OPTIONS FOR JOINT ARCHAEOLOGICAL, ETHNO-ARCHAEOLOGICAL, AND ANTHROPOLOGICAL RESEARCH IN PAPUA

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Abstrak. Opsi untuk Penelitian Arkeologi Bersama, Ethno-Arkeologi dan Antropologi di Papua. *Papua memiliki potensi arkeologi yang besar, serta masih dijumpai tradisi prasejarah yang masih berlangsung hingga saat ini. Provinsi Papua dan Papua Barat menawarkan kesempatan yang sangat menarik untuk penelitian interdisipliner di bidang prasejarah dan keragaman budaya. Temuan arkeologis menunjukkan bahwa manusia mendiami bagian timur New Guinea sekitar 40.000-50.000 tahun yang lalu. Karena imigrasi utama kemungkinan besar terjadi dari barat Pulau New Guinea dihuni lebih awal. Penelitian arkeologi dan terkait sejauh ini hanya menetapkan beberapa situs dan bukti-bukti lain dari hunian awal manusia prasejarah di Papua Nugini. Tulisan ini bertujuan menggambarkan potensi penelitian arkeologi, antropologi, etnografi di Papua dan menyebutkan secara khusus penelitian arkeologi dan etnoarkeologi di Kabupaten Pegunungan Bintang, di wilayah suku Mek dan Ok. Metode penelitian dalam tulisan ini yaitu studi pustaka, survei, ekskavasi dan pendekatan etnoarkeologi. Hasil penelitian menunjukan bahwa pegunungan Papua menjadi pusat pertanian awal di dunia. Hingga saat ini masih dijumpai tradisi prasejarah di Papua yaitu pembuatan kapak batu, alat tulang dan tradisi megalitik. Tradisi prasejarah ini dijumpai di wilayah pegunungan dan pesisir. Penelitian, pertanggalan absolut situs dan publikasi arkeologi Papua masih sedikit jika dibandingkan dengan Papua Nugini. Hal ini menjadi potensi ke depan untuk melakukan penelitian dan publikasi bersama.*

Kata kunci**:** *Etnografi, prasejarah, warisan budaya, rumah peradaban*

Abstract. With its prehistoric tradition still found to this present day, Papua is considered to have high archaeological potential. Papua and West Papua Provinces offer particularly interesting opportunities for interdisciplinary research in prehistory and cultural diversity. Archaeological findings show that humans inhabited the eastern half of New Guinea (NG) at least 40,000–50,000 years ago. As primary immigration most likely happened from west to east, the western half of the island of NG must have been inhabited even earlier. Archaeological and related research has established only a few sites and other signs of early human occupancy in the Indonesian part of NG. This review describes the potential of archaeological, anthropological, and ethnographic research in the Indonesian Papuan Provinces and specifically discusses recent ethnographic, archaeological, and ethno-archaeological work carried out in the Star Mountain Regency among the Mek and the Ok. The research methods employed in this research were literature review, survey, excavation, and ethnoarchaeological approaches. The findings show that Papuan highlands became one of the earliest centres of horticulture. Until now, there are still prehistoric traditions found in Papua, such as stone adzes, bone tools, and megalithic traditions. These prehistoric traditions are easily found in the highlands and coastal areas. Research sites absolute dating, and archaeological publication related to Papua is still considered low compared to PNG. Many facets of Papuan cultural diversity are still to be discovered for future research and collaborative publication.

Keywords: Ethnography, prehistory, cultural heritage, rumah peradaban

DOI: 10.55981/amt.v40i1.16
Diterima: 2021-08-06 Diperiksa: 2021-09-29 Disetujui: 2022-02-22

1. Introduction

The islands of Indonesia and Melanesia are the scene of particularly interesting periods of human history. The early *Homo erectus* finds of Trinil, Sangiran, Ngandong, and Sambungmacan in Java dated from *circa* 1.6 Million to *circa* 110,000 years (cf., e.g., Dubois 1894, von Koenigswald 1936, Jacob 1973, Bartstra et al. 1988, Delson et al. 2001, Sémah et al. 2000, Simanjuntak et al. 2001, Choi & Driwantoro 2007, Rizal et al. 2020), the discovery of skeletons of *Homo floresiensis* at Liang Bua cave in Flores (cf. e.g. Morwood et al. 2004), and the recent dating results of figurative rock art to *circa* 40,000 years in Sumatera (cf. e.g. Fauzi et al. 2019) and Sulawesi (cf. e.g. Aubert et al. 2014), which are older than the well-known European cave art (cf. e.g. Leroi-Gourhan 1984), are impressive proofs of this in the Indonesian Archipelago. Archaeological work in Sulawesi indicates the human presence of a still undetermined taxonomic status since at least 118,000 years ago (c.f. van den Bergh et al. 2016, O´Connor et al. 2018), while evidence of the earliest human occupation in mainland and island New Guinea (NG) date to *circa* 49,000–43,000 years ago (cf. Summerhayes et al. 2010). The highlands of NG further yielded proof of the domestication of taro (*Colocasia esculenta*) and other important food plants like sugar cane (cf. Golson 1976, Gorecki 1986, Denham 2005, 2011, Field et al. 2020). The impact of early Austronesian people arriving on the north coast of NG around 3,000 years ago (cf. e.g. Bellwood & Sather 2006, Simanjuntak 2011, Gaffney et al. 2015) and a vast network of exchange connecting this region with the rest of Southeast, East, South and Southwest Asia from 2,000 years ago on (Swadling 1996) is still little known: birds of paradise feathers for the Chinese Emperor and other valuable goods from NG were traded against pieces of Dong Son bronze objects (de Bruyn 1962, Galis 1964), porcelain (Elmberg 1968) and other precious items from Asia, which became integrated into the value system in several regions of the Bird's Head peninsula and the north coast of NG (cf. e.g. de Clercq & Schmelz 1893). The Austronesian seafarers probably played an essential part in this network (e.g., Summerhayes 2019). In the context of this contribution, we will focus on early and recent archaeological and ethno-archaeological research in the Indonesian Provinces of Papua and West Papua, which are described in more detail below.

2. Method

To identify potential topics of interdisciplinary research in the fields of archaeology, ethnography, and ethno-archaeology in the Indonesian Provinces of Papua and venues for bringing scientific knowledge to the public, we drew up an overview of the existing scientific literature and combined our respective knowledge and expertise in the aforementioned fields of research.

3. Research Result and Discussion

3.1 Pioneer research in the 20th Century

The Indonesian Provinces of Papua and West Papua (Fig. 1A) have a relatively recent and multilingual history of archaeological and ethnographical research (for overviews cf., e.g., Simanjuntak 1996, 1998; Wright et al. 2013; Schiefenhoevel & Vanhaeren 2017). Even if some early voyagers exploring the western coast of NG noticed some ethnographic customs and the existence of rock art in the present-day Province of West Papua from the second half of the 17th century on, in-depth biological, anthropological, ethnographic, and archaeological research was not carried out before the end of the 19th–beginning of the 20th century in at that time Netherlands New-Guinea. Scientists started to study the geological and geographic environments, flora and fauna as well as the livelihood and customs of the local populations during expeditions by sailing ships to the coasts and sometimes were able to proceed farther into the interior of NG; for an overview of early expeditions cf., e.g., Le Roux (1948, 1950) who carried out, from 1939 onwards, comprehensive fieldwork in hitherto un-researched areas.

Of particular interest for archaeological research is the early mention of rock art sites and caves with human remains and findings of bronze objects, stone artifacts, and pottery shards made by artisans of cultures unknown to the local people (Galis 1964). Rock art was, for example,

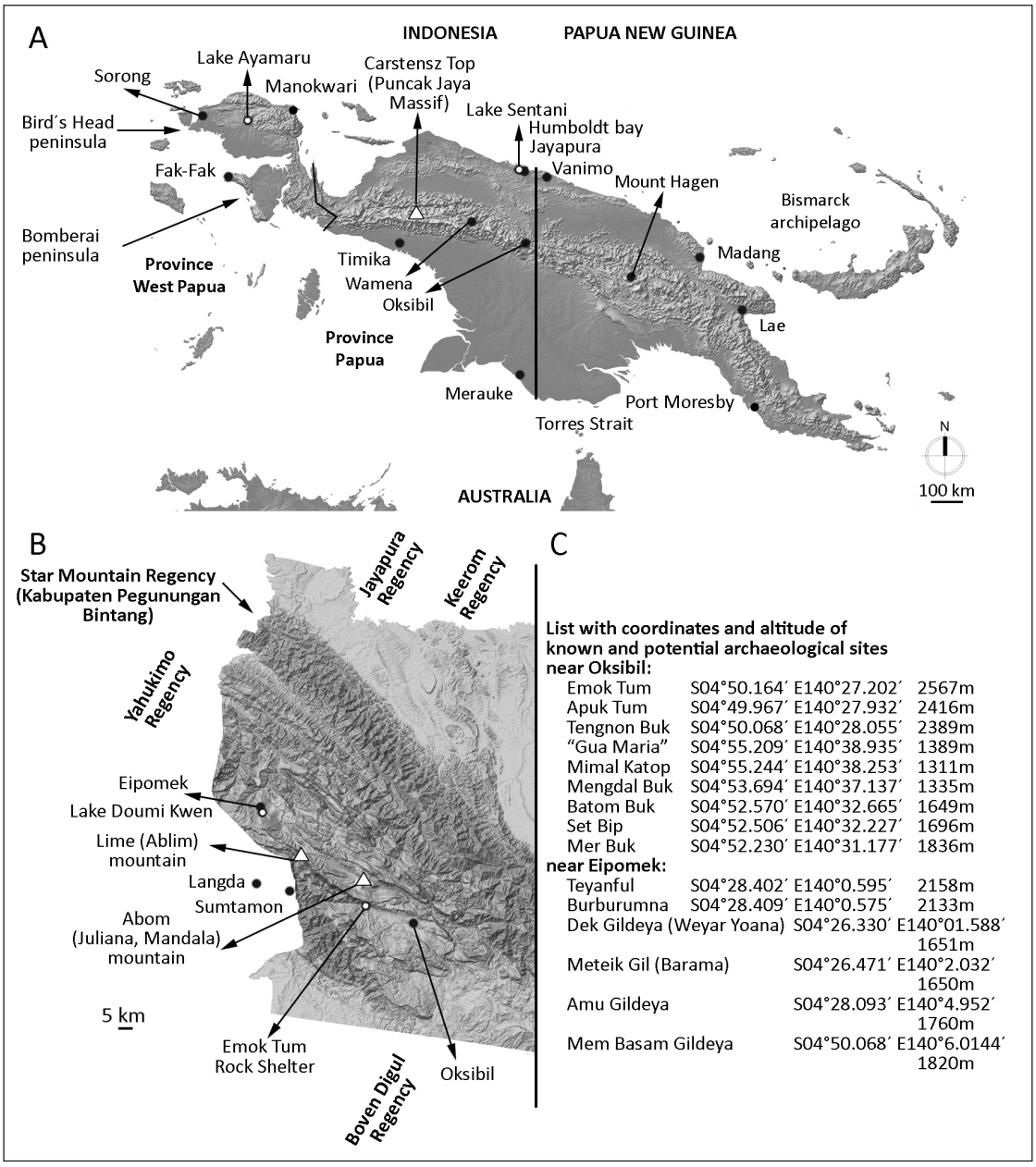


Figure 1. Maps of (A) mainland and island New Guinea, (B) the Star Mountains Regency (Kabupaten Pegunungan Bintang) with its capital Oksibil, bordered by the regencies of Boven Digoel in the south, Yahukimo in the west, Jayapura and Keerom in the north and the state Papua New Guinea in the east, (C) sites with known or possible archaeological potential in the Oksibil area and Eipomek area
(Source: surveys 2016)

described in the Province of West Papua, near Fak-Fak, by de Clercq in 1893 (de Clercq & Schmeltz 1893) and the Province of Papua, on the shore of Lake Sentani near Jayapura, by Van der Sande in 1907. An investigation of the site named Tutari near Lake Sentani with petroglyphs and megaliths is provided by Galis (1964). He worked in the administration of Netherlands New Guinea and carried out extensive literary research (Galis 1955, 1956) and fieldwork on the north coast, especially in the region of the Humboldt Bay and Lake Sentani. Galis (1964) and de Bruyn (1962) described, among others, bronze objects, characteristic of the Dong Son Culture, which thrived in Vietnam and Southern China between about 3,000 and 1,800 years ago; objects of this kind were found in the Lake Sentani area as well as in the Province of West Papua, north of the Ayumaru lakes (Elmberg 1959).

Systematic archaeological fieldwork in West Papua was carried out by Wilhelm Solheim (1976) at the Bird's Head and Bomberai Peninsula. Solheim also carried out ethno-archaeological work with two researchers from Papua (Solheim & Ap, 1977; Solheim & Mansoben, 1977). Simanjuntak (1996, 1998) evaluated the scientific potential of Papua (then Irian Jaya) in prehistory and archaeology. Arifin and Delanghe (2004) highlighted an updated illustrated inventory of rock art sites in the Provinces of Papua and West Papua and the importance of this cultural heritage. Petrequin and Petrequin, in their impressive "Objects of Power" (2006), describe, based on repeated fieldwork stays, many archaeologically and ethno-archaeologically relevant sites in the Provinces of Papua and West Papua. G.S. Hope (1977, 1998), one of the members of the Australian expedition to Carstensz-Top/Puncak Jaya Massif in 1971–1972, reports about the anthropogenic changes in flora and fauna of this region through the use of fire and together with J.H. Hope (Hope & Hope 1976) about some archaeological finds in that area; Hope and Haberle (2005) published the so far only archaeological-palaeontological study in the highlands of NG; they conclude that already 32,000 years before present (ybp) humans have lived in that area.

Otherwise, the interior of the Papuan Provinces is, until today, mainly archaeological *terra incognita*. It is, of course, most likely that the interior of the western half of NG will yield as exciting results of archaeological research as the eastern half, where several excavations have been carried out and found human existence as far back as 49,000 ybp (cf. Summerhayes et al. 2010). In the Bird's Head peninsula, the Province of West Papua, Pasveer (2004) has not only carried out the first systematic and multidisciplinary excavation and ethno-archaeological study in the region of Lake Ayamaru but also gives a beneficial account of the history of research in NG, especially its western half. For archaeology, ethno-archaeology, anthropology, and ethnology, the interior of the Papuan Provinces is, partly because of its remote and isolated geography, still most exciting and offers a wealth of research options.

For early ethnographic research, special attention can be given to the account of a first contact event during a Dutch military and geographic expedition of the team around the medical doctor de Kock (1912) who approached, in 1911, the central mountain chain from the south coast via the Eilanden and Kolff Rivers (now called Sungai Pulau and Sungai Kolff) towards a mountain (3,340 m above sea level, asl) they labeled "Goliath." De Kock and his expedition members were able to establish friendly contact with the local people living in that area and documented parts of their material culture, their physical anthropology, and wrote a list containing *circa* 100 words of the local language, the first-ever such record of one of the dialects of the Mek language, which is part of Trans-New Guinea (TNG) language family (Heeschen & Schiefenhövel 1983, Hammarström et al. 2021) and of the Mek people. Subsequent scientific investigations followed this early example of archaeological and ethnographical studies.

In the Star Mountains (Pegunungan Bintang in Indonesian, Fig. 1A and B), an interdisciplinary Dutch team carried out fieldwork in the region of Mabilabol, today's Oksibil, in the year 1959 (Brongersma & Venema 1960). Further reports on this massive logistic and expensive undertaking have been published in recent years (e.g., Sneep 2005, van Zanten 2014). A catholic priest competently described life and customs of the Ok, Sibbele Hylkema (1974), in his very detailed and empathic study on the Nalum/Ngalum around Abmisibil north of Oksibil. All Ok speaking groups are eastern neighbors of the Mek and also part of the TNG language family (Hammerström et al. 2021); the Ok, like the Mek, straddle the central mountain range; they live west and east of the international border between Indonesia and Papua New Guinea (PNG).

A first survey of the area west of the Ok region was carried out by an Indonesian military group who visited the valleys of the Eipomek River (then called X-Valley, Lembah X) and the Tanime River from October to December 1969 (Tanjung 1969, Hariono 2003). Its members parachuted into the upper Eipomek Valley. The team was received in a friendly way by the

Eipo, the inhabitants of the Eipomek Valley, and the inhabitants of the easterly adjacent Tanime Valley; the team took notes on basic ethnographic and linguistic observations during their three weeks stay in Eipomek. This expedition had been initiated by Pierre Gaisseau, a French journalist, whose group had crossed Netherlands New Guinea on foot from the south coast to the north coast in 1959/60 (Gaisseau 1961) and had come down from the mountain pass into the Eipomek Valley.

In July 1974, the interdisciplinary research project ("Humans, Culture and Environment in the Central Highlands of Irian Jaya") of the German Research Team (GRT), funded by the German Research Foundation and conducted in association with LIPI in Jakarta, started (cf. Schiefenhövel 1976, Koch 1977, Ploeg 2004). Wulf Schiefenhoevel led it as field director. In contrast to the Dutch Star Mountains project, all tasks, including building an airstrip for single-engine planes, were taken over by the local Eipo people and team members. During 2 1/2 years, 33 participants worked in and around Eipomek (Schiefenhoevel 1976, 1979, 1991, Fig. 1B). In a special monograph series of the project (Helfrich et al. 1979–1988) and many other publications reports have been given on this project.

3.2 Recent research in the first two decades of the 21st century

In recent years the intensity of archaeological, anthropological, and ethno-archaeological research in the Papuan Provinces and the awareness that archaeology is important for the self-image and the cultural roots of the indigenous populations have increased. This is demonstrated by the fact that the first International Conference on Papuan Cultural Diversity was convened at the Governor's (Barnabas Suebu) Office in 2010 (https://www.papua.go.id/view-detail-berita-2441/undefined) and by a sizeable number of publications, mainly by members of Balai Arkeologi Papua (the Archaeological Center in Jayapura-Waena, which publishes *Papua. Jurnal Penelitian Arkeologi* and related fields, a journal on issues of archaeology in the Provinces of Papua), cf. the book by Suroto et al. (2019), published in this journal. Anthropological issues are published in *Jurnal Antropologi Papua* edited by Marlina Flassy, Universitas Cendrawasih. There are also activities like seminars, conferences, and exhibitions organised by the Archaeological Center: e.g., 2010, 2011, 2014, Djama 2011, Maryone 2011, 2012, Tolla 2011, 2014, Mahmud & Suroto 2012, Sukandar 2012, Fairyo 2013a, Kawer 2014a,b, and the chapters in the volume edited by Fairyo et al. 2013 (Fairyo 2013b, Mahmud 2013, Mansoben 2013, Maryone 2013, Mene 2013, Djami 2013, Suroto 2013).

Enrico Kondologit and co-workers at the Universitas Chenderawasih have intensified research in social and cultural anthropology in the Provinces of Papua and West Papua (Kondologit 2015, Yapsenang & Kondologit 2015, Kondologit and Sawaki 2016, Yapsenang et al. 2017, Kondologit et al. 2017) and modernised the permanent ethnographic exhibition of the Loka Budaya Museum in Jayapura which is a showcase of Papuan cultures as well as a partner for international cooperation in ethnology.

Archaeological, ethno-archaeological, and anthropological research questions have benefited from advances in research methods and increased datasets from Melanesia and beyond. The question of the first peopling of NG remains a significant focus, but quaternary archaeological remains in the Western half of the island are still elusive. However, the presence of Pleistocene sites is very likely because immigration of the ancestors of Papuan people happened from west to east, either via the Smaller Sunda islands or via Sulawesi-Halmahera-Moluccas (Kealy et al. 2017) and therefore, the western regions of NG were inhabited before the eastern ones; if not, less likely, immigration happened from Australia, which was connected to NG by the Sahul Shelf, or later, after sea level rise, by "island-hopping" via the Torres Strait islands to the south coast of NG. There is, however, little if any evidence of genetic similarity between Australian Aborigines and Papuans (Bergström et al., 2016).

The reconstruction of NG´s prehistory has also benefitted from advances in linguistics (cf., e.g., Wurm 2011) and population genetics (cf., e.g., Jacobs et al. 2019). On linguistic grounds,

Wurm (2011) estimates that the first immigrants arrived at NG around 60,000 ybp and spoke an Australoid language, which was later overlaid by a Papuan language spoken by new immigrants, who arrived about 15,000 ybp. According to Wurm, the second wave of Papuan speakers, reaching about 10,000 ybp, changed the language again. Around 5,000 to 4,000 ybp, so his findings, the third wave of Papuan speakers came and again led to a linguistic transformation laying the base of the situation today. Wurm estimates that around that latter time, the first Austronesians came who moved, by sailing boats, to the east, along NG's north coast, whereas some of these groups went back westward again around 4,500 ybp. Wurm's estimate of 60,000 ybp for the first arrival of Australoid people at the shores of NG puts the immigration of the first humans to mainland and island NG earlier than those by other authors. A problem with his estimates for the two last waves of Papuan speaking immigrants (10,000 respectively 5,000–4,000 ybp and perhaps also for the first wave around 15,000 ybp) is that the end of the last ice age and thereby the rise of sea level has happened, in this part of western Oceania, around 17,000 ybp (Kealy et al. 2017). Before that, it was possible to cover much of the distance between the Smaller Sunda islands or Sulawesi and NG on foot and traverse a section of the ocean by some kind of raft or boat. The distances between the adjoining islands were such that one could see the mountains on the other side of the sea. Later, with rising sea levels after the last ice age, the distances became much bigger. It is, therefore, not so likely that Papuan people, who most probably did not have the technology to build and sail, like the Austronesians, seaworthy boats, could have arrived at the coast of NG after 17,000 ybp; except if the Papuans of the two last waves had learned to build and operate outrigger or double-hull sailing boats by themselves or from other seafaring peoples. According to Kealy et al. (2017), who take into account not only the water level of the ocean and in this way also the gradually decreasing shoreline making the distances between islands bigger, but also the inter-visibility of islands, which becomes less over time, the most likely period immigrants could have covered the distance to NG from the Smaller Sunda islands or Sulawesi was between 60,000–45,000 ybp.

At least two population dispersal events are also suggested by recent research into the introgression of Denisovan haplogroups in Papuan populations (Jacobs et al. 2019). Mapping genetic diversity in mainland and island NG has shown the divergence between highland and lowland populations for 10,000 years and high genetic diversity in both areas (Bergström et al. 2017).

With regard to the question of why mainland and island NG are home to so many languages and cultures, Antunes et al. (2020) published an article that shows that the environment does not have, for by far most languages of the area, predictive power to explain the presence of a particular ethnolinguistic group. The interior of NG, with its similar geological, geographic, and ecological conditions, is inhabited by a large number of ethnic groups speaking different languages, thereby sharing this environment. The situation is different for almost all Austronesian groups. They live on islands or at the coast, regions most suitable for their marine-based subsistence strategy and trade by seagoing sailing ships. The impressive diversity of Papuan (non-Austronesian) languages and cultures have to be explained by other than environmental factors, which are often seen to be the leading drivers of cultural diversity (cf. Hua et al. 2019). Antunes et al. (2020) suggest that bio-psychological factors like ethnicity and ethnocentrism are more likely to be leading to cultural pseudo-speciation (Erikson 1985). Inter-group warfare, typical for Melanesian societies before pacification, and its powerful effect on intra-group identification and solidarity most likely was an essential factor in bringing about cultural and linguistic diversity (Schiefenhövel 2015). For mainland and island NG, there are still many unsolved questions regarding the early and later history of human immigration and the establishment of societies and their cultures (cp. Schiefenhoevel 2014). Joint archaeological, anthropological, and ethno-archaeological research will shed more light on these fascinating aspects of humans conquering

this new habitat 40,000 ybp or even considerably earlier.

Since 2016, the authors of this contribution have explored the potential of joint research on archaeology, anthropology, and ethno-archaeology in the Provinces of Papua.

3.3 Fields and topics suggested for joint research 2021–2030

Based on discussions among the authors, as well as on a review of the existing literature and exploratory fieldwork, we will briefly describe below some research sites and topics and sketch possible forms of bilateral and international cooperation in Papuan archaeology and anthropology, two disciplines, which are gaining growing attention in the Papuan Provinces, as well as in Indonesia and abroad. We suggest combining mutual archaeological and anthropological expertise as knowledge of the conditions in the local regions to carry out joint research. The following projects seem promising.

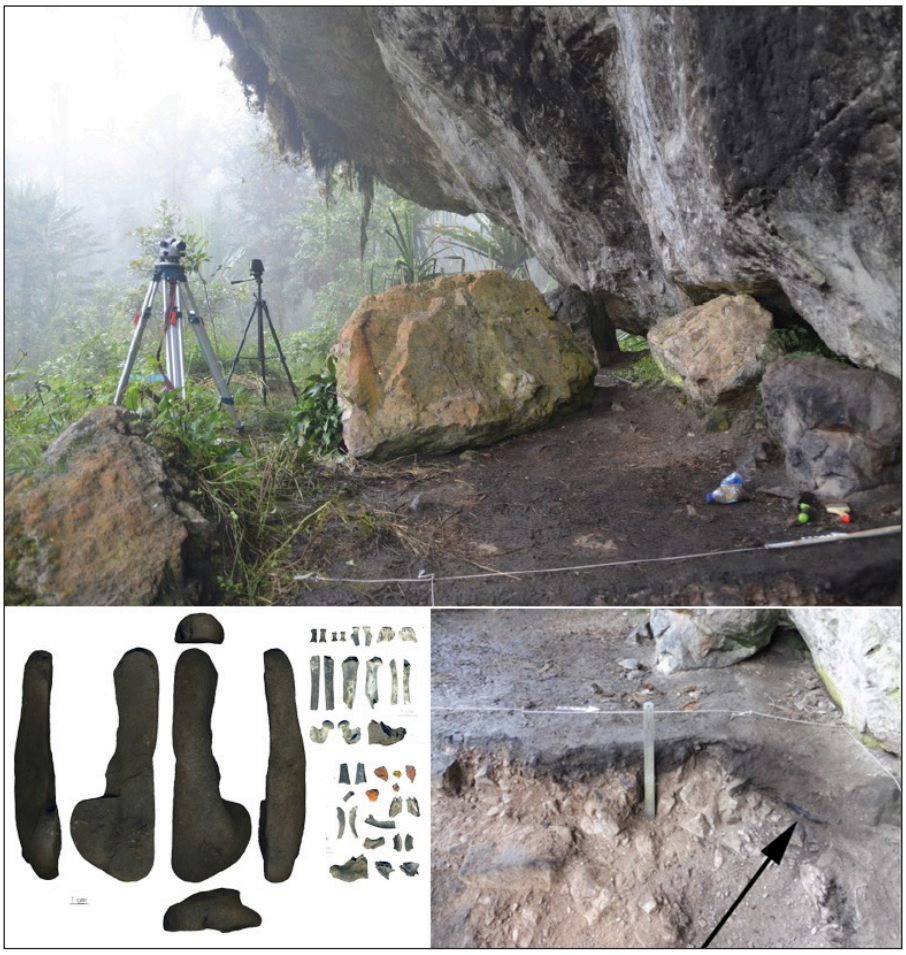
3.3.1 Carry out archaeological prospections and a ^{14}C dating campaign to find auspicious prehistoric sites for in-depth archaeological excavations

The oldest ^{14}C dates available for archaeological layers for the Papuan Provinces come from the inland of the Bird´s Head peninsula near Lake Ayamaru in the Sorong Region and are not older than 20,320 ±110 ^{14}C ybp (OxA6043) at Toé Cave and, 6,900±80 ^{14}C ybp (OxA6043) at Kria Cave (Pasveer et al. 2002). The Balai Arkeologi Papua identified several other caves and rock shelters in the Papuan high and lowlands that may reach back into the Pleistocene; some are good candidates for more extensive archaeological excavations ^{14}C dating of archaeological remains. In the Fak-Fak Region, near the coast, the Andarewa Cave yielded traces of human occupations in several stratigraphic layers (ongoing research by Balai Arkeologi Papua). A ^{14}C date was attempted on a bone tool. Still, it did not yield results due to too low collagen content (C. Oberlin, Centre de Datation par le Radiocarbone, UMR 5138, Université de Lyon, pers. com.). In the highlands, another cave, Gua Togece in the Jayawijaya Region near Wamena, also yielded a stratigraphy with still undated abundant archaeological remains (ongoing research by Balai Arkeologi Papua). Prospections in the Star Mountain Region revealed interesting cave and rock shelter sites (cf. Maryone & Tolla 2011, Maryone 2012, Vanhaeren et al. 2018, Fig 1C). A test pit excavation at the Emok Tum rock shelter (Fig. 1B, Fig. 2), situated at a mountain pass (2,567 m asl) west of Oksibil, yielded a ^{14}C date on charcoal from the lowest part of a circa 15 cm thick dark ashy archaeological layer of 2,140 +/- 30 ^{14}C ybp (Beta-518106) and of 1,850 +/- 30 ^{14}C ybp (Lyon-17268/sacA-59582) from a charcoal sample taken some 5 cm from the bottom (Vanhaeren et al. 2018, 2019, Fig. 2). We suggest expanding the search for archaeological sites towards the Aplim/Lime Mountain (Fig. 1B), where there is a high altitude, an extensive system of limestone with caves, which until today are used by the local people to seek shelter during the night when they catch, mainly in noose traps, marsupials or cross the central cordillera at 3,500–3,600 m to visit their relatives on the other side of this impressive alpine chain. Along the coast, near Jayapura, the Balai Arkeologi identified Lapita pottery at Mount Srobu (ongoing research by Balai Arkeologi Papua), which is attributed to an Austronesian population and was dated with a ^{14}C date on charcoal to 1,635 +/- 30 ^{14}C ybp (Lyon-17269/SacA-59583). This date is very recent compared to other Lapita sites in Melanesia and more recent than the ones obtained from pottery sites on the nearby north coast east of the international border with Papua New Guinea (PNG) near Vanimo (Gorecki et al. 1991, Beaumont et al. 2019). In sum, to better understand the geographical and chronological history of the earliest and subsequent prehistoric population dynamics in the western half of NG, more archaeological prospections to find promising long stratigraphies with datable archaeological remains are required. Pleistocene occupations dating back to at least 30,000 ybp for the western Papuan Highlands are suggested by dates obtained on micro-charcoal attributed to fire made by humans and retrieved from sediment cores from the Baliem Valley in the Wamena area (Hope 1998, Hope and Haberle 2005).

3.3.2 Carry out palaeoenvironmental research

to reconstruct climate change and human impact on the landscape

Charcoal microanalysis, i.e., the study of microscopic particles of charcoal contained in sediment cores from swamps, lakes, or the sea, is one method to find out about the age of human-made changes in the vegetation as their presence, in environments where natural fires are unlikely, indicates that people have made larger fires, e.g., to clear the land for gardens (cf., e.g., Hope 1998, Hope & Haberle 2005). Pollen and phytolith analyses from undisturbed stratified contexts offer another great possibility to find out about environmental changes over time. In the studies carried out so far in PNG and one location of the Baliem Valley, i.e., Supulah Hill on the eastern bank of the Baliem River, some 5 km north of Wamena (Hope 1998), a comprehensive-time range of these events has been found, from approximately 11,000 to only 300 ybp (Hope & Haberle 2005). By identifying and counting various types of pollen, changes over time in vegetation can be reconstructed, and the impact of humans on the respective



Note: Top: View towards the West from the excavated area (of which the western limit is seen in the foreground). An optical theodolite and a laser level allowed situating the excavated area at about a point 0 corresponding to the top of the highest boulder visible in the very back. **Bottom left**: Six aspects of a manuport stone found in situ in the North-West corner of the test pit and examples of burned small bone fragments and ochre pieces found in the sieve after wet sieving sediments from the dark ashy layer with a 2 mm mesh. **Bottom right**: North-West corner of the test pit with the arrow indicating the location where the manuport stone was found and the charcoal on which date of 2 140 +/- 30 ^{14}C years before present (Beta-518106) was sampled in the area just below the stone at the bottom of the *circa* 15 cm black ashy layer.

Figure 2. Emok Tum Rockshelter (Serambakon, Oksibil, Star Mountains Regency)

Figure 3. View of the Lake Doumi Kwen (left) near Eipomek (Star Mountains Regency) located at an elevation of 2055 m at S 4°28′24.144′′ E 140°0′25.093′ with a circumference ca. 560 m and of the sampling of a sediment core for palaeoenvironmental research by a member of the Balai Arkeologi Papua and two local Eipo men.

environment can be assessed (Hope & Haberle 2005, Sémah & Sémah 2012). An exploratory sediment core from a small lake (Doumi Kwen) in the upper Eipomek Valley (Fig. 1C and Fig. 3) was analysed upon an initiative by Dr. Sri Yudawati Cahyarini at the LIPI Research Center for Geotechnology in Bandung. Still, it did not yield useful information as the core was mainly material from a landslide, probably earthquake-induced. Further cooperation with this LIPI research centre in Bandung is planned to find suitable terrestrial or marine sediment cores and stalagmites for palaeoenvironmental research in the highlands and lowlands of the Papuan Provinces.

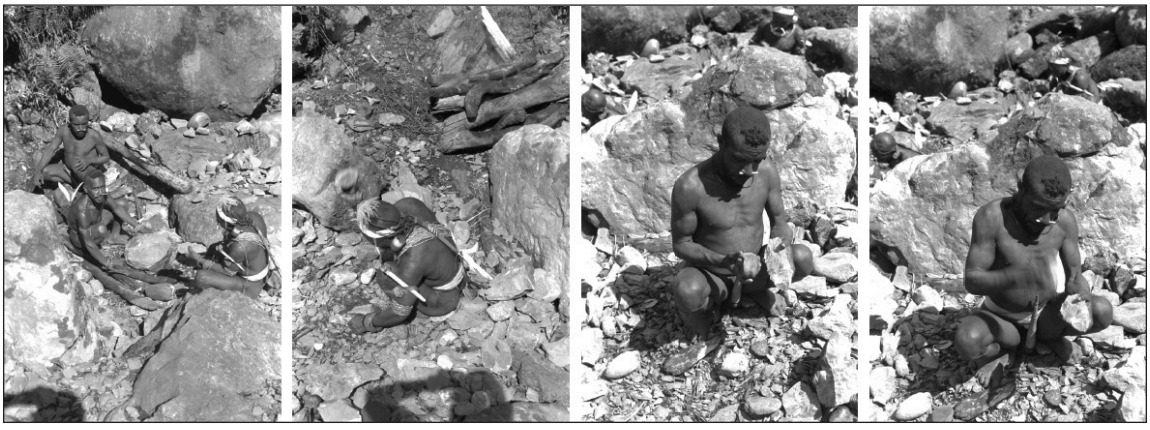
3.3.3 Carry out ethno-archaeological research on traditional cultural practices and lifestyles as well as on how they changed and continue to change as a consequence of cultural contact, to create reference collections useful for the interpretation of archaeological remains

The Star Mountain region and especially the region around Eipomek, for which a large corpus of anthropological and environmental data exists, stemming from the mentioned work of the GRT, which started fieldwork there in 1974 (Schiefenhövel 1979, 1982, 1991, 2014), offer perspectives for such ethno-archaeological research in collaboration with the local people (Schiefenhövel et al. 2019). The interdisciplinary work of the GRT includes a large number of ethnographic film documents (films from the 1970-ties on), as well as the human ethological documentation of Irenäus Eibl-Eibesfeldt (cf. Eibl-Eibesfeldt et al. 1989) portraying everyday social interactions between people, the behaviours involved in shaping and using tools of stone, bone and wood, body ornaments, and the like.

It will be important to continue to document (preferably with a professional film/TV team) the production of stone adzes (Bahasa Indonesia *kapak batu*, Mek *ya*) in the region of Langda and Sumtamon (both in the Yahukimo Regency), in the southern side of the central mountains where Mek speaking groups of the Una dialect live. The ancient technique of knapping blocks of stones (in this case, volcanic Andesite stone, Fig. 4) is still alive. After a long process of grinding and polishing, the raw forms become perfect stone tools to cut wood and perform other functions. The Mek and other groups still use stone adze blades in ritual exchange, e.g., bride price payments. That is why some specialists still use this prehistoric technique; most probably, it is the only place in the whole world where one can witness this remnant of the prehistoric past of humankind still connected to ancient tradition.

For archaeology and ethno-archaeology, this fact represents a veritable treasure, which must be carefully documented, including all steps of the *chaîne opératoire*. The specialists may die without having passed on their complex skills to the younger generation–steel axes and bush knives have replaced, as working tools, the ancient stone tools decades ago. So, it would be essential to at least keep the memory of this prehistoric technique in the form of high-quality visual and scientific documentation.

Students from Bordeaux University carried out exploratory ethno-archaeological research with colleagues from the University of Cenderawasih and the Balai Arkeologi Papua. One study explored the characteristics of "magical" objects used in traditional healing (Kama 2021), another studied manufacturing and use-wear traces on traditional personal ornaments composed of *Nassarius* sp. shell beads (Mouclier 2021). Great potential for such interdisciplinary research also comes from studying collections of ethnographic objects housed in the two anthropological museums of Jayapura, the Museum Loka Budaya, and the Museum Unit Pelaksana Teknis Dinas/UPTD, as well as objects in other museums worldwide into the programme. A study of the characteristics of personal ornaments used as bride price and kept at the Museum Loka Budaya reveals they are composed of standardised objects of value accumulated over a century and may be up to 2,000 years old (Reyjasse 2017). An extensive study of the significant ethnographic publications on the highlands of Papua and PNG has yielded a large body of information on body decoration (Vanhaeren & Schiefenhoevel in prep.). The work of Petrequin & Petrequin (1990–1992, 2006) is also an essential basis for this kind of ethno-archaeological research which will shed light on the origins of seashells, the exchange routes through which they finally arrived in the highlands areas, and their significance as highly valuable objects in the traditions of the mountain Papuans. The change in cultural practices and the "modern" revival of these are also interesting research topics. Comparison between traditional personal ornaments and those in use today in traditional societies in the Highland region reveals the loss of some items, the replacement of others, and the introduction of new ones (Vanhaeren &



Note: The knappers worked with their bare hands, their bodies naked except for the classic penis gourd. Their skills were so advanced that they did not need any protective devices. It was impressive to see a master knapper select a large raw stone (a blank) to gradually and very swiftly turn it into a perfect adze preform by applying exact, forceful, but controlled strikes with the percussion tool, breaking off too sharp edges with lighter force or by grinding movements. The fourth finger of the left hand (in the usual case that the knapper was a right-hander) was placed under the stone blank and functioned as a kind of buffer, allowing just the right amount of shock to be applied to the blank.

Figure 4. Photos were taken by Wulf Schiefenhövel in 1975 of Una stone tool makers at the Andesite stone quarry deep down below Langda on the bank of the Feime/Heime River.

Schiefenhövel in prep.) without there being a (demic) change/replacement of populations, a hypothesis often proposed by archaeologists to account for similar changes in the archaeological record (cf. e.g., Rigaud et al. 2015). Besides cultural practices, lifestyle changes are also relevant, and their study reveals correlates that have many implications for archaeologists and other disciplines such as population genetics involved with population dynamics. As an example, one can mention here a study on the dramatic decrease in age at menarche among Eipo girls in the Star Mountains, which shows an extremely fast secular trend and a strong correlation with the increased availability of high-calorie food (Preissing 2020, Schiefenhövel et al. in prep). Such drastic changes which have important implications for fertility rates and population dynamics may also have happened in the past and should be considered in the modelling of prehistoric population movements and contacts.

In the general public and among scientists (cf. the book edited by Banuri & Apffel Marglin 1993, the foreword in this book is written by Harlem Brundtland, the former Norwegian Minister for the Environment and Prime Minister as well as Director-General of WHO, known for the "Brundtland Report" on sustainable development, and Weeratunge 2000, UN 2013) there is a popular notion and influential political movement assuming that traditional people have lived in a kind of sacred harmony with nature and that the "western" way of life and economy has destroyed this bond so that there is now increasing damage to flora, fauna and generally the environment, an ecological disaster. While it can of course not be denied that modern societies are causing enormous harm to nature, the assumption that this is due to the fact that we have stepped out of a sacred bond with "Mother Nature" and its living beings, is, in our view false.

The members of traditional societies caused relatively limited damage to forests and other habitats not because they had a sacred connection with them (which was undoubtedly often the case), but because their stone tools were not efficient enough to cause massive damage to the rainforest; also, the population density was very low and so the need to cut down rain forest was limited. One must bear in mind, that there are well-documented cases of animal species becoming totally extinct by human hunting, e.g., the Moa bird of New Zealand (Allentoft et al. 2014). For the eradication of the Asian ostrich, once very widespread, the role of humans is not yet proven, but possible (cf. Kurochkin et. al. 2010).

A very interesting example of prehistoric humans most likely eradicating animal species is highland NG. Hope & Haberle (2005) and Hope & Aplin (2007) found bones of very large sheep to calf-sized marsupials (*Protemnodon* spp., *Hulitherium*, *Zygomaturus,* and *Maokopia ronaldii*) in the Jayawijaya Regency of Papua Province (cf. Schiefenhoevel & Vanhaeren 2017). These animals, which existed until about 30,000 ybp, a time humans had started to enter the still quite cold highlands, provided large quantities of meat and were probably easy to hunt. So, one argument is that they died out because the ancestors of Papuan people killed them with their simple means, perhaps spears, bow and arrows, snares, or other traps, which are still used today. Humans are maximizers, not, as a rule, optimizers with a long-time span of planning stretching over the time of the future of one's grandchildren.

Living with Papuan friends in highland villages, one can often see them hitting trees at the roadside, causing damage to bark and stem. They do this, not thinking that the tree might be harmed and possibly die. There are many more trees around, is their view. Since local people can buy air pressure guns, it has become a fashion among young men to shoot birds. Not so much for food, but out of the classic male hunting instinct, one would assume. Older people in Eipomek complain bitterly about this damage to nature: "We have hardly any birds around anymore. So bad of the boys to do that." Also, animals are often maltreated, sometimes brutally. The ones who do that know that animals like humans feel pain, but there is not much concern that they are suffering. A few groups in the world are different in this respect, especially the members of the Jain version of the Hindu religion who follow a strict

principle of non-violence (*ahimsa*, cf. Tähtinen 1976, Dundas 2004), which stipulates that no avoidable harm should be done to humans and animals, even insects or lower forms of life. However, this attitude is clearly not widespread and certainly not typical for traditional societies in Melanesia and other regions of the world. So, if a sacred non-harming bond with nature most probably has been rare in prehistory and history and is rare today, this tells us that we modern people cannot count on some intuitive, instinctive impulse to protect the environment, but we must develop new strategies to do that. Ethnological research can help to elucidate these complex attitudes and behaviours towards nature and shed light on prehistoric events of animals becoming extinct.

Whereas it is unlikely that humans, in general, have a universal, i.e., evolved bio-psychological tendency to respect the environment, it must be stressed that members of traditional cultures are often extraordinarily knowledgeable about nature. Their systems of taxonomy are very similar to the Linnean system used in modern biology: plants and animals are classified in hierarchical patterns of morphological relationships. The Eipo express these relationships in terms of human genealogy and claimed, in talking with the two biology professors (Paul Hiepko and Wolfram Schulze-Motel) of the GRT, that certain plants were the "brothers" and "uncles" of other plants, which the German specialists did not identify as such. It took detailed laboratory research with herbarium samples from Bogor (Indonesia), Leiden (Netherlands), and London (United Kingdom) to find out that the Eipo informants had been correct (Hiepko & Schiefenhövel 1987). A very striking, but for many traditional cultures not unusual performance. Ethno-botanical and ethno-zoological research, carried out jointly with local co-workers, is, therefore, another promising avenue for scientific inquiries in the Papuan Provinces and can shed the light on the role of knowledge of nature, actual natural science, in formerly preliterate, prehistoric societies.

Another interesting aspect of the Neolithic phase of human history is, that in NG and elsewhere local people who started to domesticate plants have increased biodiversity (Schiefenhoevel 2013). This is a stark contrast to the situation today where due to monopolies in seed production and other parts of agroindustry plant diversity in developed and developing countries is decreasing at an alarming rate. This aspect offers another interesting angle of ethnological and ethno-agricultural field research in Melanesia.

3.3.4 Further work at the site of petroglyphs and megaliths at Tutari

Investigations into rock art sites such as the prehistoric site of Tutari at the western shore of Lake Sentani, not far from the homonymous big airport, with its impressive number of petroglyphs over an area of more than 60 000m², depicting among others fish, lizards, and land turtles, classic Papuan iconic motifs, will offer an easily accessible showcase for archaeological and related interdisciplinary research as well as conservation of important cultural heritage sites in Papua. The megalithic structures of Tutari (vertically placed oblong stones of about 30 cm length with often two or smaller stones at their base) and a long line, partly double, of round stones connecting, in their direction, Cyclops Mountain and the lake are a unique testimony of prehistoric artistic performance on NG soil (Fig. 5). Research on this site has been carried out since the beginning of the 20th century (van der Sande 1905, 1906–1907). Prasetyo (2001) has studied the site and the team of the Balai Arkeologi Papua has published in 2017 a leaflet to be used by teachers at secondary schools describing important elements of the Tutari site. Mas'ud (unpublished) has created a map of the location of the rocks with petroglyphs. Even though researchers agree that this is a very important cultural site, it is hardly known by international archaeological specialists and by the public of Papua and Indonesia; its value for tourism in Papua is not yet sufficiently utilised. In a collaborative study between a Master's student from the University of Bordeaux and the Balai Arkeologi Papua, a geographic information system (GIS) map of the site has been achieved to locate the six different sectors of the site, the megalithic structures (menhirs and stones alignments) as

well as the petroglyphs on stones (Girard 2017). In addition, this study recorded the rock art in a multivariate database with information on the depicted objects, size, orientation, and state of preservation, and is completed with detailed iconographic material. A digital 3D reconstruction has also been made for some of the rocks to allow a better understanding of all petroglyphs on the different rock surfaces. Pieces of broken pottery have been found at the archaeological site Marweri Urang at nearby Lake Sentani (Suroto 2011), a sign of Austronesian technology. Broken pottery is also present on the surface at one part of Tutari itself (Suroto, pers. communication 2017). Whether this can be interpreted as an indication that Austronesian inhabitants of the area actually produced the petroglyphs and megaliths is still an open question. The local people who live near the Tutari sites are very knowledgeable about their traditions connected to constructing fishing boats and fishing, building houses on carved posts as well as producing other carvings of mythical relevance. Yet, they seem to have no detailed knowledge of the origin, function, and meaning of the petroglyphs and megalithic stones, which could have been made by their ancestors or possibly by members of an unrelated group. This is not surprising as oral traditions in Papua, e.g., remembering genealogies, often go back about seven generations, i.e., about 210 years, and thereby do not necessarily represent deeper layers of history. Oral traditions could, of course, nevertheless contain some elements of historic truth; this needs to be checked with findings in archaeology. The predominant motifs of the Tutari petroglyphs are ones found on various other objects of Papuan cultures (cf. Mitton 1983), as a matter of fact, they could be described as iconic for these indigenous peoples: simple symmetric representations of fish, reptiles, turtles, circular and other geometric signs. It thus seems that the site of Tutari as well as the sites with rock art in the Keerom Regency where Fairyo (2013a) of the Balai Arkeologi has found rock paintings with similar motifs, represent artistic, possibly religious concepts of ancestral Papuan peoples, and are not connected to the later influx of Austronesian culture. It seems most likely that the petroglyphs were made by using pointed, hard chisel stones, perhaps of granite or similar material of a higher degree of hardness than the magmatic Gabbro rocks which were incised and thus decorated by the artists, to make the impressions in the rocks (Suroto, pers.

Figure 5. View of some of the petroglyphs (left) and stone alignments (right) at the site of Tutari on the northern shore of the Sentani Lake (Doyo Lama, Jayapura Regency)

Figure 6. Drone photo by Leo Tarfik from the Eijkman Institute of the Eipomek village (Star Mountains Regency) with its red-roofed rounded cultural center and adjacent rectangular guesthouse in the foreground

comm. 2017). In any case, one does not need metal (e.g., bronze) hammers or similar tools to produce the Tutari images we marvel at today. The Papuans are still very skillful in producing stone tools, they will understand the different lithic materials, their specific qualities, and the ways to shape them. At the two mentioned sites in the Star Mountains (near Langda and Sumtamon), the production of stone adze blades by prehistoric stone knapping is still going on in a traditional context (Petrequin & Petrequin 2006) – probably the only place in the world where this happens (Schiefenhoevel & Vanhaeren 2017). The Tutari site may also allow to highlight the fact that NG, at least since the Bronze Age, was not as isolated as it is often believed, as is demonstrated by the finds of Dong Son objects, mentioned above. It is most desirable that more excavations are carried out at this extended site to determine its historic and cultural context.

3.3.5 Conserve and valorise Papuan cultural heritage

In the Papuan Provinces, the attraction to modern life is in general (much) bigger than the tendency to keep traditions. Modern tools, modern dress, modern hairstyles, music, etc. have very quickly replaced the old ones. The case of culture change among the Eipo is well documented (cf. Schiefenhövel 2019). They wanted to change. They had realised, that they lived, so to speak, in a bubble of a forgotten corner of the world and that there was an exciting new world outside their narrow, isolated mountain valleys. They wanted to get out of that corner to participate in modern life. They thought that the new religion, which protestant missionaries started to preach, was the best base for that. It opened new opportunities for them, especially in education.

The Papuan people now have become aware of the fact that they are losing their old culture and customs very fast. Some of the wise older Eipo people started to think about that and became convinced that society needs roots in the past. That is why the “Center Budaya Eipomek” (Fig. 6) was established with funds from the German and the Star Mountains governments. It was inaugurated by the then Bupati of the Star Mountains Regency, Drs. Wellington L. Wenda, in 2014. It houses all the films and many photographs, as well as most of the books, which were written about their land, their culture, and their language. Hironimus Uropmabin, at that time Head of the Culture Department in Oksibil and the Eipo themselves, made this project possible. The Centre Budaya Eipomek today

is a place for the history of the Eipo people. It will act as a catalyst to keep and regain cultural identity. "A tree without roots will die", the Eipo says. They have become aware that their history is precious and should not disappear completely.

Trying to discover more of Papua's still largely unknown prehistory is a challenging task. It is similarly demanding to make the local people and outsiders aware of the rich Papuan history and its cultural diversity. Some former customs, techniques, and knowledge are starting to become lost among the local people themselves because of the very fast process of modernisation. The ongoing series "Rumah Peradaban" of the National Centre for Archaeology (Arkenas) under its director I Made Geria is one of the important steps in this direction (Pusat Penelitian Arkeologi Nasional 2016–ongoing). This programme will facilitate the appreciation of important cultural developments in Indonesia and other parts of South-East Asia (e.g., the domestication of taro, Golson 1976, in highland NG as well as the domestication of other important food plants like sugar cane, Denham 2011) and of socio-cultural processes connected to the advent of Austronesian peoples (cf. e.g. Galipaud 2020).

It would be desirable to establish more cultural centres and/or small museums in other major settlements of the Star Mountains and other regions of the Papuan Provinces as well; this will connect the indigenous people with their history. Many of the historic records are in Dutch, others are in English, German, and French; it will be important to translate the important ones into Indonesian so that they become accessible to the people of Tanah Papua. Museums and other institutions in Europe may provide copies of the publications, photographs, and films of the early times of the Dutch administration of Papua for the so-far empty museum near Oksibil and similar cultural centres in other settlements in the Star Mountains and Papua. Material from the Dutch Star Mountains expedition in 1959 is in the anthropological museums of Leiden and other cities in the Netherlands and can be made available for education and research.

There is a lack of knowledge of the cultures of the Papuan Provinces. Even the local people themselves, undergoing a dramatically fast process of acculturation, are often already out of touch with their traditions. It will, therefore, be important to inform the indigenous inhabitants, the public in the other parts of Indonesia and other countries in the region, and the world in general of the rich cultures of NG by providing accounts of relevant research so that the significance and importance of the obtained data and the on-going process to uncover and describe the history and cultures of Papuan peoples become known. Such valorisation also includes professional contacts with the Indonesian and international press. Scientific exhibitions can be planned for the Loka Budaya Museum in Jayapura, other parts of Indonesia, in France (e.g., in the Prehistoric Museum of Les Eyzies), and in other cities of Europe to transport the findings to a wider public. To inform scientific colleagues and the public on a national and international level is equally important.

One aspect of tradition has not become lost, on the contrary, it has, throughout NG, become developed and has gained economic importance: the typical female activity of making looped string bags (*noken* in the Indonesian language). This tradition with its sophisticated techniques involved in making durable, versatile bags and pieces of clothes, and their rich socio-cultural meaning (cf. MacKenzie's monograph, 1990, on string bags in the mountain Ok area of PNG) has been declared "Intangible Cultural Heritage" by Indonesia in 2012. Efforts are underway to have this tradition included in the UNESCO World Heritage List. If successful, this would be a great step to valorise, on the international scale, one of the fascinating aspects of Papuan culture.

4. Conclusion

When and how the first arrival of humans on mainland and island NG took place is still subject to debate. Estimates based on linguistic data suggest that the earliest immigration happened about 60,000 years before the present, archaeologists have discovered sites where humans lived around 45,000 ybp. Such sites with traces of human presence have been found in the eastern regions of Melanesia. It is, however, likely

that the first immigrants arrived via the Sunda Islands and the Moluccas or Sulawesi and the region of Ternate and Halmahera. This means that the main direction of immigration was from west to east. Accordingly, one would expect very old sites with human presence in the Province of West Papua (the "Bird's Head") and the Province of Papua. There are, however, few such publications so far that report signs of human interference with flora and fauna in the Baliem region about 32,000 ybp; however, no human bones or tools have yet been found there. This leads to the conclusion that the Papuan Provinces are harbouring other very ancient sites, which are waiting to be discovered, e.g., so far un-researched caves as well as lakes and swamps with possible signs of micro-charcoal indicating the use of fire for instance to make room for gardens, and pollen showing a change of flora, also connected to the development of horticulture, which happened about 8,000–10,000 ybp.

Because some regions of the Papuan Provinces have started the process of acculturation as recently as two generations ago, many traditions are still intact or well remembered. In this way, the two provinces with their formerly isolated interior, their hundreds of languages, and ethnic groups are not only a treasure box for archaeology but also ethnography, ethno-archaeology, and anthropology.

Eipomek, a representative of the Mek cultures and languages situated in the west, and the Ok people around Oksibil in the east of the Star Mountains are good candidates for future research, as basic interdisciplinary fieldwork (with the except of archaeology) has been carried out there in 1959 in the case of the groups around Oksibil and from 1974 onwards in case of the Eipo and their neighbours. Work in archaeology, ethno-archaeology, ethnography, and evolutionary anthropology has been going on there, jointly with ARKENAS (the Indonesian Center for Archaeological Research), the Balai Arkeologi Papua, and the ethnological Museum Loka Budaya, until now.

Five topics of promising joint international research are sketched out: 1) further archaeological prospecting, excavating, and ^{14}C dating of interesting sites, 2) palaeo-archaeological research utilising cores from swamps, lakes, or the sea bed to further determine, via micro-charcoal and pollen analysis the times of large-scale human intervention in flora and fauna, e.g., the burning of forest for the establishment of gardens for taro and other domesticated food plants, 3) using local and international collections of material culture, including objects used as body decoration, to understand the ancient methods of production of these objects and the networks of exchange, 4) further work on the Tutari site with its impressive number of petroglyphs and megalithic stone settings, 5) conservation and valorisation of the rich history of peoples in the Papuan provinces; the Indonesian government has already, in 2012, declared the loop-netted string bag (noken) tangible cultural heritage. The *noken* is a typical, often artistically decorated, very useful traditional product of the highland women, which has become an economic success story on the markets and is a symbol of Papuan culture.

The joint project sketched above would also greatly contribute to strengthening Indonesian-European cooperation in the field of science and culture.

Acknowledgments

For stimulating as well as encouraging discussions and support, we thank our respective colleagues and friends, the Indonesian Embassy in Paris, particularly His Excellency Ambassador Letnan Jenderal TNI (Purn.) M.P. Hotmangaradja Pandjaitan and Surya Rosa Putra, the French Embassy and the Institut Français d´Indonésie in Jakarta, particularly Nicolas Gascoin, Endhita Siregar, Thierry Maré, Diah Dharmapatni and Stefany Claudia, the German Embassy in Jakarta, particularly Svann Languth, the Ecole Française d´Extrême Orient (EFEO) in Jakarta, particularly Veronique Degroot, as well as the Eijkman Institute, Jakarta, particularly Herawati Sudoyo and Leo Taufik, the Musée National de Préhistoire in Les Eyzies de Tayac, particularly Jean-Jacques Cleyet Merle. For financial support, we thank the French LaScArBx Cluster of Excellence ANR-

10-LABX-52, particulary Valérie Fromentin-Zugmeyer and Catherine de Nooter, the UMR 5199 PACEA, particularly Anne Delagne and Catherine Morel-Chevillet, and the University of Bordeaux, particularly its president Emmanuel Turon de Lara, Laurent Servant, Sophie Dartoen-Chave, Marc-Eric Gruénais, Carlos Mendoza, the CNRS, particularly Nicolas Teyssandier, Véronique Debord Lazaro et Luc Le Calvez, the Max Planck Institute for Ornithology, particularly Manfred Gahr and Bart Kempenaers, and the CNRS Artemis 14C dating programme. For the issuing of research visa, we thank Arkenas, the respective ministries in Jakarta and the Governor's Office in Jayapura, Province of Papua. For further assistance in Papua, we warmly thank the Ok and the Mek people for their hospitality and willingness to share their history, their lives and their work with us, the Government of the Star Mountains Regency, especially its former Governor Wellington Lod Wenda, Hironimus Uropmabin of the Culture Department, Omkular Sostenes Uropmabin of the section History and Museum and Amatus Uropmabin. Also, we thank Marijke Bakker-Werimon and the staff of the Women's Training and Development Center (P3W) in Jayapura-Waena for accommodating and assisting us in many ways. Finaly our gratitude goes to the Editorial board and reviewers of the Amerta Journal for their constructive comments and editions of the manuscript.

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