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AUSTRONESIAN DIASPORA

A NEW PERSPECTIVE



The National Research Centre of Archaeology
The Agency of Research and Development
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Proceedings the International Symposium
on Austronesian Diaspora

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PREFACE OF PUBLISHER

This book is a proceeding from a number of papers presented in The International Symposium on Austronesian Diaspora on 18th to 23rd July 2016 at Nusa Dua, Bali, which was held by The National Research Centre of Archaeology in cooperation with The Directorate of Cultural Heritage and Museums. The symposium is the second event with regard to the Austronesian studies since the first symposium held eleven years ago by the Indonesian Institute of Sciences in cooperation with the International Centre for Prehistoric and Austronesia Study (ICPAS) in Solo on 28th June to 1st July 2005 with a theme of “the Dispersal of the Austronesian and the Ethno-geneses of People in the Indonesia Archipelago” that was attended by experts from eleven countries.

The studies on Austronesia are very interesting to discuss because Austronesia is a language family, which covers about 1200 languages spoken by populations that inhabit more than half the globe, from Madagascar in the west to Easter Island (Pacific Area) in the east and from Taiwan-Micronesia in the north to New Zealand in the south. Austronesia is a language family, which dispersed before the Western colonization in many places in the world. The Austronesian dispersal in very vast islands area is a huge phenomenon in the history of humankind. Groups of Austronesian-speaking people had emerged in ca. 7000-6000 BP in Taiwan before they migrated in 5000 BP to many places in the world, bringing with them the Neolithic Culture, characterized by sedentary, agricultural societies with animal domestication.

The Austronesian-speaking people are distinguished by Southern Mongoloid Race, which had the ability to adapt to various types of natural environment that enabled them to develop through space and time. The varied geographic environment where they lived, as well as intensive interactions with the outside world, had created cultural diversities. The population of the Austronesian speakers is more than 380 million people and the Indonesian Archipelago is where most of them develop. Indonesia also holds a key position in understanding the Austronesians. For this reason, the Austronesian studies are crucial in the attempt to understand the Indonesian societies in relation to their current cultural roots, history, and ethno-genesis.

This book discusses six sessions in the symposium. The first session is the prologue; the second is the keynote paper, which is Austronesia: an overview; the third is Diaspora and

Inter-regional Connection; the fourth is Regional highlight; the fifth is Harimau Cave: Research Progress; while the sixth session is the epilogue, which is a synthesis of 37 papers.

We hope that this book will inspire more researchers to study Austronesia, a field of never ending research in Indonesia.

Jakarta, December 2016

Publisher

TABLE OF CONTENT

Preface of Publisher	v
Table of Content	vii
 Prologue	 1
Austronesia: an Overview	
Austronesian Studies in 2016: Where Are We Now? <i>Peter Bellwood</i>	7
Diaspora and Inter-Regional Connection	
Occupation and Diaspora of Austronesia: Learning from Geo-oceanoclimatology Perspective in Indonesian Maritime Island <i>Wahyoe S. Hantoro</i>	25
Reframing the Island Southeast Asian Neolithic: Local vs Regional Adaptations <i>Peter V. Lape, Fadhila Arifin Aziz, Dian Ekowati, Jenn Huff, Wuri Handoko, Andre Huwae, Michael Lahallo, Simon Latupapua, Adhi Agus Oktaviana, Emily Peterson, Marlon Ririmasse, Karyamantha Surbakti, Joss Whittaker, and Lauryl Zenobi</i>	65
Splitting Up Proto-Malayopolynesian; New Models of Dispersals from Taiwan <i>Roger Blench</i>	77
“Ex Oriente Lux”: Recent Data from Lapita Culture Sites Bearing on the Austronesian Diaspora within Island Southeast Asia <i>Matthew Spriggs</i>	105
The Formation and Dispersal of Early Austronesian-speaking Populations: New Evidence from Taiwan, the Philippines, and the Marianas of Western Micronesia <i>Hsiao-chun Hung</i>	125
Austronesian and Australian Analogs in Vietnam through Paleoanthropological Evidence <i>Nguyen Lan Cuong</i>	145
Rock art as an indication of (Austronesian) migration in Island Southeast Asia <i>Noel Hidalgo Tan</i>	165
The Connection and Tradition - The Bark Cloth Making in Hawai’i and Taiwan <i>Chi-shan Chang</i>	181
Bali in the Global Contacts and the Rise of Complex Society <i>I Wayan Ardika</i>	193
	vii

Regional Highlights

Updated Views on the Austronesian Studies in Indonesia <i>Truman Simanjuntak, Adhi Agus Oktaviana, and Retno Handini</i>	207
Reassessing the Neolithic-Metal Age Transition in Batangas, Philippines: A Distinct Southern Luzon Pottery Tradition <i>Grace Baretto-Tesoro</i>	223
Indication of Early Plant Domestication in Java Based on the Palynology Research <i>Andjarwati Sri Sajekti</i>	253
Austronesian Dispersal to Malaysian Borneo <i>Stephen Chia</i>	267
Sea, Stones and Stories: The Maritime Tradition in Southeast Moluccas Islands <i>Marlon Ririmasse</i>	275
Swinging-like Movement: Pattern of Ancient Migration in Eastern Part of Indonesia <i>Toetik Koesbardiati, Rusyad Adi Suriyanto, Delta Bayu Murti, and Achmad Yudianto</i>	289
Indonesian Megaliths as the Result of the Interaction between Indigenous Peoples and Hindu-Buddhist Kingdoms <i>Tara Steimer-Herbet and Marie Besse</i>	301
Austro-Protohistory: the Dispersal of Megaliths in Indonesia Islands <i>Bagyo Prasetyo</i>	319
Inter-islands Relations: The Javanese Factor in Barus and Padang Lawas, North Sumatra (9th – 16th c. CE) <i>Daniel Perret and Hedy Surachman</i>	337
The Neolithic Cultures of Lingnan (Southern China) <i>XIE Guangmao</i>	351
The Origins of Orang Melayu <i>Amri Marzali</i>	367
Techno-Cultural Development of Toraja Textiles in Relation to Austronesian Origin: Materials, Dyes, Looms, and Weaves <i>Keiko Kusakabe</i>	375
Maritime People and Wetland Settlement <i>Bambang Budi Utomo</i>	395
A Shifting Phenomenon in Tomini-Tolitoli Language Group: Tajio as a Case Study <i>Luh Anik Mayani</i>	407

Small Island as a Bridge to Austronesian Diaspora: Case in Here Sorot Entapa Caves, Kisar Island, Maluku <i>Alifah, Mahirta, and Sue O'Connor</i>	417
Tradition and Function of Cili on Agricultural Ritual of Subak in Bali <i>I Nyoman Wardi</i>	427
Archaeolinguistics for a Study of Ethnic Group Formation: a Case Study of Speakers of Austronesian in Northern Sumatra <i>Ery Soedewo, Deni Sutrisna</i>	445
The Contribution of Sanskrit to the Balinese Language <i>Ni Luh Sutjiati Beratha</i>	465
The Continuity of Austronesian Tradition on Islamic and Early Colonial Period in Maluku <i>Wuri Handoko</i>	481
 Gua Harimau: Research Progress	
Verifying Austronesian Hypothesis from the Skeletal Human Remains from Gua Harimau Site in Sumatra <i>Hirofumi Matsumura, Truman Simanjuntak, Adhi Agus Oktaviana, Sofwan Noerwidi, Dyah Prastiningtyas, Nguyen Lan Cuong, Marc Oxenham, Anna Willis, Rahayuningsih Restu, Martha Hana, and Hsiao Chun Hung</i>	495
Determination of Genetic Characteristics of Ancient Skeletal Remains Excavated from the Gua Harimau Site in Sumatra <i>Ken-Ichi Shinoda, Tsuneo Kakuda, Hideaki Kanzawa-Kiriyama, Noboru Adachi, Dyah Prastiningtyas, Sofwan Noerwidi, and Hirofumi Matsumura</i>	511
Prehistoric Burial of Gua Harimau: Socio-Cultural Complexity of Austronesian Society <i>D. Prastiningtyas, S. Noerwidi, M.L. Herbiyamami, Fauzi, M.R., Ansyori, M., Matsumura, and Truman Simanjuntak</i>	523
Continuity on Rainforest Foraging During the Course of Neolithic Period in Sumatera: Evidences, Artifacts and Its Chronology <i>M. Ruly Fauzi and Truman Simanjuntak</i>	543
Comparative Analysis of Non-figurative Rock Art at Gua Harimau Site within the Scope of Indonesian Archipelago <i>Adhi Agus Oktaviana, Pindi Setiawan</i>	559
Metal Artifacts Analysis from Gua Harimau, South Sumatera, Indonesia <i>Harry Octavianus Sofian, Thomas Oliver Pryce, Truman Simanjuntak, and François Sémah</i>	571
Epilogue	587

SWINGING-LIKE MOVEMENT: PATTERN OF ANCIENT MIGRATION IN EASTERN PART OF INDONESIA

Toetik Koesbardiati, Rusyad Adi Suriyanto, Delta Bayu Murti, and Achmad Yudianto

Introduction

The history of residential in Indonesia has long been a concern of researchers. Based on dental aspect, Turner (in Ballinger et al. 1992) states that there are two population groups that migrated out of China about 20,000-30,000 years ago. The groups are sinodont and sundadont. Sinodont moved to the north. Meanwhile, sundadont moved to the south heading to Southeast Asia and Indonesia. Sundadont moved further to Melanesia, Micronesia and Polynesia. Based on morphological aspect, Jacob (1967) and Glinka (1978, 1981) state that the migration in Indonesia was from the west and north of Indonesia. In his thesis, Jacob (1967) states that Indonesia was inhabited by at least two races namely Australomelanesoid and Mongoloid. Australomelanesoid first inhabited Southeast Asia, including Indonesia. Mongoloid were immigrants who migrated to Indonesia through the west and north. Jacob's rationale is the study of morphological features of the remains of modern human skeleton which among others were found in Flores and Sumba. This postulation is reinforced by Glinka (1978, 1981) who conducted research on morphological characteristics of facial somatometry of several populations in Indonesia archipelago. The results of the research indicated that Indonesia had at least three racial elements, namely Protomalayid, Deuteromalayid, and Dayakid. Dayakid is a variant of Deuteromalayid whose characters are different from Deuteromalayid's. Dayakid grow rapidly in Kalimantan. Protomalayid is the population that first inhabited the entire region of Indonesia and Southeast Asia, while Deuteromalayid is immigrant (Mongoloid) who came in waves and shoved the natives.

The results of the studies conducted by Jacob (1967) and Glinka (1978, 1981) are reinforced by Belwood (2000) who states that the Indo-Malayan islands, including Indonesia, were inhabited by populations with Australomelanesoid and Mongoloid racial elements. Australomelanesoid is allegedly to be the first to inhabit and dominate the western region of Indonesia to the east, becoming the strong influence of Melanesia (Papua). Then, in waves, Mongoloid migrated from the west and north of Indonesia. The influence of this migration is clearly seen moving to the south and east of Indonesia. It is evident from the diverse morphological features of Australomelanesoid with the influence of Mongoloid. The features of Australomelanesoid were increasingly dominant in the eastern part of Indonesia. The Austromelanesoid features are strongly evident to the east. If the Mongoloid

migrated to Indonesia and shoved the natives to the eastern Indonesia, at least there has been a mix of morphology in eastern Indonesia. In other words, there are Australomelanesoid and Mongoloid features in eastern Indonesia, with sundadont's dental features.

The diversity in eastern Indonesia is not only the interest of research in anthropology, archeology, and language, but also genetics. Ballinger et al. (1992) examined the human mtDNA of 153 independent samples encompassing seven Asian Populations using PCR, restriction endonuclease analysis and oligonucleotide hybridization. The results indicated that all populations in Southeast Asia came from the same source, namely the southern Mongoloid. Southern Mongoloid is alleged to have replaced or assimilated by the previous inhabitants namely Australomelanesoid. More specific research was conducted by Karafet et al. (2005). Karafet et al. examined the genetic variation of the population in Bali, Indonesia based on Y-chromosomes to see the relative contributions of Austronesia farmers and pre-Neolithic hunter gatherers to the paternal gene pool of current population in Bali as well as to test the hypothesis of recent paternal gene flow from the Indian Subcontinent. Phylogeographic analysis results showed that all three major Y-chromosomes haplogroups migrated to Bali with the arrival of Austronesia speakers. Further, Karafet et al. stated that STR diversity patterns associated with these haplogroups are complex. This is likely to be due to the multiple waves of Austronesian expansion to Indonesia by different routes. Karafet et al. found that the paternal gene pool of current Bali's population was influenced by the Pre-Neolithic component and migration from India from a younger age.

Recently, Tumonggor et al. (2013) reported the results of their research on mtDNA and associated Y-chromosomes diversity in Indonesia. Tumonggor et al. managed to reconstruct 50,000 years of population movement based on mitochondria lineages. It indicates the very earliest settlement in islands in Southeast Asia to Neolithic population dispersals. This study also indicates the influence of the population of China, India, Arab and Europe. In the migration taking place in the past, women moved further and more widespread. It indicates that the pattern of genetic diversity is influenced by the matri- or ambilocality marriage pattern of Austronesian communities at that time. However, the marriage pattern evolved toward current patrilocal. In other words, genetic diversity in Indonesia is influenced by the region's complex immigration, transitory migrants and population that have endure in situ since the region's first settlement.

The findings of prehistoric remains are spread over several sites in the eastern Indonesian ranging from Semawang, Gilimanuk in Bali, Liang Bua, Liang Toge in Flores, Lewoleba in Lembata and Melolo in Sumba. The purpose of this paper is to describe the pattern of ancient migration in the eastern part of Indonesia based on data of antiquity,

epigenetics, facial morphology, dental modification and genetics compiled from the results of study conducted by the authors.

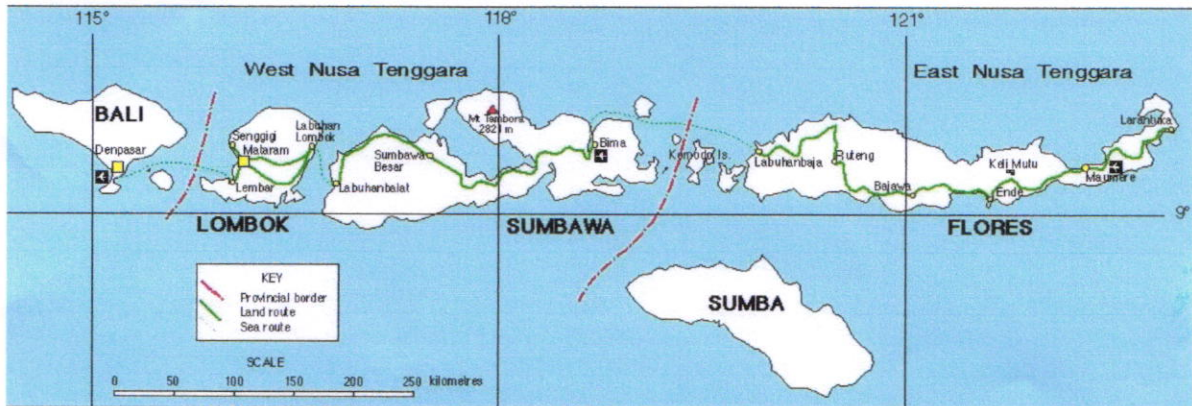


Figure 1. Islands in Eastern Indonesia.

Material and Method

The material of this study is the remains of human skeleton with neolithic until iron age antiquity found in Bali, Flores, and Sumba, namely the population of Gilimanuk, Semawang, Melolo, Gunung Piring, Ntodo Leseh, Liang Bua, Liang Toge and Lewoleba.

Table 1. Variation of samples in Nusa Tenggara

No.	Cranial Sample	Antiquity	Racial Affinity	Dental Modification	Dental Colorization
1	Gilimanuk	Paleometalic	Mongoloid	Yes	No
2	Semawang	Paleometalic	Mongoloid	Yes	Yes
3	Gunung Piring	Paleometalic	Mongoloid / Australomelanesoid	Yes	No
3	Ntodo Leseh	Paleometalic	Mongoloid / Australomelanesoid	No	No
4	Liang Bua	Neolithic	Australomelanesoid / Mongoloid	Yes	Yes
5	Liang Toge	Neolithic	Australomelanesoid	Yes	Yes
6	Melolo	Early paleometalic	Australomelanesoid / Mongoloid	Yes	Yes
7	Lewoleba	Neolithic	Australomelanesoid / Mongoloid	Yes	Yes

Antiquity data were collected from the literature (see Table 1), i.e. antiquity data of each specimen examined. Morphological data were collected through anthropometric method which includes the following variables: frontal breadth (fmt-fmt), bimaxillary breadth (zm-zm), biyzgomatic breadth (ZY-ZY) and the height of face (n-pr). The

measurement method was based on Martin method (Brauer, in Martin & Knussmann, 1988). Based on the single measurements, facial index and upper facial malaris index were then calculated. Metrical data of Liang Bua, Liang Toge and Lewoleba populations were then compared with the one of the population of China, Indonesia in general and Australomelanesoid. ANOVA test with a significance level of 99.00% was conducted to see the differences among samples. In addition, Scheffe test was performed to determine the affiliation between samples.

In addition to morphological data, epigenetic data measured by Hauser & de Stefano (1989), Buikstra & Ubelaker (1994), and Indriati (2001) were also collected. The measured variables include the number of palatine foramen, the size of palatine foramen, the shape of palatine foramen, the degree of expression of torus palatinus, the continuity of torus palatinus, the degree of expression of torus maxillae, the degree of expression of os japonicum, the level of completeness of tuberculum marginale, tuberculum force projection, the degree of expression of infraorbital suture, the number of infraorbital foramen, the degree of infraorbital foramen, the number of zygomaticofasiale foramen and the size of the zygomaticofasiale foramen.

Genetic data were derived from mtDNA of human skeletal remains found in Gilimanuk, Semawang, Liang Bua, Liang Toge, Melolo and Lewoleba. Haplotype variation among the populations examined was then compared to see the similarities among the populations.

Cultural activity was measured by the practice of dental modification determined by macroscopic observation. Observation results were then grouped and categorized by adopting the method of grouping by Romero (in Koesbardiati, 2015).

Results and Discussion

Morphology

Facial morphology was measured based on the variables of frontal breadth (fmt-fmt (M38)), bimaxillary breadth (zm-zm (M22)), bizygomatic breadth (zy-zy (M-20)) and the height of face (n-pr (M18)). The measurements of these variables were used to calculate the facial index and the upper facial malaris index. The calculation results showed that the average size of the frontal breadth (fmt-fmt) of the samples of Nusa Tenggara was the widest. When compared with the samples of China and Australomelanesia, based on Scheffe test, the samples of Nusa Tenggara were closer to the samples of Australomelanesia. Variables of upper facial index, bizygion breadth (zy-zy) and the height of face (n-pr) showed no significant differences among the samples of Nusa Tenggara, China and Australomelanesia. On the other hand, the measurement results of bimaxillary breadth (zm-zm) showed that the average size of the samples of Nusa Tenggara tended to be closer to the samples of China. In

general, the samples of Nusa Tenggara can be categorized as having a strong affiliation with the samples of Australomelanesia. However, regarding the facial width, the samples of Nusa Tenggara had a closeness with the samples of Mongoloid. If the similarities and differences of these variables are translated as mongolidization process, the samples of Lewoleba are the samples with the least similarity to the samples of Mongoloid. In other words, Lewoleba received the least influence from Mongoloid. Lewoleba is located at the east of Nusa Tenggara. It is clear that the influence of mongolidization moved to the east of Indonesia, but not too strong to reach the eastern part of Flores Island.

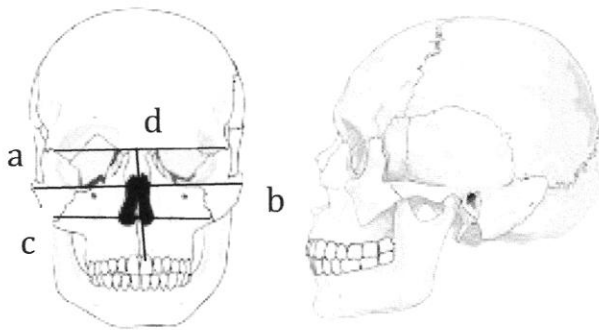


Figure 2. anthropometric measurements (Suriyanto and Koesbardiati, 2006)

a: fmt-fmt (M38) c zm-zm (M22)
 b: zy-zy (M20) d: n-pr (M18)

Epigenetic character

Some epigenetic characteristics show more real existence in one sex. Racial factors reinforce this distinction. Functional factors or extrinsic factors such as biotic, abiotic and culture are factors that greatly affect the bone structure which in turn forms the epigenetic characteristics.

Embryologically, the skull is controlled by a genetic program that has been affected by environmental factors (Schumacher 1997, in Suriyanto 2007). In the postnatal period, jaw grows rapidly under the effect of genetics and environment. Genetics and environment are overlapping in affecting the growth of the jaw, causing cryptical changes in morphology. Genetic factors will bring local characteristics, while epigenetic factors will bring local and general characteristics. According to Hauser and de Stefano (1989), Epigenetics is a progressive determination and differentiation process of cells and tissues as a result of the genetic order in an environmental process. Furthermore, Hauser and de Stefano state that epigenetic is gene relations as a result of mutation affected by the environment during ontogeny. Epigenetic characteristics has a broader meaning than a research simply relying on morphometric variable. Epigenetics can also be used to record information on population

dynamics. In particular, epigenetics can be applied in analyzing osteology with human skeletal remains of paleoanthropologists archaeology that is fragmentary, incomplete and poorly maintained.

Epigenetic characteristics of upper viscerocranium of samples of Nusa Tenggara showed the overall characteristics of Australomelanesoid, but some samples showed peculiarities. The male samples of Liang Bua, Lewoleba, Melolo and Ntodo Leseh showed significant differences ($p < 0.05$) in the size of palatine foramen, the degree of expression of torus palatinus, the degree of completeness of tuberculum marginale, force projection of tuberculum marginale, the number of foramen infraorbitale, the degree of expression of infraorbitale foramen and the size of zygomaticofasiale foramen. This suggests that the aspects of size, degree of expression and projection play an important role in the manifestation of difference among the male samples. According to Hauser and de Stefano (1989), the manifestation of difference is influenced by genetical background which emerges first in male.

The samples of Liang Bua showed the least difference from the samples of Lewoleba. This difference was influenced by the samples' antiquity which were older than other samples and the strongest Australomelanesoid characteristics. Among the samples of Nusa Tenggara being examined, the samples of Lewoleba showed the strongest Australomelanesoid characteristics. It was consistent with the results of anthropometric measurements, which indicated that Lewoleba had the strongest Australomelanesoid characteristics.

Differences among samples further indicated variation in characteristics of Australomelanesoid. This variation is allegedly to be influenced by the geographical environment and adaptation to the surrounding environment. It can be seen in the samples of Melolo that showed the most unique characteristics. Melolo is located in the southest part of East Nusa Tenggara. The possibility to adapt to the environment is very influential on the characteristics of the population.

Instead, the samples of skull of Ntodo Leseh showed minor differences from the samples of Liang Bua and Melolo, but showed major differences from the samples of skull of Lewoleba. Similar to the samples of Melolo, the samples of Ntodo Leseh were located in the west of East Nusa Tenggara.

Based on this, we can conclude that mongolidization spreaded from the west to the east of Indonesia, shoved the natives to the east, but it was less intensive in Lewoleba. The remains of archaeological artifacts of Ntodo Leseh also showed antiquity similar to the one of Gilimanuk (Bali), namely a site with samples of skull at the west of Ntodo Leseh. Jacob (1967) and Glinka (1978, 1981) state that mongolidization moved from the west to east of Indonesia since the Iron Age until now (see Karafet et al. 2005).

Genetic Data

Samples of mitochondrial DNA (mtDNA) were taken from the skulls found in Liang Bua, Semawang, Gilimanuk and Melolo. The samples of mtDNA were analyzed using PCR technique. From the sequences, haplotypes were obtained. Table 2 shows the variation of haplotypes in each sample of the skull. Comparison among haplotypes of each of the samples showed that there was similarity between haplotypes in the samples of Gilimanuk and Semawang, namely G101A, G107A and T139C. The samples of Melolo had similarity with both populations. It was evident as the haplotypes in the samples of Semawang and Gilimanuk were found in the samples of Melolo, namely G101A, G107A, T139C, -130A, T139C, T149C and T159A. The diversity of haplotypes of the samples of Melolo showed a strong relationship between Gilimanuk and Semawang toward Melolo. Based on the antiquity, the samples of Melolo were older than the samples of Gilimanuk and Semawang, Thus do not rule out the possibility that Melolo population migrated to Gilimanuk and Semawang. Yet it can not be ignored that the populations of Gilimanuk and Semawang also migrated to Melolo and hybridized with the natives.

On the other hand, the samples of Liang Bua had the most variation of haplotypes, but did not show any similarity with the samples of Melolo, Semawang and Gilimanuk. It is as if Liang Bua stood on its own and was isolated from other populations on the island of Flores. Another possibility is the migration (Mongoloid) which came from another wave and did not reach Liang Bua.

Table 2. Variation of haplotypes of ancient population in eastern Indonesia (Koesbardiati, et al., 2016)

No	Sample	Haplotype
1	Semawang	
	- RIX	A109T
	- R XV	G101A, G107A, T117A, C129T, -130A, T139C, T149C, T159A
	- RXII	G111T
2	Gilimanuk	
	- Gilimanuk 1	G101A, G107A, T118A, C129T, T130A, T139C, T159C, T160A
	- Gilimanuk 2	G110T
	- Gilimanuk 3	G101A, G110T
3	Melolo	
	- Melolo	G101A, A109T, T127G, C128T
	- Melolo Palindi	G107A, C110T, T127G, -130A, T139C, T149C, T159A
4	Liang Bua	
	- LB3	C101G, C105G, A107-, C110A, A111G, T112/113/114/117G, T120C, T121/122-, G124A, C126-, T127-, G133C, T134/136G, C138A, C140G, A142T, C144A, A145C, T147A, C149T, G150A

Dental Modification

Tooth is a fascinating part of the face. When one smiles, their front teeth are visible. When one speaks, their front teeth are also visible. In other words, tooth is not only a biological organ, but also a social organ (Scott and Turner, 1997), which becomes the center of attention and treatment. Tooth is part of communication devices contributing to the meaning of facial expressions. Therefore, tooth is more often modified to get a sense of cultural aspect. Dental modification is a way of manipulating tooth for the sake of beauty, initiation, rituals, symbols of status (marriage, tribe), wailing due to death etc. In Indonesia, dental modification has been performed since thousands of years ago. Currently, dental modification is not common anymore among the society. However, some societies in Indonesia still perform dental modification. Balinese people still conduct the tradition of tooth filing as a part of the Hindu belief system. Elsewhere, dental modification is performed in the context of ethnic status (Mentawai) and beauty (Kupang, NTT).

Observation on the shape of the teeth of the samples of Semawang, Gilimanuk, Gunung Piring, Ntodo Leseh, Liang Bua, Liang Toge, Lewoleba and Melolo found variations in the pattern of dental modification. Table 3 shows the variation of dental modification of the samples of Semawang, Gilimanuk, Gunung Piring, Liang Bua, Liang Toge, Lewoleba and Melolo.

Table 3. Pattern of dental modification in eastern Indonesia

Location	teeth modified	Type of dental modification
Sumbawa		
Gunung Piring	Upper left and right incisors and canines	Filing (occlusal surface)
Bali		
Semawang	Upper left and right incisors and canines Lower left and right incisors and canines	Filling (labial and occlusal surface) Filling (pointed shape)
Gilimanuk	Upper left and right incisors and canines Lower left and right incisors and canines	Filling (labial and occlusal surface) Filling (occlusal surface)
Sumba		
Melolo	Upper left and right lateral incisors	Extraction, blackening (chewing betel-nut?)
Flores		
Liang Bua	Upper left and right lateral incisors	Extraction, blackening (betel-nut chewing?)

Location	teeth modified	Type of dental modification
Lewoleba	Upper left and right lateral incisors	Extraction, blackening (betel-nut chewing?)
Liang Toge	Upper left and right incisors and canines	Filing (labial, occlusal and lingual surface)

Table 3 shows two major groups of the pattern of dental modification. The first group is dominated by modification (filing) on the occlusal surface. The first group consists of samples of Gilimanuk and Semawang in Bali, as well as samples of Gunung Piring in Sumbawa. Samples practicing filing were the samples of Liang Toge. Yet, the samples of Liang Toge had different variant of filing because the filing was not performed on the occlusal surface, but on the labial and lingual surfaces. The second group consists of samples practicing dental modification in the form of extraction. This group consists of samples of Liang Bua, Melolo and Lewoleba (See Koesbardiati & Suriyanto 2007).

Based on the aspects of antiquity, the group with occlusal filing pattern is from the younger age compared with group with the pattern of extraction. In other words, extraction is a pattern practiced first or early tradition. While occlusal filing is cultural influence brought by immigrants which was then allegedly as Mongoloid population. It shows the pattern of migration of Mongoloid that moves toward the eastern part of Indonesia.

Conclusion

In the period between neolithic and Iron Age, according to the antiquity samples examined, it appears that the Mongoloid migrated to Indonesian archipelago. The migration generally moved from the west and north of Indonesia toward the east. Based on the data of anthropometric, epigenetics, genetics, and dental modification, the migration took place in waves, shoving the natives to the east and the migrants acculturated and hybridized with indigenous people. Uniquely, morphological and epigenetic characteristics as well as similarities and differences in mtDNA haplotype in each sample showed an engaging process that occurred between migrants and inhabitants of the region of Nusa Tenggara.

Variation in the pattern of dental modification also confirmed that a new culture was preferred making it more commonly practiced, for example, occlusal filing which was commonly practiced by the samples of group of younger antiquity. Occlusal filing pattern is still practiced today in Bali. It indicates that this pattern is younger, so that it is acceptable in the long term. On the other hand, extraction is an older dental modification pattern that is practiced as a tradition for local residents.

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