength), metonymy (gustaoceptory)

184.	*Ki Lauk*	*Acalypha caturus* Blume	*Ki*: grand father *Lauk*: fish	Utility	Metaphor (strength), Metonymy (Procedural)
185.	*Kiara Bunut*	*Ficus glabella* Blume	*Kiara*: *Ficus benjamina* L. Bunut: latex	Utility	Metonymy (Procedural)
186.	*Koas*	*Canavalia ensiformis* (L.) DC.	-	-	
187.	*Kokosan*	*Lansium aqueum* (Jack) Kosterm.	*Kokos*: suck	Utility	Metonymy (Procedural)
188.	*Kondang*	*Ficus variegata* Blume	*Kondang—dikoko laju dipandang* *dikoko*: hold on *laju*: then *dipandang*: looked at	Utility	Portmanteau, metonymy (Procedural)
189.	*Koneng*	*Curcuma longa* L.	*Koneng*: yellow	Morphology	Metonymy (Ophthalmoceptory)
190.	*Kopi*	*Coffea arabica* L.	-		
191.	*Kowang Areuy*	*Canavalia* sp.	*Kowang*: *Canavallia* sp *Areuy*: vine	Morphology	Metonymy (Behavioural)
192.	*Kowang Dungkuk*	*Canavalia gladiata* (Jacq.) DC.	*Kowang*: *Canavallia* sp *Dungkuk*: handicapped	Morphology	Metonymy (Behavioural)
193.	*Kucai*	*Allium ramosum* L.	-	-	-

194.	*Kukuk*	*Lagenaria siceraria* (Molina) Standl.	*Kukuk—ngalekuk*: curved	Morphology	Metonymy (Ophthalmoceptory)
195.	*Kundur*	*Benincasa hispida* (Thunb.) Cogn.	-	-	-
196.	*Kupa*	*Syzygium polycephalum* (Miq.) Merr. & L.M.Perry	*Kupa*—dikuku ku bapa *Dikuku*: opened *Ku*: by *Bapa*: father	Utility	Portmanteau, metonymy (Procedural)
197.	*Laja*	*Alpinia galanga* (L.) Willd.	-	-	-
198.	*Laja Bereum*	*Alpinia purpurata* (Vieill.) K.Schum.	*Laja*: galangale *Bereum*: red	Morphology	Metonymy (Ophthalmoceptory)
199.	*Laja Goah*	*Alpinia malaccensis* (Burm.f.) Roscoe	*Laja*: galangale *Goah*: cave	Ecology	Metonymy (Ecological or spatiological)
200.	*Lampeni*	*Ardisia humilis* Vahl.	-	-	-
201.	*Langkodeh*	*Stenochlaena palustris* (Burm.	-	-	-
202.	*Lempuyang*	*Zingiber amaricans* Blume	-	-	-
203.	*Leunca*	*Solanum americanum* Mill.	-	-	-
204.	*Leungsir*	*Allophylus cobbe* (L.) Raeusch.	-	-	-
205.	*Limus*	*Mangifera foetida* Lourteig	-	-	-

206.	*Lingsuh*	*Baccaurea lanceolata* (Miq.) Müll.Arg.	*Lingsuh*: pain	Quality	Metonymy (human influence)
207.	*Lopang*	*Luffa cylindrica* (L.) M.Roem.	-	-	-
208.	*Mangga Darmayu*	*Mangifera indica* L.	*Mangga*: manggo *Darmayu*: Indramayu city	Ecology	Metonymy (introducer)
209.	*Mangga Golek*	*Mangifera indica* L.	*Mangga*: manggo *Golek*: puppet	Morphology	Metaphor (shape)
210.	*Manggu*	*Garcinia* × *mangostana* L.	-	-	-
211.	*Manggu Leuweung*	*Garcinia lateriflora* Blume	*Manggu*: mangosteen *Leuweung*: forest	Ecology	Metonymy (ecological and spatiological)
212.	*Manjakalan = tok bray*	*Blumeodendron tokbrai* (Blume) Kurz	*Tokbray—diketok ngegebray* *Diketok*: pounded *ngegebray*: smashed	Morphology	Portmanteau, Metonymy (Ophthalmoceptory)
213.	*Markisah*	*Passiflora edulis* Sims	-	-	-
214.	*Mayasih*	*Erechtites valerianifolia* (Link ex Wolf) Less. ex DC.	-	-	-
215.	*Menteng*	*Baccaurea racemosa* (Reinw. ex Blume) Müll.Arg.	-	-	-
216.	*Moris*	*Spondias dulcis* Parkinson	-	-	-

217.	*Muncang*	*Aleurites moluccanus* (L.) Willd.	-	-	-
218.	*Nangka*	*Artocarpus heterophyllus* Lam.	-	-	-
219.	*Nangka Beurit*	*Artocarpus integer* (Thunb.) Merr.	*Nangka*: jack fruit *Beurit*: mouse	Morphology	Metaphor (size)
220.	*Nangka Bubur*	*Artocarpus* sp.	*Nangka*: jack fruit *Bubur*: porridge	Morphology	Metaphor (texture)
221.	*Nangka Walanda*	*Annona muricata* L.	*Nangka*: jack fruit *Walanda*: Dutch	Ecology	Metaphor (color)
222.	*Onyam*	*Antidesma ghaesembilla* Gaertn.	-	-	-
223.	*Oyong*	*Luffa acutangula* (L.) Roxb	*Oyong—hoyong*: desire	Quality	Metonymy (Gustaoceptory)
224.	*Paku Hurang*	*Stenochlaena palustris* (Burm. f.) Bedd.	*Paku*: fern *Hurang*: prawn	Morphology	Metaphor (color)
225.	*Paku Kapal*	*Tectaria repanda* (Willd.) Holttum	*Paku*: fern *Kapal*: sail	Morphology	Metaphor (shape)
226.	*Pandan*	*Pandanus amaryllifolius* Roxb.	-	-	-
227.	*Parasi*	*Molineria latifolia* (Dryand. ex W.T.Aiton) Herb. ex Kurz	-	-	-

228.	*Pare Abu Ganti*	*Oryza sativa* L.	*Pare*: paddy *Abu Ganti*: name of a person	Ecology	Metonymy (introducer)
229.	*Pare Alean*	*Oryza sativa* L.	*Pare*: paddy *Alean*: chosen	Quality	Metonymy (procedural)
230.	*Pare Bangban*	*Oryza sativa* L.	*Pare*: paddy *Bangban*: *Donax canniformis* (G.Forst.) K.Schum.	Morphology	Metaphor (shape)
231.	*Pare Beuntik*	*Oryza sativa* L.	*Pare*: paddy *Beuntik*: curved on the top	Morphology	Metonymy (Ophthalmoceptory)
232.	*Pare Cangkudu*	*Oryza sativa* L.	*Pare*: paddy *Cangkudu*: *Morinda citrifolia* L.	Morphology	Metaphor (color)
233.	*Pare Cao*	*Oryza sativa* L.	*Pare*: paddy *Cao*—cau: banana	Ecology	Metonymy (Ecological or spatiological)
234.	*Pare Cokrom*	*Oryza sativa* L.	*Pare*: paddy *Cokrom*: eggplant	Morphology	Metaphor (shape)
235.	*Pare Hawara*	*Oryza sativa* L.	*Pare*: paddy *Hawara*: quick	Ecology	Metonymy (Behavioural)

236.	*Pare Hawara Benteur*	*Oryza sativa* L.	*Pare*: paddy *Hawara*: quick *Benteur*: *Barbodes binotatus* (Valenciennes, 1842)	Morphology; ecology	Metonymy (Behavioural), metaphor (pattern)
237.	*Pare Hideung*	*Oryza sativa* L.	*Pare*: paddy *Hideung*: black	Morphology	Metonymy (Ophthalmoceptory)
238.	*Pare Janah*	*Oryza sativa* L.	*Pare*: paddy *Jannah*: name of a person	Ecology	Metonymy (Introducer)
239.	*Pare Jeruk*	*Oryza sativa* L.	*Pare*: paddy *Jeruk*: orange	Morphology	Metaphor (shape)
240.	*Pare Karang*	*Oryza sativa* L.	*Pare*: paddy *Karang*: coral	Morphology	Metaphor (color)
241.	*Pare Kasumba*	*Oryza sativa* var. *glutinosa* Blanco	*Pare*: paddy *Kasumba*: outside area	Ecology	Metonymy (Introducer)
242.	*Pare Ketan Areuy*	*Oryza sativa* var. *glutinosa* Blanco	*Pare*: paddy *Ketan*: sticky *Areuy*: vine	Morphology	Metaphor (palatability), metonymy (Behavioral)

243.	*Pare Ketan Hideung*	*Oryza sativa* var. *glutinosa* Blanco	*Pare*: paddy *Ketan*: sticky *Hideung*: black	Morphology; quality	Metaphor (palatability), Metonymy (Ophthalmoceptory)
244.	*Pare Ketan Keong*	*Oryza sativa* var. *glutinosa* Blanco	*Pare*: paddy *Ketan*: sticky *Keong*: snail	Morphology; quality	Metaphor (palatability), metaphor (shape)
245.	*Pare Ketan Keuyeup*	*Oryza sativa* var. *glutinosa* Blanco	*Pare*: paddy *Ketan*: sticky *Keuyeup*: crab	Morphology; quality	Metaphor (palatability), Metonymy (Ophthalmoceptory)
246.	*Pare Ketan Langgasari*	*Oryza sativa* var. *glutinosa* Blanco	*Pare*: paddy *Ketan*: sticky *Langgasari*: name of people	Morphology; quality	Metaphor (palatability), Metonymy (Introducer)
247.	*Pare Ketan Putri*	*Oryza sativa* var. *glutinosa* Blanco	*Pare*: paddy *Ketan*: sticky *Putri*: princes	Quality	Metaphor (palatability), Metonymy (Procedural)
248.	*Pare Ketan Siang*	*Oryza sativa* var. *glutinosa* Blanco	*Pare*: paddy *Ketan*: sticky *Siang*: afternoon	Morphology; quality	Metaphor (palatability), Metaphor (color)
249.	*Pare Kiara*	*Oryza sativa* L.	*Pare*: paddy	Morphology	Metaphor (behavioural)

			Kiara: *Ficus benjamina* L.		
250.	*Pare Kolelet*	*Oryza sativa* L.	*Pare*: paddy *Kolelet*: Kolelet region	Ecology	Metonymy (introducer)
251.	*Pare Koneng*	*Oryza sativa* L.	*Pare*: paddy *Koneng*: yellow	Morphology	Metonymy (Ophthalmoceptory)
252.	*Pare Konyal*	*Oryza sativa* L.	*Pare*: paddy *Konyal*: rubbery	Quality	Metonymy (texture)
253.	*Pare Kowas*	*Oryza sativa* L.	*Pare*: paddy *Kowas*: *Canavalia ensiformis* (L.) DC.	Morphology	Metaphor (shape)
254.	*Pare Limar*	*Oryza sativa* L.	*Pare*: paddy *Limar*—angar: insufficient	Ecology	Metonymy (Ecological or spatiological)
255.	*Pare Lulut*	*Oryza sativa* L.	*Pare*: paddy *Lulut*: soft	Quality	Metonymy (texture)
256.	*Pare Menteng*	*Oryza sativa* L.	*Pare*: paddy *Menteng*: *Baccaurea racemosa* (Reinw. ex Blume) Müll.Arg.	Morphology	Metaphor (shape)
257.	*Pare Menyan*	*Oryza sativa* L.	*Pare*: paddy	Quality	Metaphor (smell)

			Menyan: incense		
258.	*Pare Menyan Bodas*	*Oryza sativa* L.	*Pare*: paddy *Menyan*: incense *Bodas*: white	Morphology; quality	Metaphor (smell), Metonymy (Ophthalmoceptory)
259.	*Pare Menyan Hideung*	*Oryza sativa* L.	*Pare*: paddy *Menyan*: incense *Hideung*: black	Morphology; quality	Metaphor (smell), Metonymy (Ophthalmoceptory)
260.	*Pare Nangsi*	*Oryza sativa* L.	*Pare*: paddy *Nangsi*: *Oreocnide rubescens* (Blume) Miq.	Ecology	Metonymy (Ecological or spatiological)
261.	*Pare Pendok*	*Oryza sativa* L.	*Pare*: paddy *Keris*: kris	Morphology	Metaphor (shape)
262.	*Pare Rabeg*	*Oryza sativa* L.	*Pare*: paddy *Rabeg*: long and hairy	Morphology	Metonymy (structure)
263.	*Pare Racik*	*Oryza sativa* L.	*Pare*: paddy *Racik*: one by one	Morphology	Metonymy (Behavioural)

264.	*Pare Rumbai*	*Oryza sativa* L.	*Pare*: paddy *Rumbai*: hairy	Morphology	Metonymy (Behavioural)
265.	*Pare Sampai*	*Oryza sativa* L.	*Pare*: paddy *Sampaian*: hanger for drying paddy	Utility	Metonymy (Procedural)
266.	*Pare Sereh*	*Oryza sativa* L.	*Pare*: paddy *Sereh*: lemon grass	Morphology	Metaphor (shape)
267.	*Pare Seungkeu*	*Oryza sativa* L.	*Pare*: paddy *Sengkeu*: neckless	Morphology	Metaphor (shape)
268.	*Pare Seuti*	*Oryza sativa* L.	*Pare*: paddy *Seuti*: *Calamus ornatus* Blume	Morphology	Metaphor (shape)
269.	*Pare Siang*	*Oryza sativa* L.	*Pare*: paddy *Siang*: afternoon	Morphology	Metaphor (color)
270.	*Pare Singgul*	*Oryza sativa* L.	*Pare*: paddy *Singgul*: touch	Quality	Metonymy (Behavioural)
271.	*Pare Sireupeun*	*Oryza sativa* L.	*Pare*: paddy *Sireupeun*: *Apis* sp.	Morphology	Metaphor (size)
272.	*Pare Tapos*	*Oryza sativa* L.	*Pare*: paddy	Morphology	Metaphor (shape)

			Tapos: *Elateriospermum tapos* Blume		
273.	*Pare Tembaga*	*Oryza sativa* L.	*Pare*: paddy *Tembaga*: copper	Morphology	Metaphor (color)
274.	*Pari*	*Mangifera similis* Blume	-	-	-
275.	*Paria*	*Momordica charantia* L.	-	-	-
276.	*Pedes*	*Piper nigrum* L.	-	-	-
277.	*Peusar*	*Artocarpus rigida* Blume	-	-	-
278.	*Peutag*	*Eugenia lineata* (Sw.) DC.	-	-	-
279.	*Peuteuy*	*Parkia speciosa* Hassk.	-	-	-
280.	*Picung*	*Pangium edule* Reinw.	*Picung*—cung-cung: soaked in water	Utility	Metonymy (Procedural)
281.	*Pisitan*	*Dysoxylum alliaceum* (Blume) Blume	*Pisit or peset*: to rip of	Utility	Metonymy (Procedural)
282.	*Poh-pohan*	*Pilea melastomoides* (Poir.) Wedd.	*Poh-pohan*—*popoh*: compressed	Utility	Metonymy (Procedural)
283.	*Purut*	*Parartocarpus venenosa* Becc.	-	-	-

284.	*Putat*	*Planchonia valida* (Blume) Blume	-	-	-
285.	*Rampai*	*Solanum lycopersicum* var. *cerasiforme* (Dunal) D.M. Spooner, G.J. Anderson & R.K. Jansen	*Rampai*: weak stemmed plant	Morphology	Metonymy (Behavioural)
286.	*Rane*	*Selaginella willdenowii* (Desv. ex Poir.) Baker	-	-	-
287.	*Ranji*	*Dialium indum* L.	*Renggang*: loosen *Biji*: seed	Morphology	Portmanteau, metonymy (behavioral)
288.	*Rendeu*	*Staurogyne elongata* Kuntze	-	-	-
289.	*Roway*	*Phaseolus lunatus* L.	-	-	-
290.	*Rukem*	*Flacourtia rukam* Zoll. & Moritzi	*Rukem*: spine	Morphology	Metonymy (texture)
291.	*Salak*	*Salacca zalacca* (Gaertn.) Voss	-	-	-
292.	*Salam Leuweung*	*Syzygium nervosum* A.Cunn. ex DC.	*Salam*: *Syzygium nervosum* A.Cunn. ex DC. Leuweung: forest	Ecology	Metonymy (Ecological or spatiological)

293.	*Salempat*	*Schismatoglottis calyptrata* (Roxb.) Zoll. & Moritzi	*Salempat*: anywhere	Ecology	Metonymy (Ecological or spatiological)
294.	*Saninten*	*Castanopsis javanica* (Blume) A.DC.	-	-	-
295.	*Sasawi*	*Brassica juncea* (L.) Czern.	*Sawi*: cabbage *Sa*: replication	Morphology	Metaphor (shape)
296.	*Sawi Lobak*	*Brassica rapa* L.	*Sawi*: cabbage *Lobak*: *Raphanus raphanistrum* subsp. *sativus* (L.) Domin	Morphology	Metaphor (shape)
297.	*Seeur*	*Antidesma tetrandrum* Blume	*Seeur*: plenty	Ecology	Metonymy (Ecological or spatiological)
298.	*Semangka*	*Citrullus lanatus* (Thunb.) Matsum. & Nakai	-	-	-
299.	*Sempur*	*Dillenia aurea* Sm.	-	-	-
300.	*Sempur Gunung*	*Dillenia indica* L.	*Sempur*: *Dillenia aurea* Sm. *Gunung*: mountain	Ecology	Metonymy (Ecological or spatiological)
301.	*Senggang*	*Amaranthus lividus* L.	-	-	
302.	*Sentul*	*Sandoricum koetjape* (Burm.f.) Merr.	-	-	-

303.	*Sereh*	*Cymbopogon nardus* (L.) Rendle	*Sereh—tereh*: fast	Ecology	Metonymy (Behavioural)
304.	*Seuhang*	*Ficus grossularioides* Burm.f.	-	-	-
305.	*Seureuh*	*Piper betle* L.	-	-	-
306.	*Supa Akar*	*Clitocybe* sp.	*Supa*: mushroom *Akar*: root	Ecology	Metonymy (Ecological or spatiological)
307.	*Supa Amis*	*Mycena* sp.	*Supa*: mushroom *Amis*: sweet	Quality	Metonymy (gustaoceptory)
308.	*Supa Baseuh*	*Campanella* sp.	*Supa*: mushroom *Baseuh*: wet	Quality	Metonymy (texture)
309.	*Supa Beas*	*Irpex lacteus* (Fr.) Fr.	*Supa*: mushroom *Beas*: rice	Morphology	Metaphor (color)
310.	*Supa Bejog*	*Pleurotus* sp.	*Supa*: mushroom *Bejog*: cleaver (big knife)	Utility	Metonymy (procedural)
311.	*Supa Kayang*	*Bertrandia* sp.	*Supa*: mushroom *Kayang*: *Lithocarpus korthalsii* (Endl.) Soepadmo	Ecology	Metonymy (Ecological or spatiological)
312.	*Supa Koja*	*Phallus indusiatus* Vent.	*Supa*: mushroom *Koja*: traditional Kanekes bag	Morphology	Metaphor (shape)

313.	*Supa Lember Aceh*	*Auricularia auricula-judae* (Bull.) J.Schröt.	*Supa*: mushroom *Lember*: ear *Aceh*—tundun aceh: *Nephelium lappaceum* L.	Morphology	Metaphor (shape)
314.	*Supa Lember Lutung*	*Auricularia polytricha* (Mont.) Sacc.	*Supa*: mushroom *Lember*: ear *Lutung*: *Trachypithecus auratus* ssp. *mauritius* (Griffith, 1821)	Morphology	Metaphor (shape), metaphor (color)
315.	*Supa Nyeruan*	*Favolus tenuiculus* P. Beauv.	*Supa*: mushroom *Nyeruan*: *Apis cerana* Fabricius (1793)	Morphology	Metaphor (shape)
316.	*Supa Padali*	*Paxillus involutus* (Batsch) Fr.	*Supa*: mushroom *Padali*: *Radermachera gigantea* (Blume) Miq.	Ecology	Metonymy (Ecological or spatiological)
317.	*Supa Patukul*	*Boletus* sp.	*Supa*: mushroom *Patukul*: hammer	Morphology	Metaphor (shape)
318.	*Supa Teropong*	*Coprinellus disseminatus* (Pers.) J.E.Lange	*Supa*: mushroom *Teropong*: binocular	Morphology	Metaphor (shape)
319.	*Supa Tikukur*	*Parasola plicatilis*	*Supa*: mushroom	Morphology	Metonymy (Structure)

		(Curtis) Redhead *et al.*	*Tikukur*: assembly		
320.	*Suum Bulan*	*Gymnopus* sp	*Suum*: ground mushroom *Bulan*: moon	Morphology; ecology	Metonymy (Ecological or spatiological), metaphor (shape)
321.	*Suum Pahatu*	*Hygrocybe acutoconica* (Clem.) Singer	*Suum*: ground mushroom *Pahatu*: orphan	Ecology	Metonymy (Ecological or spatiological), metaphor (human behavioural)
322.	*Suum Rampak*	*Marasmiellus candidus* (Fr.) Singer	*Suum*: ground mushroom *Rampak*: spread	Morphology; ecology	Metonymy (Ecological or spatiological), Metonymy (behavioural)
323.	*Suum Uncal*	*Hygrocybe* sp.	*Suum*: ground mushroom *Uncal*: *Reinwardtiodendron humile* (Hassk.) Mabb.	Ecology	Metonymy (Ecological or spatiological)
324.	*Takokak*	*Solanum torvum* Sw.	-	-	-
325.	*Taleus Balitung*	*Alocasia macrorrhizos* (L.) G. Don	*Taleus*: yam *Balitung*: salted fish	Morphology	Metaphor (shape)

326.	*Taleus Bogor*	*Colocasia gigantea* (Blume) Hook.f.	*Taleus*: yam *Bogor*: bogor city	Ecology	Metonymy (Introducer)
327.	*Taleus Colat*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Colat*: stripe	Morphology	Metonymy (Pattern)
328.	*Taleus Endog*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Endog*: egg	Morphology	Metonymy (Ophthalmoceptory)
329.	*Taleus Hejo*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Hejo*: green	Morphology	Metonymy (Ophthalmoceptory)
330.	*Taleus Hideung*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Hideung*: black	Morphology	Metonymy (Ophthalmoceptory)
331.	*Taleus Honje*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Honje*: *Etlingera hemisphaerica* (Blume) R.M.Sm.	Morphology	Metaphor (shape)
332.	*Taleus Ketan*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Ketan*: sticky	Quality	Metonymy (texture)
333.	*Taleus Landak*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Landak*: porcupine	Morphology	Metaphor (shape)
334.	*Taleus Loma*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Loma*—loba di huma	Ecology	Metonymy (Ecological or spatiological)

			Loba: plenty *Huma*: swidden rice field		
335.	*Taleus Lunglum*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Lunglum*: *Arenga pinnata* (Wurmb) Merr.	Morphology	Metaphor (texture)
336.	*Taleus Ronyok*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Ronyok*: aggregate	Morphology	Metonymy (structure)
337.	*Taleus Ruyung*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Ruyung*: *Arenga pinnata* Merr.trunk	Morphology	Metonymy (Structure)
338.	*Taleus Susun*	*Colocasia esculenta* (L.) Schott	*Taleus*: yam *Susun*: arrangement	Morphology	Metonymy (Structure)
339.	*Tangkalak*	*Litsea robusta* Blume	-	-	-
340.	*Tangkil*	*Gnetum gnemon* L.	-	-	-
341.	*Tapos*	*Elateriospermum tapos* Blume	*Tapos*—kempes: burst	Morphology	Metonymy (structure)
342.	*Teong*	*Solanum quitoense* Lam.	-	-	-
343.	*Tepus*	*Etlingera coccinea* (Blume) S.Sakai & Nagam.	-	-	-

344.	*Teureup*	*Artocarpus elasticus* Reinw. ex Blume	-	-	-
345.	*Tewu Landu*	*Artocarpus glaucus* Blume	-	-	-
346.	*Tiwu*	*Saccharum officinarum* L.	-	-	-
347.	*Tiwu Endog*	*Saccharum spontaneum* var. *edulis* (Hassk.) K.Schum.	*Tiwu*: sugar cane *Endog*: egg	Morphology	Metaphor (shape)
348.	*Tiwu Koneng*	*Saccharum officinarum* L.	*Tiwu*: sugar cane *Koneng*: yellow	Morphology	Metonymy (color)
349.	*Tomat*	*Solanum lycopersicum* L.	-	-	-
350.	*Tundun Aceh*	*Nephelium lappaceum* L.	*Tundun*: *Nephelium lappaceum* L. *Aceh*: easy to peel	Morphology	Metonymy (structure)
351.	*Tundun Biasa*	*Nephelium lappaceum* L.	*Tundun*: *Nephelium lappaceum* L. *Biasa*: ordinary	Morphology	Metonymy (structure)
352.	*Walang Biasa*	*Etlingera walang* (Blume) R.M.Sm.	*Walang*: *Etlingera walang* (Blume) R.M.Sm.Biasa: ordinary	Ecology	Metonymy (Ecological and spatiological)
353.	*Walang Cina*	*Eryngium foetidum* L.	*Walang*: *Etlingera walang* (Blume) R.M.Sm. Cina: china	Ecology	Metonymy (Introducer)

354.	*Waluh*	*Cucurbita pepo* L.	*Waluh*— wawuh jadi sedulur: *Wawuh* : know *Jadi:* become *Sedulur:* relative	Utility	Portmanteaus, metonymy (Procedural)
355.	*Waluh Bodas*	*Cucurbita moschata* Duchesne	*Waluh*: *Cucurbita pepo* L. *Bodas*: white	Morphology; utility	Portmanteau, metonymy (Procedural), metonymy (Ophthalmoceptory)
356.	*Waluh Hideung*	*Cucurbita* sp.	*Waluh*: *Cucurbita pepo* L. *Hideung*: black	Morphology; utility	Portmanteau, metonymy (Procedural), metonymy (Ophthalmoceptory)
357.	*Watu*	*Sesamum indicum* L.	*Watu*: stone	Utility	Metonymy (Ophthalmoceptory)
358.	*Wuni*	*Antidesma bunius* (L.) Spreng.	-	-	-

Appendix 2 Traditional knowledge and language vitality of Kanekes people

R	Sex	Cluster	Proficience		Time (s)		A	B	C	D	E	Tralavi
			L1	L2	L1	L2						
1	F	1	5	2	127	427	25	25	23	25	25	0.984
2	F	1	5	1	691	2614	25	25	22	25	25	0.976
3	F	1	5	2	135	580	25	25	22	25	25	0.976
4	F	1	5	2	157	729	25	25	25	25	25	1
5	F	1	5	2	293	1035	25	25	22	25	25	0.976
6	F	1	5	2	190	465	25	25	20	25	25	0.96
7	F	1	5	2	133	551	25	25	25	25	25	1
8	F	1	5	3	171	341	25	25	22	25	25	0.976
9	F	1	5	3	299	625	25	25	21	25	25	0.968
10	F	1	5	2	165	313	25	25	21	25	25	0.968
11	F	1	5	2	181	825	25	25	25	25	25	1
12	F	1	5	2	175	1230	25	25	25	25	25	1
13	F	1	5	2	215	524	25	25	22	25	25	0.976
14	F	1	5	2	250	738	25	25	23	25	25	0.984
15	F	1	5	1	522	2533	25	25	24	25	25	0.992
16	M	1	5	2	269	660	25	25	25	25	25	1
17	M	1	5	2	190	715	25	25	25	25	25	1
18	M	1	5	2	221	803	25	25	25	25	25	1
19	M	1	5	3	331	708	25	25	25	25	25	1
20	M	1	5	3	180	421	25	25	25	25	25	1
21	M	1	5	4	251	336	25	25	23	25	25	0.984
22	M	1	5	2	278	1163	25	25	25	25	25	1
23	M	1	5	3	339	599	25	25	25	25	25	1
24	M	1	5	4	280	315	25	25	23	25	25	0.984
25	M	1	5	2	203	606	25	25	25	25	25	1
26	M	1	5	3	253	501	25	25	25	25	25	1
27	M	1	5	4	284	330	25	25	25	25	25	1

R	Sex	Cluster	Proficience		Time (s)		A	B	C	D	E	Tralavi
			L1	L2	L1	L2						
28	M	1	5	3	274	550	25	25	25	25	25	1
29	M	1	5	1	216	1805	25	25	25	25	25	1
30	M	1	5	2	278	784	25	25	25	25	25	1
31	F	2	5	2	200	650	25	25	25	25	25	1
32	F	2	5	2	458	1260	25	25	25	25	21	0.968
33	F	2	5	4	38	570	25	25	25	25	25	1
34	F	2	5	3	296	569	25	25	22	25	21	0.944
35	F	2	5	2	233	750	25	25	23	25	20	0.944
36	F	2	5	4	260	300	25	25	24	25	21	0.96
37	F	2	5	5	178	332	25	25	24	25	24	0.984
38	F	2	5	5	380	342	15	25	25	25	20	0.88
39	F	2	5	5	335	447	25	25	23	25	24	0.976
40	F	2	5	5	452	430	25	25	24	25	21	0.96
41	F	2	5	2	394	778	25	25	24	25	21	0.96
42	F	2	5	2	317	509	25	25	22	25	22	0.952
43	F	2	5	2	294	1167	25	25	25	25	25	1
44	F	2	5	3	233	585	25	25	25	25	24	0.992
45	F	2	5	4	256	305	25	25	25	25	24	0.992
46	M	2	5	1	264	1576	25	25	23	25	25	0.984
47	M	2	5	5	251	218	15	25	24	25	25	0.912
48	M	2	5	2	135	588	25	25	24	25	25	0.992
49	M	2	5	2	144	510	25	25	25	25	25	1
50	M	2	5	2	262	600	25	25	23	25	25	0.984
51	M	2	5	3	224	483	25	25	24	25	25	0.992
52	M	2	5	3	193	372	25	25	23	25	25	0.984
53	M	2	5	4	391	464	25	25	24	25	25	0.992
54	M	2	5	4	286	399	25	25	25	25	25	1
55	M	2	5	4	271	336	25	25	24	25	24	0.984

R	Sex	Cluster	Proficience		Time (s)		A	B	C	D	E	Tralavi
			L1	L2	L1	L2						
56	M	2	5	3	167	324	25	25	25	25	25	1
57	M	2	5	2	263	607	25	25	25	25	25	1
58	M	2	5	2	197	656	25	25	24	25	24	0.984
59	M	2	5	5	564	379	15	25	25	25	22	0.896
60	M	2	5	4	240	240	25	25	24	25	21	0.96

R=respondent; L1= Kanekes language; L2= Bahasa Indonesia

Appendix 3 Ethnotaxonomy of Ba'ie fishes

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
1.	*Qeret Baem*	*qəRet baʔəm*	*Nebrius ferrugineus* (Lesson, 1831)	*QəRet*=shark *baʔəm*= meaning unknown	-	-
2.	*Qeret jalur mapuq*	*qəRet jalour mapƱ̄ʔ*	*Carcharhinus amblyrhynchos* (Whiteley, 1934)	*QəRet*= shark *jalour* = stripe *mapƱ̄ʔ*= white	Morphology	Metonymy
3.	*Qeret karang*	*qəRet kaRaŋ*	*Atelomycterus marmoratus* (Anonymous [Bennett], 1830)	*QəRet*= shark *kaRaŋ*= coral	Ecology	Metonymy
4.	*Qeret Mapuq*	*qəRet mapƱ̄ʔ*	*Carcharhinus dussumieri* (Valenciennes *in* Müller and Henle, 1839)	*Qeret*= shark *MapƱ̄ʔ*= white	Morphology	Metonymy
5.	*Qeret te'dal*	*qəRet taʔdəl*	*Sphyrna lewini* (Griffith & Smith, 1834)	*QəRet*: shark *taʔdə*= flat head	Morphology	Metaphor
6.	*Qeret teteq asang mapuq*	*qəRet tətəq asaŋ mapƱ̄ʔ*	*Chiloscyllium punctatum* (Müller & Henle, 1838)	*QəRet*= shark *Teteq*= lizard *MapƱ̄ʔ*= white	Morphology	Metaphor and Metonymy
7.	*Njen Aked*	*njein aqəd*	*Saurida tumbil* (Bloch, 1795)	*Njen*= fish	Ecology	Metonymy

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
				Aked= attached to something		
8.	*Njen Alu-alu*	*njen alʊʔ- alʊʔ*	*Sphyraena barracuda* (Edwards, 1771)	*Njen*=fish *alʊʔ- alʊ*= traditional pounder	Morphology	Metaphor
9.	*Njen Bageng*	*njen bagəŋ*	*Arius maculatus* (Thunberg, 1792)	*Njen*= fish *bagəŋ* = unanalysable	-	-
10.	*Njen Balid*	*njen baled*	*Scomberoides tala* (Cuvier, 1832)	*Njen*=fish *baled*= unanalysable	-	-
11.	*Njen Basung*	*njen basoŋ*	*Selar crumenophthalmus* (Bloch, 1793)	*Njen*=fish *basoŋ*= unanalysable	-	-
12.	*Njen Beligu*	*Njen bəligʊʔ*	*Leptobarbus hoevenii* (Bleeker, 1851)	*Njen*= fish *bəligʊ*= unanalysable	-	-
13.	*Njen Belujau*	*njen bəlƱjaw*	*Decapterus kurroides* *(*Bleeker, 18 55)	*Njen*=fish *bəlujaw*= unanalysable	-	-
14.	*Njen Bengetot*	*njen bəŋətot*	*Ilisha pristigastroides* *(*Bleeker 1852)	*Njen*=fish *bəŋətot*= "tot" sound	Quality	Metonymy
15.	*Njen Berira*	*njen bəRiRa*	*Chitala borneensis* (Bleeker, 1851)	*Njen*=fish	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
				bəRiRa= unanalysable		
16.	*Njen Bibeq*	*njen bibƐq*	*Pampus argenteus* (Euphrasen, 1788)	*Njen*= fish *bibƐq*= unanalysable	-	-
17.	*Njen Bueng*	*njen bƱʔƐŋ*	*Channa striata* (Bloch, 1793)	*Njen*=fish *buʔƐŋ*= unanalysable	-	-
18.	*Njen Bulan*	*njen bƱlan*	*Megalops cyprinoides* (Broussonet, 1782)	*Njen*=fish *bƱlan*= moon	Morphology	Metaphor
19.	*Njen Bulan sungai*	*njen bƱlan sungai*	*Tenualosa macrura* (Bleeker, 1852)	Njen=fish *bƱlan*= moon *Sungai*= river	Morphology, Ecology	Metaphor and Metonymy
20.	*Njen Buleng Suan*	*njen bƱlƐŋ*	*Nemapteryx macronotacantha* (Bleeker 1846)	*Njen*= fish *bƱlƐŋ* = unanalysable	Morphology	Metaphor
21.	*Njen Bulong*	*njen bƱloŋ*	*Polynemus melanochir melanochir* (Valenciennes, 1831)	*Njen*= fish *bƱloŋ* = feather	Morphology	Metonymy
22.	*Njen Gagog*	*njen gagog*	*Arius* sp.	*Njen*= fish *Gagog*= unanalysable	-	-
23.	*Njen Gelonggong*	*njen gəlʊŋgoŋ*	*Megalaspis cordyla* (Linnaeus, 1758)	*Njen*= fish *gəlʊŋgoŋ* = unanalysable	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
24.	*Njen Gerut-gerut*	*njen gəRot-gəRot*	*Pomadasys argenteus* (Forsskål, 1775)	*Njen*= fish *gəRot- gəRot* = -	-	-
25.	*Njen Gilau*	*njen gi:law*	*Clarias nieuhofii* (Valenciennes, 1 840)	*Njen*= fish *gi:law* = unanalysable	-	-
26.	*Njen Ipot ba'*	*njen ipot baʔ*	*Toxotes jaculatrix* (Pallas, 1767)	*Njen*= fish *Ipot*= "pot" sound *baʔ*= water	Quality	Metonymy
27.	*Njen Iron*	*njen iRon*	*Pomadasys sp.*)	*Njen*= fish *Iron*= unanalysable	-	-
28.	*Njen Iron mila*	*njen iRon mila*	*Lutjanus argentimaculatus* (Forsskål, 1775)	*Njen*= fish *iRon*= unanalysable *mila*= red	Morphology	Metonymy
29.	*Njen Jamah Beloqoq*	*njen jamah bəlʊqo (1)*	*Carangoides hedlandensis* (Whitley, 1934)	*Njen*= fish *Jamah*= carangidae *bəlʊqoʔ* = curve	Morphology	Metonymy
30.	*Njen Jamah Beloqoq*	*njen jamah bəlʊqo (2)*	*Carangoides malabaricus* (Bloch & Schneider, 1801)	*Njen*= fish *Jamah*= carangidae *bəlʊqoʔ* = curve		

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
31.	*Njen Jamah Iqoy Qunieng*	*njen jamah iqoy qʊnieŋ*	*Carangoides praeustus* (Anonymous [Bennett], 1830)	*Njen*= fish *Jamah*= Carangidae fish *Iqoy*= tail *qʊnieŋ* = yellow	Morphology	Metonymy
32.	*Njen Jamah Kapek*	*njen jamah qapəʔ*	*Alectis indica* (Rüppell, 1830)	*Njen*= fish *Jamah*= Carangidae fish *qapəʔ*= axe	Morphology	Metaphor
33.	*Njen Jamah Luleng*	*njen jamah lʊləŋ*	*Carangoides coeruleopinnatus* (Rüppell, 1830)	*Njen*= fish *Jamah*= Carangidae fish *lʊləŋ*= meaning unknown	-	-
34.	*Njen Jamah mapuq*	*njen jamah mapʊʔ*	*Carangoides armatus* (Rüppell, 1830)	*Njen*= fish *Jamah*= Carangidae fish *mapʊʔ* = white	Morphology	Metonymy
35.	*Njen Jamah panau*	*njen jamah panaw*	*Atule mate* (Cuvier, 1833)	*Njen*= fish *Jamah*= Carangidae fish *panaw* = traditional fisihing technique of Malanau	Utility	Metonymy

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
36.	*Njen Jamah Seliday*	*njen jamah səliday*	*Atule sp.*	*Njen*= fish *Jamah*= Carangidae fish *səliday* = meaning unknown	-	-
37.	*Njen Jamah Sew*	*njen jamah sew*	*Caranx sexfasciatus* (Quoy & Gaimard, 1825)	*Njen*= fish *Jamah*= carangidae *sew*= meaning unknown	-	-
38.	*Njen Jayong*	*njen jayoŋ*	*Coilia macrognathus* (Bleeker, 1852)	*Njen*= fish *Jayong*= unanalysable	-	-
39.	*Njen Jolong*	*njen jʊloŋ*	*Strongylura strongylura* (van Hasselt, 1823)	*Njen*= fish *jʊloŋ* = long and cylindrical	Morphology	Metonymy
40.	*Njen Kaci*	*njen qači*	*Diagramma pictum* (Thunberg, 1792)	*Njen*= fish *Kaci*= unanalysable	-	-
41.	*Njen Kaloy*	*njen qaloy*	*Osphronemus goramy* (Lacepède, 1801)	*Njen*= fish *qaloy* = unanalysable	-	-
42.	*Njen Kejiken (1)*	*njen qədʒiqən (1)*	*Hemibagrus nemurus* (Valenciennes, 1840)	*Njen*= fish *qədʒiqən* = unanalysable	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
43.	*Njen Kejiken (2)*	*njen qədʒiqɘn (2)*	*Mystus gulio* (Hamilton, 1822)	*Njen*= fish *qədʒiqɘn* = unanalysable	-	-
44.	*Njen Kelapa*	*njen qɘlapaʔ*	*Lactarius lactarius* (Bloch & Schneider, 1801)	*Njen*= fish *qɘlapaʔ* = coconut	Morphology	Metaphor
45.	*Njen Kepburak*	*njen kəɓuRaʔ*	*Liza vaigensis* (Quoy & Gaimard, 1825)	*Njen*= fish *kəɓuRaʔ* = unanalysable	-	-
46.	*Njen Kerisi (1)*	*njen qəRisi (1)*	*Pristipomoides multidens* (Day, 1871)	*Njen*= fish *qəRisiʔ* = unanalysable	-	-
47.	*Njen Kerisi (2)*	*njen qəRisi (2)*	*Pristipomoides typus* (Bleeker, 185 2)	*Njen*= fish *qəRisiʔ* = unanalysable	-	-
48.	*Njen Kerisi (3)*	*njen qəRisiʔ (3)*	*Pentapodus setosus* (Valenciennes, 1830)	*Njen*= fish *qəRisiʔ* = unanalysable	-	-
49.	*Njen Lata'*	*njen lataʔ*	*Lobotes surinamensis* (Bloch, 1790)	*Njen*= fish *lataʔ* = unanalysable	-	-
50.	*Njen Luey/ dai*	*njen lʊʔey/ daʔie*	*Kryptopterus kryptopterus* (Bleeker, 1851)	*Njen*= fish *lʊʔey* = unanalysable *daʔie*= faeces	Quality	Metonymy

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
	Njen Luey / dai	*njen lʊʔey/ daʔie*	*Pseudolais micronemus* (Bleeker, 1846)	*Njen*= fish *lʊʔey* = unanalysable *daʔie*= faeces		
51.	*Njen Lupid*	*njen lʊ̃pƐd*	*Aluterus monoceros* (Linnaeus, 1758)	*Njen*= fish *lʊ̃pƐd*= unanalysable	-	-
52.	*Njen Mapuq*	*njen mapʊʔ*	*Piaractus* sp.	*Njen*= fish *Mapʊ̃ʔ*= white	Morphology	Metonymy
53.	*Njen Mila*	*njen mila*	*Lutjanus gibbus* (Forsskål, 1775)	*Njen*= fish *mila* = red	Morphology	Metonymy
54.	*Njen Mila Azeng mata*	*njen mila azəŋ mata*	*Priacanthus macracanthus* (Cuvier, 1829)	*Njen*= fish *mila* = red *azəŋ* = big *mata* = eyes	Morphology	Metonymy
55.	*Njen Ngeram*	*njen ŋeRa:m*	*Setipinna melanochir* (Bleeker, 1849)	*Njen*= fish *ŋeRa:m* = unanalysable	-	-
56.	*Njen Nyaked*	*njen ɲaqət*	*Oxyeleotris* sp.	*Njen*= fish *ɲaqət* = attach to something	Ecology	Metonymy

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
57.	*Njen Nyaked rat*	*njen ɲaqət Rat*	*Platycephalus indicus* (Linnaeus, 1758)	*Njen*= fish *ɲaqət* = attach to something *Rat*= sea	Ecology	Metonymy
58.	*Njen Nyipa*	*njen ɲipa*	*Muraenesox cinereus* (Forsskål, 1775)	*Njen*= fish *ɲipa* = snake	Morphology	Metaphor
59.	*Njen Pai bendiraq*	*njen pay bədiRaʔ*	*Pastinachus stellurostris* (Last, Fahmi & Naylor,2010)	*Njen*= fish *Pay*= rays *bədiRaʔ* = flag	Morphology	Metaphor
60.	*Njen Pai Kebabeq*	*njen pay qəɓaʔbəq*	*Gymnura poecilura* (Shaw, 1804)	*Njen*= fish *Pay*= rays *qəɓaʔbəq* = butterfly	Morphology	Metaphor
61.	*Njen Pai Manuq*	*nejn pay manoq*	*Rhinoptera javanica* (Müller & Henle, 1841)	*Njen*= fish *Pay*= rays *manoq* = bird	Quality	Metaphor
62.	*Njen Pai Manuq titieq*	*njen pay manoq titeyʔ*	*Aetobatus ocellatus* (Kuhl, 1823)	*Njen*= fish *Pay*= rays *manoq* = bird *titeyʔ* = dot	Quality, Morphology	Metaphor and Metonymy

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
63.	*Njen Pai minyak*	*njen pay mi<u>n</u>aq*	*Dasyatis zugei* (Müller & Henle, 1841)	*Njen*= fish *Pay*= rays *mi<u>n</u>aq*= oil	Morphology	Metonymy
64.	*Njen Pai sureq*	*njen pay sƱRəq*	*Himantura gerrardi* (Gray, 1851)	*Njen*= fish *Pay*= rays *sƱRəq* = stripes	Morphology	Metonymy
65.	*Njen Pai tunggul*	*njen pay tuŋgƱ̄l*	*Himantura uarnacoides* (Bleeker, 1852)	*Njen*= fish *Pay*= rays *tuŋgƱ̄l* = stump	Quality	Metonymy
66.	*Njen Pai (1)*	*njen pay (1)*	*Neotrygon kuhlii* (Müller & Henle, 1841)	*Njen*= fish *Pay*= rays	-	-
67.	*Njen Pai (2)*	*njen pay (2)*	*Himantura lobistoma* (Manjaji-Matsumoto &Last, 2006)	*Njen*= fish *Pay*= rays	-	-
68.	*Njen Papap (1)*	*njen papap (1)*	*Psettodes erumei* (Bloch & Schneider, 1801)	*Njen*= fish *Papap*= unanalysable	-	-
69.	*Njen Papap (2)*	*njen papap (2)*	*Cynoglossus arel* (Bloch & Schneider, 1801)	*Njen*= fish *Papap*= unanalysable	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
70.	*Njen Patin*	*njen patƐn*	*Pangasius hypophthalmus* (Sauvage, 1878)	*Njen*= fish *patƐn* = unanalysable	-	-
71.	*Njen Perambang*	*njen pəRambaŋ*	*Ilisha elongata* (Bennett 1830)	*Njen*= fish *pəRambaŋ* = unanalysable	-	-
72.	*Njen Perangiang*	*njen pəRaŋiaŋ*	*Chirocentrus dorab* (Forsskål, 1775)	*Njen*= fish *pəRaŋiaŋ* = unanalysable	-	-
73.	*Njen Perechong*	*njen pəRenčoŋ*	*Proteracanthus sarissophorus* (Ca ntor, 1849)	*Njen*= fish *pəRenčoŋ* = unanalysable	-	-
74.	*Njen Piras*	*njen pi:Ras*	*Setipinna breviceps* (Cantor, 1849)	*Njen*= fish *pi:Ras* = unanalysable	-	-
75.	*Njen Pisang-pisang*	*njen pisaŋ- pisaŋ*	*Lutjanus madras* (Valenciennes, 1831)	*Njen*= fish *pisaŋ- pisaŋ* = unanalysable	-	-
76.	*Njen Pitin*	*njen pitƐn*	*Equulites leuciscus* (Günther, 1860)	*Njen*= fish *pitƐn* = unanalysable	-	-
77.	*Njen Puau*	*njen pʊʔaw*	Leiocassis micropogon (Bleeker, 1852)	*Njen*= fish *pʊʔaw* = unanalysable	-	-
78.	*Njen Puqoq*	*njen pʊqoq*	*Otolithoides biauritus* (Cantor, 1849)	*Njen*= fish *pʊqoq* = unanalysable	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
79.	*Njen Puqoq Bap*	*njen pʊqoq bəb*	*Panna perarmatus* (Chabanaud, 1926)	*Njen*= fish *pʊqoq* = unanalysable *bəb* = rounded	Morphology	Metonymy
80.	*Njen Puqoq buluh*	*njen pʊqoq bʊloh*	*Panna microdon* (Bleeker, 1849)	*Njen*= fish *pʊqoq* = unanalysable *bʊloh* = bamboo	Morphology	Metaphor
81.	*Njen Puqoq jarang gigi*	*njen pƱ̆qoq jaRaŋ gigi*	*Chrysochir aureus* (Richardson, 1846)	*Njen*= fish *pʊqoq* = unanalysable *jaRaŋ* = loosen *gigi* = teeth	Morphology	Metonymy
82.	*Njen Puqoq mitem*	*njen pʊqoq mitəm*	*Dendrophysa russelii* (Cuvier, 1829)	*Njen*= fish *pʊqoq* = unanalysable *mitəm* = black	Morphology	Metonymy
83.	*Njen Puran*	*njen puRan*	*Platax orbicularis* (Forsskål, 1775)	*Njen*= fish *puRan* = unanalysable	-	-
84.	*Njen Qapau*	*njen qapaw*	*Epinephelus sexfasciatus* (Valenciennes, 1828)	*Njen*= fish *qapaw* = unanalysable	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
85.	*Njen Qapau*	*njen qapaw*	*Cephalopholis boenak* (Bloch, 1790)	*Njen*= fish *qapaw* = - unanalysable	-	-
86.	*Njen Qapau*	*njen qapaw*	*Epinephelus areolatus* (Forsskål, 1775)	*Njen*= fish *qapaw* = unanalysable	-	-
87.	*Njen Qitang*	*njen qitaŋ*	*Scatophagus argus* (Linnaeus, 1766)	*Njen*= fish *qitaŋ* = unanalysable	-	-
88.	*Njen Qitang manai*	*njen qitaŋ manay*	*Drepane punctata* (Linnaeus, 1758)	*Njen*= fish *qitaŋ* = unanalysable *manay* = male	Morphology	Metonymy
89.	*Njen Qitang re'du*	*njen qitaŋ RəʔdƱ*	*Ephippus orbis* (Bloch, 1787)	*Njen*= fish *qitaŋ* = unanalysable *RəʔdƱ* = female	Morphology	Metonymy
90.	*Njen Quasi*	*njen qƱasiʔ*	*Anodontostoma chacunda* (Hamilton, 1822)	*Njen*= fish *qƱasiʔ* = unanalysable	-	-
91.	*Njen Reman manai*	*njen Rəman manay*	*Rastrelliger kanagurta* (Cuvier, 1816)	*Njen*= fish *Rəman* = unanalysable *manay* = male	Morphology	Metonymy

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
92.	*Njen Reman re'du*	*njen Rəman RəʔdƱ*	*Rastrelliger brachysoma* (Bleeker, 1851)	*Njen*= fish *Rəman* = unanalysable *RəʔdƱ* = female	Morphology	Metonymy
93.	*Njen Ruay*	*njen RƱay*	*Parastromateus niger* (Bloch, 1795)	*Njen*= fish *RƱay* = unanalysable	-	-
	Njen burus	*njen bƱRos*	*Parastromateus niger* (Bloch, 1795)	*Njen*= fish *bƱRos* = unanalysable	-	-
	Njen pelapi'	*njen pəlapiʔ*	*Parastromateus niger* (Bloch, 1795)	*Njen*= fish *pəlapiʔ* = unanalysable	-	-
94.	*Njen ruay mapuq*	*njen RƱay mapƱʔ*	*Pampus chinensis* (Euphrasen, 1788)	*Njen*= fish *RƱay* = *Parastromateus niger* (Bloch, 1795) *MapƱ̃ʔ*= white	Morphology	Metonymy
95.	*Njen Sebeled (1)*	*njen səbələd (1)*	*Rasbora* sp. 1	*Njen*= fish *səbələd* = unanalysable	-	-
	Njen Sebeled (2)	*njen səbələd (2)*	*Rasbora* sp. 2	*Njen*= fish *səbələd* = unanalysable	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
96.	*Njen Selayar*	*njen səlayaR*	*Istiophorus platypterus* (Shaw, 1792)	*Njen*= fish *səlayaR* = sail	Morphology	Metaphor
97.	*Njen Selelung*	*njen sələlƆŋ*	*Ambassia vachellii* (Richardson, 1846)	*Njen*= fish *sələlƆŋ* = unanalysable	-	-
98.	*Njen Seleped*	*njen sələpəd*	*Ambassis nalua* (Hamilton, 1822)	*Njen*= fish *sələpəd* = unanalysable	-	-
99.	*Njen Selusong rat*	*njen səlʊsoŋ Rat*	*Lates calcarifer* (Bloch, 1790)	*Njen*= fish *səlʊsoŋ* = unanalysable *Rat*= sea	Ecology	Metonymy
100.	*Njen Senangin*	*njen sənaŋin*	*Eleutheronema tetradactylum* (Shaw, 1804)	*Njen*= fish *sənaŋin* = -	-	-
101.	*Njen Senangin Tanda*	*njen sənaŋin tanda*	*Polydactylus sextarius* (Bloch & Schneider, 1801)	*Njen*= fish *sənaŋin* = unanalysable *tanda* = mark	Morphology	Metonymy
102.	*Njen Sepelu'*	*njen səpəlʊʔ*	*Harpadon nehereus* (Hamilton, 1822)	*Njen*= fish *səpəlʊʔ* = unanalysable	-	-
103.	*Njen Sepered*	*njen səpəRƐt*	*Tenualosa macrura* (Bleeker, 1852)	*Njen*= fish *səpəRƐt* = unanalysable	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
104.	*Njen Sepet*	*njen səpət*	*Trichopodus pectoralis* (Regan, 1910)	*Njen*= fish *səpət* = unanalysable	-	-
105.	*Njen Seqael*	*njen səqael*	*Plotosus canius* (Hamilton, 1822)	*Njen*= fish *səqael* = unanalysable	-	-
106.	*Njen Seruay*	*njen səRʊay*	*Barbonymus gonionotus* (Bleeker, 1849)	*Njen*= fish *səRʊay* = unanalysable	-	-
107.	*Njen Sezau rat*	*njen səzaw Rat*	*Abalistes stellaris* (Bloch & Schneider, 1801)	*Njen*= fish *səzaw* = chicken *Rat* = sea	Morphology, Ecology	Metaphor and metonymy
108.	*Njen Sulet Kuning*	*njen sʊlat qʊnieŋ*	*Caesio cuning* (Bloch, 1791)	*Njen*= fish *sʊlat*= unanalysable *qʊnieŋ* = yellow	Morphology	Metonymy
109.	*Njen Sulet merah*	*njen sʊlat mila*	*Pterocaesio chrysozona* (Cuvier, 1830)	*Njen*= fish *sʊlat*= unanalysable *mila* = red	Morphology	Metonymy
110.	*Njen Sultan*	*njen sultan*	*Leptobarbus hoevenii* (Bleeker, 1851)	*Njen*= fish *sultan* = unanalysable	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
111.	*Njen Supaq*	*njen sʊpaʔ*	*Kryptopterus parvanalis* (Inger & Chin, 1959)	*Njen*= fish *sʊpaʔ* = unanalysable	-	-
	Njen Selesi (juvenile of supaq)	*njen sələsiʔ*	*Juvenile of Kryptopterus* parvanalis (Inger & Chin, 1959)	*Njen*= fish *sələsiʔ* = unanalysable	-	-
112.	*Njen Taoq*	*njen ta:oʔ*	*Osteogeneiosus militaris* (Linnaeus, 1758)	*Njen*= fish *ta:oʔ* = unanalysable	-	-
113.	*Njen Tavai*	*njen tavey*	*Wallago leerii* (Bleeker, 1851)	*Njen*= fish *tavey* = unanalysable	-	-
114.	*Njen Tebengor*	*njen təbəŋor*	*Oxyeleotris marmorata* (Bleeker, 1852)	*Njen*= fish *təbəŋor* = unanalysable	-	-
115.	*Njen Tenges*	*njen təŋəs*	*Barbonymus schwanenfeldii* (Bleeker, 1854)	*Njen*= fish *təŋəs* = unanalysable	-	-
116.	*Njen Tengiriq batang*	*njen təŋiRiʔ bataŋ*	*Scomberomorus commerson* (Lacepède, 1800)	*Njen*= fish *təŋiRiʔ* = unanalysable *bataŋ* = log	Morphology	Metaphor

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
117.	*Njen Tengiriq papan*	*njen təŋiRiʔ papan*	*Scomberomorus guttatus* (Bloch & Schneider, 1801)	*Njen*= fish *təŋiRiʔ* = unanalysable *papan* = board	Morphology	Metaphor
118.	*Njen Terupbok*	*njen* təRʊʔɓoq	*Tenualosa toli* (Valenciennes, 1847)	*Njen*= fish *təRʊʔɓoq* = unanalysable	-	-
119.	*Njen Tilan*	*njen tilan*	*Mastacembelus erythrotaenia* (Bleeker, 1850)	*Njen*= fish *tilan* = unanalysable	-	-
120.	*Njen Tilapia Mila*	*njen təlapia mila*	*Oreochromis* sp.	*Njen*= fish *təlapia* = unanalysable *mila* = red	Morphology	Metonymy
121.	*Njen Tilapia mitem*	*njen təlapia mitəm*	*Oreochromis mossambicus* (Peters , 1852)	*Njen*= fish *təlapia* = unanalysable *mitəm* = black	Morphology	Metonymy
122.	*Njen Timah Mapuq*	*njen timah mapʊʔ*	*Lepturacanthus savala* (Cuvier, 1829)	*Njen*= fish *Timah*= unanalysable *Mapʊ̃ʔ*= white	Morphology	Metonymy
123.	*Njen Timah Qunieng*	*njen timah qʊnieŋ*	*Trichiurus lepturus* (Linnaeus, 175 8	*Njen*= fish *Timah*= unanalysable	Morphology	Metonymy

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
				qʊnieŋ = yellow		
124.	*Njen Tiqas*	*njen tiqas*	*Seriolina nigrofasciata* (Rüppell, 1829)	*Njen*= fish *tiqas*= unanalysable	-	-
125.	*Njen Tuqol*	*njen tʊqol*	*Euthynnus affinis* (Cantor, 1849)	*Njen*= fish *tʊqol* = unanalysable	-	-
126.	*Njen Tuqol Mitem*	*njen tʊqol mitəm*	*Euthynnus sp.*	*Njen*= fish *tʊqol* = unanalysable *mitəm*= black	Morphology	Metonymy
127.	*Njen Tuqol Selaseh*	*njen tʊqol səlasƐh*	*Auxis thazard* (Lacepède, 1800)	*Njen*= fish *tʊqol* = unanalysable *səlasƐh* = basil	Morphology	Metonymy
128.	*Njen Tuqol Sisiq*	*njen tʊqol siseʔ*	*Thunnus tonggol* (Bleeker, 1851)	*Njen*= fish *tʊqol* = unanalysable *siseʔ* = scales	Morphology	Metonymy
129.	*Njen Tuted Kuning*	*njen tʊted qʊnieŋ*	*Xenopterus naritus* (Richardson, 1848)	*Njen*= fish *tʊted* = unanalysable *qʊnieŋ* = yellow	Morphology	Metonymy

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
130.	*Njen Udun*	*njen ʊdʊn*	*Rachycentron canadum* (Linnaeus, 1766)	*Njen*= fish *ʊdʊn* = unanalysable	-	-
131.	*Njen Ulau titoq*	*njen* pɑkƆŋ kəpɑlɑʔ	*Datnioides polota* (Hamilton, 1822)	*Njen*= fish *pakƆŋ* = knock *kəpalaʔ* = head	Morphology	Metonymy
132.	*Njen Uweng batu*	*njen ʊwəŋ batʊ*	*Terapon theraps* (Cuvier, 1829)	*Njen*= fish *ʊwəŋ* = unanalysable *batʊ* = stone	Ecology	Metonymy
133.	Njen X1	*Njen X1*	*Piaractus brachypomus* (Cuvier, 1818)	-	-	-
134.	Njen X2	*Njen X2*	*Helostoma temminckii* (Cuvier, 1829)	-	-	-
135.	Njen X3	*Njen X3*	*Parambassis* sp.	-	-	-
136.	Njen X4	*Njen X4*	*Cyclocheilichthys apagon* (Valenciennes, 1842)	-	-	-
137.	Njen X5	*Njen X5*	*Osteochilus microcephalus* (Valenciennes, 1842)	-	-	-
138.	Njen X6	*Njen X6*	*Lutjanus* sp.	-	-	-

No.	Vernacular name	Transcription	Scientific name	Meaning	TK mechanism	Linguistic mechanism
139.	Njen X7	*Njen X7*	*Myripristis hexagona* (Lacepède, 1802)	-	-	-
140.	Njen X8	*Njen X8*	*Upeneus tragula* (Richardson, 184 6)	-	-	-
141.	Njen X9	*Njen X9*	*Siganus canaliculatus* (Park, 1797)	-	-	-

Appendix 4 Traditional knowledge and language vitality of Ba'ie people

R	Cluster	Sex	Proficience		Time (s)		Criteria					TraLaVi score
			L1	L2	L1	L2	A	B	C	D	E	
1	1	M	5	5	219	269	25	24	24	23	23	0.952
2	1	M	5	5	217	452	25	24	23	23	23	0.944
3	1	M	5	5	196	537	25	25	25	23	23	0.968
4	1	M	5	3	261	303	25	24	24	24	24	0.968
5	1	M	5	3	189	377	25	24	24	23	23	0.952
6	1	M	5	3	276	562	25	25	25	24	24	0.984
7	1	M	5	5	604	602	25	21	21	23	23	0.904
8	1	M	5	5	249	427	25	25	25	24	24	0.984
9	1	M	5	4	225	871	25	24	24	23	23	0.952
10	1	M	5	5	240	256	25	22	22	20	20	0.872
11	1	M	5	5	233	335	25	23	23	17	17	0.84
12	1	M	5	3	329	1050	25	21	21	19	19	0.84
13	1	M	5	5	114	233	25	22	22	17	17	0.824
14	1	M	5	4	128	267	25	25	25	21	21	0.936
15	1	M	5	4	147	150	25	24	24	25	25	0.984
16	1	F	5	5	267	332	25	25	25	22	22	0.952
17	1	F	5	5	161	338	25	24	24	21	21	0.92
18	1	F	5	5	178	234	25	24	24	20	20	0.904
19	1	F	5	5	905	745	25	23	23	19	19	0.872
20	1	F	5	5	360	891	25	25	25	20	20	0.92
21	1	F	5	5	334	863	25	25	25	18	18	0.888
22	1	F	5	5	303	189	25	24	24	21	21	0.92
23	1	F	5	5	224	180	25	24	24	18	18	0.872
24	1	F	5	5	283	319	25	24	24	17	17	0.856
25	1	F	5	5	385	413	25	22	22	16	16	0.808
26	1	F	5	5	233	315	25	24	24	18	18	0.872
27	1	F	5	4	365	716	25	23	23	16	16	0.824

R	Cluster	Sex	Proficience		Time (s)		Criteria					TraLaVi
			L1	L2	L1	L2	A	B	C	D	E	score
28	1	F	5	5	114	120	25	22	22	13	13	0.76
29	1	F	5	3	211	Gave up	25	24	24	20	20	0.904
30	1	F	5	3	236	Gave up	25	22	22	15	15	0.792
31	2*	M	5	3	447	861	25	23	23	21	21	0.904
32	2*	M	5	5	199	462	25	24	24	23	23	0.952
33	2*	M	5	5	220	308	25	24	24	22	22	0.936
34	2*	M	5	5	447	867	25	23	23	22	22	0.92
35	2*	M	5	5	207	209	25	25	25	23	23	0.968
36	2	M	5	5	259	242	15	23	23	20	20	0.808
37	2	M	5	5	200	252	25	21	21	6	6	0.632
38	2	M	5	5	233	180	15	23	23	15	15	0.728
39	2	M	5	5	772	347	0	20	20	13	12	0.52
40	2	M	5	5	368	316	15	23	23	13	12	0.688
41	2	M	5	5	247	293	25	25	25	19	19	0.904
42	2	M	5	3	364	335	15	25	25	15	0	0.64
43	2	M	5	5	364	335	15	25	25	15	15	0.76
44	2	M	5	5	262	618	25	24	24	20	20	0.904
45	2	M	5	4	309	154	0	22	22	20	20	0.672
46	2	F	5	5	181	334	25	24	24	24	24	0.968
47	2	F	5	5	675	304	0	24	24	17	17	0.656
48	2*	F	5	5	287	349	25	23	23	22	22	0.92
49	2	F	5	2	468	1006	25	22	22	10	2	0.648
50	2	F	5	4	511	482	15	23	23	12	2	0.6
51	2	F	5	4	649	229	0	21	21	12	5	0.472
52	2	F	5	5	231	229	15	24	24	11	11	0.68
53	2	F	5	5	227	212	15	21	21	14	13	0.672
54	2	F	5	3	265	258	15	23	23	13	10	0.672
55	2	F	5	2	668	Gave up	25	24	24	11	11	0.76

R	Cluster	Sex	Proficience		Time (s)		Criteria					TraLaVi
			L1	L2	L1	L2	A	B	C	D	E	score
56	2	F	5	2	224	411	25	25	25	14	14	0.824
57	2*	F	5	5	280	204	15	25	25	21	21	0.856
58	2*	F	5	4	236	456	25	23	23	19	19	0.872
59	2*	F	5	3	236	456	25	23	23	17	17	0.84
60	2*	F	5	5	419	562	25	23	23	15	15	0.808

R= respondent; *= hobbies fishermen; L1= Ba’ie language; L2= Malay language

Appendix 5 Mann-Whitney test for cluster and gender group in Ba’ie community

Criteria A. Bilingualism

a. Cluster

Ranks

	Cluster	N	Mean Rank	Sum of Ranks
CriteriaA	Fishermen	30	37.50	1125.00
	non-fishermen	30	23.50	705.00
	Total	60		

Test Statistics[a]

	CriteriaA
Mann-Whitney U	240.000
Wilcoxon W	705.000
Z	-4.207
Asymp. Sig. (2-tailed)	.000

b. Gender

Ranks

	Sex	N	Mean Rank	Sum of Ranks
CriteriaA	male	30	30.50	915.00
	female	30	30.50	915.00
	Total	60		

Test Statistics[a]

	CriteriaA
Mann-Whitney U	450.000
Wilcoxon W	915.000
Z	.000
Asymp. Sig. (2-tailed)	1.000

Criteria B. Retreival of Information

a. Cluster

Ranks

	Cluster	N	Mean Rank	Sum of Ranks
CriteriaB	Fishermen	30	32.83	985.00
	non-fishermen	30	28.17	845.00
	Total	60		

Test Statistics[a]

	CriteriaB
Mann-Whitney U	380.000
Wilcoxon W	845.000
Z	-1.068
Asymp. Sig. (2-tailed)	.285

b. Gender

Ranks

	Sex	N	Mean Rank	Sum of Ranks
CriteriaB	Male	30	31.18	935.50
	Female	30	29.82	894.50
	Total	60		

Test Statistics[a]

	CriteriaB
Mann-Whitney U	429.500
Wilcoxon W	894.500
Z	-.313
Asymp. Sig. (2-tailed)	.754

Criteria C. Knowledge erosion

a. Cluster

Ranks

	Cluster	N	Mean Rank	Sum of Ranks
CriteriaC	Fishermen	30	32.53	976.00
	non-fishermen	30	28.47	854.00
	Total	60		

Test Statistics[a]

	CriteriaC
Mann-Whitney U	389.000
Wilcoxon W	854.000
Z	-.930
Asymp. Sig. (2-tailed)	.352

b. Gender

Ranks

	Sex	N	Mean Rank	Sum of Ranks
CriteriaC	male	30	30.87	926.00
	female	30	30.13	904.00
	Total	60		

Test Statistics[a]

	CriteriaC
Mann-Whitney U	439.000
Wilcoxon W	904.000
Z	-.168
Asymp. Sig. (2-tailed)	.867

Criteria D. Visual Recognition

a. Cluster

Ranks

	Cluster	N	Mean Rank	Sum of Ranks
CriteriaD	Fishermen	30	37.12	1113.50
	non-fishermen	30	23.88	716.50
	Total	60		

Test Statistics[a]

	CriteriaD
Mann-Whitney U	251.500
Wilcoxon W	716.500
Z	-2.945
Asymp. Sig. (2-tailed)	.003

b. Gender

Ranks

	Sex	N	Mean Rank	Sum of Ranks
CriteriaD	male	30	37.45	1123.50
	female	30	23.55	706.50
	Total	60		

Test Statistics[a]

	CriteriaD
Mann-Whitney U	241.500
Wilcoxon W	706.500
Z	-3.093
Asymp. Sig. (2-tailed)	.002

Criteria E. Knowledge transmission

a. Cluster

Ranks

	Cluster	N	Mean Rank	Sum of Ranks
CriteriaE	Fishermen	30	37.23	1117.00
	non-fishermen	30	23.77	713.00
	Total	60		

Test Statistics[a]

	CriteriaE
Mann-Whitney U	248.000
Wilcoxon W	713.000
Z	-2.996
Asymp. Sig. (2-tailed)	.003

b. Gender

Ranks

	Sex	N	Mean Rank	Sum of Ranks
CriteriaE	male	30	37.22	1116.50
	female	30	23.78	713.50
	Total	60		

Test Statistics[a]

	CriteriaE
Mann-Whitney U	248.500
Wilcoxon W	713.500
Z	-2.989
Asymp. Sig. (2-tailed)	.003

Appendix 6 Mann-Whitney test analysis of TraLaVi score toward cluster group and sex group in Ba'ie community

a. Cluster

Ranks

	Cluster	N	Mean Rank	Sum of Ranks
TraLaVi	Fishermen	30	38.62	1158.50
	non-fishermen	30	22.38	671.50
	Total	60		

Test Statistics[a]

	TraLaVi
Mann-Whitney U	206.500
Wilcoxon W	671.500
Z	-3.607
Asymp. Sig. (2-tailed)	.000

b. Gender

c. Ranks

	Sex	N	Mean Rank	Sum of Ranks
TraLaVi	male	30	35.45	1063.50
	female	30	25.55	766.50
	Total	60		

Test Statistics[a]

	TraLaVi
Mann-Whitney U	301.500
Wilcoxon W	766.500
Z	-2.199
Asymp. Sig. (2-tailed)	.028

Appendix 7 Language Vitality and Endangerement asessment

Language Vitality and Endangerment

UNESCO Ad Hoc Expert Group on Endangered Languages

Document submitted to the ***International Expert Meeting on UNESCO Programme Safeguarding of Endangered Languages***
Paris, 10–12 March 2003