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Between Mining and Archaeology

Machinaza Culture in the cordillera Del Condor Mountain Range



MACHINAZA CULTURE

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Machinaza Culture In the Cordillera del Condor Mountain Range

This is a production by the INVACMA CIA. LTDA. Team., with the approval and financing of Lundin Gold.

Between Mining and Archaeology





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Original title

Machinaza Culture in the Cordillera del Condor Mountain Range Between Mining and Archaeology

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Presentation

Responsible mining in Ecuador is possible and Aurelian Ecuador S.A., a tributary of the Canadian company Lundin Gold Inc., has put it into practice during the development of its "Fruta del Norte (FDN) Gold Mining Project", located in the parish of Los Encuentros, in the province of Zamora Chinchipe.

As part of the Company's social responsibility, and in accordance with the regulations regarding the preservation and protection of the State's cultural heritage, Aurelian Ecuador S.A., hereinafter Lundin Gold, hired the services of INVACMA CIA. LTDA. to develop an archaeological research program in the area between the Zamora and Machinaza rivers. This program consists of carrying out continuous and comprehensive research before and during earth movements, under the authorization and technical control of the National Institute of Cultural Heritage- Zone 7.

This book presents the results of the archaeological studies carried out in its different phases, and the process of cultural heritage management during the implementation of the mining project infrastructure.

During the research, this project recovered archaeological evidence that offered insights on the lifeways and settlement patterns of the cultural groups living in the south-eastern region of Ecuador. These findings demonstrate the presence of human occupations between the Paleo-Indian-Preceramic period (7000 B.C.) and the Integration period (A.D. 1500), which has been verified through radiocarbon dating applied to archaeological samples.

Based on the archaeobotanical analysis of phytoliths and starches, it was determined which plants were cultivated and consumed as food and which were used to build houses, make utensils, or use resins. In addition, botanical species from the Andean region of Ecuador were identified, representing some form of trade between different ecological regions.

The findings of a vessel with applique of hands and arms of a sloth, as well as the finding of a petroglyph in the shape of a tapir's head, give an idea of the animals of the region and their symbolic meaning.

What can we say about mining? Evidence of metal pieces, instruments to crush rocks, and remains of metals such as gold, silver, and copper have demonstrated a tradition of mining for more than thousand years. Mining might be presented in this region before the Inka expansion and Spanish conquest.

Based on this background, the social organization in the southeastern region of the country included the rise of agriculture, spinning, mining, rituals, and interregional trade.

The comprehensive research carried out opens a door to the past and the lifeways of Amazonian peoples. The archaeological remains demonstrate the existence of a society that until now was unknown.

This study is the result of more than a decade of research, and is a significant contribution to Ecuadorian archaeology for its scientific value. Furthermore, it sheds light on the origins of our cultural identity. We hope that the information contained in this book will reflect the importance of our culture and the legacy of our ancestors.

Mgs. Lilian Moya

Senior Environment and Permits Coordinator Lundin Gold

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PROLOGUE

The geographic configuration of the eastern sub-Andean region of Ecuador provided an appropriate environment for the establishment of pre-Hispanic societies with direct access to the inter-Andean basins and Amazonian lands. In the north, the valley of the Quijos and Coca rivers was a settlement of the Quijos ethnic group, during the Inka period. In this valley, the extensive distribution of archaeological evidence displays a continuity in its occupation from the Formative period to the Integration period. In this last archaeological period, the societies settled in the inter-Andean basin of Guayllabamba, had well-established intercultural contacts with the sub-Andean Quijos, and were the basis for the Spanish incursion. While the inter-Andean Chambo Valley was mostly related to the Pacific coast through the Chimbo River valley and the Chanchán Valley, archaeological evidence in the headwaters of the Cebadas River valley suggests that, around 2700 B.P.*, there were contacts with the mountain and sub-Andean ridge adjacent to the Sangay Volcano.

BP*. Before the Present

In the southern center of the Sub-Andean basins, the monumental complex of Huapula, located in the higher portion of the Upano Valley, is a representation of a sophisticated culture, whose ramifications towards the Andes and the Amazon seem to have been interrupted in A.D. 1100. Similarly, in the upper basin of the Morona-Santiago River, there is a diversity of archaeological evidence with habitational and defensive structures, which indicate a permanent cultural

interaction between Andes, Sub-Andean basins and Upper Amazon. However, in the province of Zamora Chinchipe, the excavated data obtained from the domestic structures of the site Santa Ana de la Florida, located in the Mayo River Valley, suggest a direct contact with sites in northern Peru.

The common patterns of cultural interaction between broader geographic regions, the Andes and the Amazon, included the occupation of the eastern valleys and the permanent migratory-trade movement along the river currents of the piedmont. In other words, crossing the Eastern *Cordillera* to the inter-Andean basins and having access to the Amazonian foothills was an exclusive privilege of the Sub-Andean cultures.

These intermediate societies, settled in the sub-Andean basins, are represented by ceramic groups. In the north, the ceramics of the Cosanga phase had an extensive distribution in the tributary valleys of the Quijos River. This phase, located west of the Eastern *Cordillera*, was identified in the valleys of Guayllabamba and Carchi. Towards the Amazon, the Cosanga ceramics were found in El Coca, Tena, and the higher portion of the Napo River.

In southern Ecuador, the red-banded incised ceramics, initially described at Cerro Narrío, are found in the Cebadas, Pirincay, and Alto Upano river valleys. These ceramic styles, distributed over a wide

territory of the central Andean Highlands and the piedmont, indicate that cultural interactions were established from early periods. In the Upper Upano, identifying three ceramic styles during the period between 600 B.C. and A.D. 1100. demonstrates a sequence of occupation in the Upano River Valley.

In this region, the archaeological research of the last three decades suggest the presence of a permanent cultural interaction between the pre-Hispanic occupations of Pirincay, Huapula, and Cuyes-Gualaquiza. These sites are in the valleys of the Paute, Upano, and Zamora rivers. These rivers are the tributaries of the Morona-Santiago River which divides the sub-Andean Mountain range in two, *Vieja de Cucutu* range and *El Cóndor range*.

Additionally, part of the INVACMA Archaeological Research Program mapped archaeological areas and performed archaeological excavations in the mountain ridge of the Yantzaza canton, parish of Los Encuentros (Zamora Chinchipe province).

In this INVACMA publication, María Aguilera describes the methodology used in the fieldwork and the analysis of the ceramic material. The author emphasizes the formal and stylistic discontinuity in the vessels (pots). From this analysis, this study suggests different socioeconomic dynamics taking place in the pre-Hispanic occupations. She also notes that the corrugated decoration, limited to the rim of large vessels, is related to the diffusion of this decorative style from the northern Amazonian foothills of Ecuador.

On the other hand, based on ethnoarchaeological research, Aguilera proposes that the pre-Hispanic communities of the area had a mysticalreligious association with geographical features, fauna, and flora. Beliefs that currently persist in the Shuar society settled in the area.

We hope that this contribution of INVACMA and the archaeology of the sub-Andean and Amazonian regions of Ecuador will broaden our knowledge of the intercultural mechanisms between the pre-Hispanic groups settled in the upper Zamora River basin, the Upper Upano, and Amazon basin.

A. Jorge Arellano L.

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INTRODUCTION

National and international laws, as well as the social responsibility of those involved in projects that include earth removal, require archaeological research to be carried out prior to any infrastructure work. This is based on the consideration that archaeological heritage constitutes an important non-renewable cultural resource that must be preserved, conserved, and managed.

In this context, Lundin Gold, a gold mining company, with the *Fruta del Norte* (FDN) project in the *Cordillera Del Cóndor* mountain range started archaeological studies with a first identification phase in 2004, limited to two concessions; in a second stage, an identification was made for thirty-nine concessions. In 2010, the company considered the need to develop an archaeological research program with continuous and comprehensive studies. These investigations were authorized and technically controlled by the National Institute of Cultural Heritage (INPC)- Zone 7 before and during soil movements.

Afterword, INVACMA Ltda., hired by Lundin Gold, executed the Archaeological Research Program at *Fruta del Norte* for several years, and gathered basic information from previous studies to which guided the line of research. Once this preliminary phase was finished, the research proposed hypotheses, methodologies, and techniques were further investigated in the field.

The investigation followed its course in the field and then in the office where the information was processed, and the respective analyses were carried out to establish correlations and confirm or

reject the hypotheses. Through this systematic and scientifically rigorous process, important results were achieved that illustrated the history of the human groups that inhabited the southeast of the Ecuadorian Amazon, between the Machinaza and Zamora rivers.

Archaeological studies began with a diagnosis from primary bibliographic review. This is followed by the archaeological survey phase to determine the presence or absence of archaeological evidence on or below the surface. Based on the results of the survey, the archaeological excavation is planned to rescue the material and reveal more detailed information of past societies. An archaeological monitoring follows to recover materials that had not been identified in any of the previous phases. Lastly, the cultural heritage management phase is carried out, which includes the dissemination of the study results.

The archaeological investigation covered an area approximately 17 km long and 2 km wide. This area of study (*franja de estudio*) corresponds to the mountain ridge or foothills and extends between the Machinaza and Zamora rivers. It crosses alluvial valleys, steep terrains that form the crest of the Cordillera del Condor Mountain range, composed of sandstone plateaus. The sector has a humid tropical climate, which for thousands of years endured strong climatic changes and the influence of the El Niño and La Niña phenomena, with consecutive stages of drought and rainfall. Apparently, these natural phenomena would have caused the populations to move to safer areas, such as the foothills of the mountain range.

The continuous and comprehensive program of study of this area established correlations and valuable conclusions to understand the relationship between people and the environment among the archaeological periods of the aboriginal era. Pre-Hispanic groups in the southeastern Ecuadorian Amazon knew their environment, took advantage of, and used available natural resources. They adapted and transformed their environment for their well-being.

The investigation revealed signs of adaptation and transformation including some intentional modifications in the ridgelines, made to construct their temporary or permanent dwellings. These alterations to the environment are called *terraplenes* (embankments) and constitute a pre-Hispanic cultural practice that continues to this day in the region. These structures were strategically placed to protect the population from the risks presented by the environment, which speaks of societies with the knowledge and wisdom to preserve humanity.

Likewise, the record of multifunctional constructions such as mounds (*tolas*), semicircles or small stone mounds, located in the alluvial valley, are evidence of a complex society.

This society transformed and took advantage of their landscape based on its social needs and cosmovision. In addition, it assigned exclusive flatlands to practice their symbolism and to strategically control access to resources.

Some of the important findings in the investigation are ceramic vessels with different surface treatment for domestic and ritual use, spinning wheels (*torteros* in Spanish), stone axes that may have been used in agricultural activities, and other axes with less hardness for ritual purposes. Traces of gold, silver, and copper identified in large stones have been related to mining activities. Pieces made of copper are evidence of the development of goldsmithing. Other evidence are traces of the use of corn, yucca, beans, sweet potato, caimito, ovo, achiote, atzera; and trees such as huambula, chonta and palms, among others.

The material expressions of rituality include representations of animals, such as the arms of a sloth (in appliqués of a large pot) and a tapir head carved in stone. There are also representations of human elements, such as the distal end of a phallus carved in stone, and the feet of possible figurines, in ceramic.

The material evidence left by societies that settled in the mountainous areas of the southeast Ecuadorian Amazon, from different chronological periods, demonstrates their lifeways, use of the space, and patterns of subsistence.

The research has defined a settlement pattern that, due to its characteristics, has been called 'Montane-forest riverside settlement' and was developed by societies from early (sedentary) to late periods.

Finally, the research results, have determined that this landscape was occupied and reoccupied from the aboriginal era until the European incursion in the region. These conclusions confirm the existence of a human occupation of thousands of years in the Ecuadorian Amazon.

This publication presents a synthesis of the research carried out in the Cordillera del Condor, Fruta del Norte project of the Lundin Gold company. It aims to bring readers closer to the social discipline of archaeology through the presentation of results, and to strengthen local and national identities.

Furthermore, INVACMA CIA. LTDA., is a multidisciplinary team of archaeologists, archaeological technicians, support staff, geographers, geologists, paleontologists, anthropologists, historians, restorers, architects, biologists, and surveyors. The health professionals who assisted the technical team in the field workdays are also part of our team.

1.

Archaeology in the Amazon region: geographical aspects of Zamora-Chinchipe

"The first treasure found underground is our history."

The territory of the Ecuadorian Amazon is part of the great tropical rainforest of the Amazon River basin with great biodiversity. According to Arellano (Prial remains of this region is dragged by erosion from the surrounding slopes).

The bodies of water that run through the three zones are the product of the melting of the mountain range and the rainfall. The flora and fauna are related to the formation of ecological micro-niches within each of the three environments, which were well-recognized and used by different societies.

Lundin Gold's mining concessions are located on the Montaneforest (*ceja de montaña*). One of the study zones is the territory of La Zarza concession, located in the parish of Los Encuentros, canton of Yantzaza (province of Zamora Chinchipe). The topography is irregular including pronounced mountains with reduced flat lands, small wetlands, and rocky outcrops. This zone has high rainfall and permanent humidity. Rainfall drags the soils from the steep slopes to the reduced flat areas and to the alluvial terraces of the large rivers, such as the Zarza, the Machinaza and the Zamora rivers. Due to these conditions, a large part of the slope surface is impoverished, while the soils of the alluvial valleys are rich in nutrients.



This sector is part of the western foothills of the *Cordillera del Condor* Mountain range, the largest and most diverse sandstone mountain formation in the Andes. The *Cordillera del Condor* is mainly formed by sandstone plateaus, but at the same time, has underlying layers (buried layers) of other rock formations. As they are cut and exposed by deep ravines, a variety of habitats are formed, very different from those that normally characterize sandstone mountains (Schulenberg and Awbrey, 1997). Sandstone fragments are scattered throughout the region in areas that are typically plateaus with near vertical sides.

The factors that determined the current configuration of the Cordillera Del Cóndor are the following: a) geological structures, geological folds, uplifts, faults, and overthrusts; b) continental sedimentation processes (sandstones, clays, conglomerates, etc.); c) volcanic and tectonic events in the Jurassic, which injected gigantic granitic plutons and large volcanic masses into various geologic levels; The Ecuadorian Amazon is part of the Amazon River basin. The region is rich in biodiversity, water sources and breathtaking landscapes.

The study area is in the western branches of the Cordillera del Condor. CHAPTER I



Cordillera del Condor Mountain Range, Zamora Chinchipe.

d) cycles of Cretaceous marine transgressions and regression of the Cretaceous (accumulation of shales, limestones and fine sandstones with fine sandstones and abundant fossils); e) water erosion, associated with heavy rainfall. In the area of direct influence of the La Zarza concession, there are outcrops of Holocene detrital deposits, of the Lower Cretaceous soot formation and the Zamora batholith dated to the Middle Jurassic.

Summary of the geomorphology of the area



N	DESCRIPTION
	Sand strata, conglomerates and colluvial strata.
	Rhyodacitic to dacitic volcanic series, and intermediate felsic dykes.
ndstone	Quartz sandstone, white.
	Grey to black mudstones and siltstones.
ndstone	Quartz sandstone, white color, with layers of red-brown iron coloration.
	Andesitic lava (Fruta member), lutites, sandstones and conglomerates, tuffs.
er pool	Dark grey sandy relicts and shallow hydrothermal breccias.
	Weakly magnetic andesites, dark blue-green, with chloritic alteration and moderate silicification.
	Lavas and red lutites.
	Type I, with phases of hornblende diorite, syenite, por- phyritic and aplite dikes, granites and granodiorites.
	Andesitic tuffs intercalated by sequences of siltstones and sandstones.
	T 11.4

Tabla 1.Generalized geologicalstratigraphic column.Prepared by: INVACMA, 2020

The study area (*franja de estudio*) is approximately 17 km long, and 2 km wide.

1.

ENSO is the natural fluctuation of sea surface temperatures and atmospheric pressure between the eastern and western tropical Pacific Ocean Since ancient times, climate change has been part of the dynamics of the planet. If these fluctuations exceed limits considered as 'normal', they affect living beings. The "El Niño" phenomenon (ENSO)¹ is one of the generators of these changes. It has two phases: a warming phase, known as "El Niño," and a cooling phase, known as "La Niña." Both have transformed the landscape in geological and historical periods. In addition, they have caused effects on nature, since the intense rains and subsequent droughts impacted the environment and the social groups that inhabited the study area. As a response to environmental phenomena, pre-Hispanic societies took advantage of their resources and built temporary or permanent dwellings.

The study area, today, has a tropical, mega-thermal and humid climate; the temperature varies between 18 °C and 22 °C (Cañadas, 1983). A rainfall between 2,400 mm and 3,350 mm is recorded annually, according to data from Lundin Gold's meteorological stations at the site. Based on information about climate, water resources, and geomorphology, two climatic zones are determined. In the lower zone, the hottest, the temperature ranges between 25 °C during the day and 15 °C at night and can sporadically reach 25 °C and 30 °C. Los Encuentros and El Pindal are the towns in this zone described as a location without fog (Kinross-Aurelian, n.d., p. 3). This area corresponds to the alluvial valleys of the Zamora River, with nutrient-rich soils result of colluvial and alluvial inputs and natural and constant irrigation.

In the upper zone, temperatures range between 20 °C and 25 °C during the day, and between 10 °C and 12 °C at night. This is where most of the present settlers' farms are located. The presence of fog is frequent, and rainfall exceeds 2,800 mm per year. Summer is marked

Figure 1. Montane-forest riverside settlement Pattern



(The second seco

in October, November, and December (Kinross-Aurelian, n.d., p. 3). The soils do not offer the best conditions for floristic production due to the highly irregular surfaces with moderate to steep slopes and constant erosion.

Prepared by: INVACMA, 2022

2.

Archaeology in the Montane-forest between the Zamora and Machinaza Rivers

Cultural History of Amazonian Peoples

The Amazon was populated long before the Inkas and the Spanish arrived. The societies of the past developed their own social organization, cultural identity, and went through historical transformations. This information is reflected in the lithic, ceramic, metal, and wooden artifacts, among others, created and produced by these original societies. The micro and macro findings of botanic resources prove how they used and made good use of the forest to obtain wood, food, dyes, and perhaps medicinal plants. They used hardwoods to build their family and community dwellings. Modifications, transformations, and adaptations of the environment in response to family and community demands are also evident. These mechanisms of adaptation demonstrate the people of this region advanced in broadening knowledge of their environment, improving the living conditions of their community, and building relationships with other societies.

The development and knowledge of these people transcend in taking advantage of new resources, such as metallic resources, to produce new material goods. At the time, this must have generated changes in several aspects. Historical transformation towards a complex social organization might have included the manufacture of more complex tools, division of space for working and ritual activities, new patterns of subsistence (food acquirement and clothing), the rise of spiritual leaders, and trade. Interactions with other societies are reflected in the evidence of products, especially plant-based, that crossed ethnic and linguistic boundaries over short and long distances.

Since the Spanish conquest (16th century), the constant search for metal objects in the Amazon region was documented, as well as the sources of supply of these minerals. The intention was to gain access to these resources (especially gold and silver), for which several religious missions and explorations to the Amazon were organized. These explorations were based on oral stories of Andean settlers, who spoke of the existence of a city of gold, which generated the myth of "El Dorado" and set the tone for journeys to the Amazon region. As a testimony of these incursions, there are numerous documents about the intentions and routes. Additionally, there are remains of Spanish cities and accounts of the places they crossed and their multiple confrontations with the native groups that inhabited the region.

In the 20th century, since 1916, a continuous migration to the Amazon region was unleashed by the ambition to exploit the gold and the *cascarilla* plant (husk). The main centers were Zamora and Gualaquiza. This lasted until 1935 when the migrations decreased, although never completely, since the roads at that time allowed safe entry. The religious order of the Salesians was the first to promote the opening of roads between the cities of Cuenca (Highlands) to Zamora and Macas (Amazonian region). Dr. Pio Jaramillo Alvarado is a historical figure who maintained the dynamic of migration over time. He led several expeditions, especially the one in 1924.

The exploitation of gold and cascarilla plant (husk) unleashed the migration to the Ecuadorian Amazon. CHAPTER II



There is a vast literature regarding geographic, ethnographic, and historic accounts about the entrance of several missions, the ways of life of the inhabitants of the area, as well as environmental references to the flora and fauna. These approaches recognize the presence of aboriginal peoples in the Amazon region. Even though they describe the way of life and the environment, they do not explain their origin and how long ago these human groups came to occupy these territories.

Many chroniclers, geographers, historians, ethnographers, among others, have described and studied the ethnohistory and archaeology of Ecuador. For instance, Federico González Suárez (1878) reports, among his many studies, information on the life of the "Jíbaros of Gualaquiza" or Shuar and compares them with other human groups to explain their origins. Porras (1971) based on previous authors, also recognized the presence of pre-Hispanic pots in various sizes and shapes, stone axes, and other objects related to the native peoples of the Amazon.

In general, theories of social complexity establish that the evolution of human groups in the Amazon depended on various elements of environmental change or conditioning, economic development,



The Amazonian humans adapted to the varied geography of the area and faced diverse environmental changes.

population growth, ritual practices, and other social factors. Theories have been proposed based on various studies, analyses, and reflections that explain the presence of the Amazonian people in this territory.

Meggers and Evans (1957) and Meggers (1976) argue that the origin of the "Amazonian culture" is in the Andes. These authors consider that the ecological conditions of the Amazon did not make it suitable for the development of complex societies. Lathrap (2010), on the other hand, proposes that human occupation of the Amazon is conditioned by the access to aquatic resources. Therefore, populations near water sources are larger settlements and have occupied these places for longer periods than settlements far from rivers. This indicates that the societies of the tropical forest are of continental but not coastal origin. This author suggests that the culture of the Ecuadorian coastline emerged from the "Amazon basin at a fairly remote time" (Lathrap, 2010, p. 101).

The lower Amazon was studied by A. Roosevelt (1999). With the results obtained, he reconsiders Meggers' theory and points out that the aboriginal peoples of this region are native and of Amazonian genetic filiation, not Andean; organized in small social groups with their own governments known as complex heterarchical societies.

The approaches of the last two researchers, who agree on the origin of the peoples in the Amazon, give grounds to affirm, from the results obtained in the archaeological studies of the Montane-forest, that the Amazonian peoples arise in the "tropical forest".

Neves (2019) challenges Roosevelt's arguments regarding this social structure. Based on accounts of Catholic missionaries, the author indicates that the "Tapajonic society" in the 17th century A.D.*

maintained a form of hierarchical order, in which women played a substantial political and religious role.

Since the 1990s, research in the upper Amazon, which includes the Montane-forest (Porras 1975 and 1987; Salazar 1989 and 2000; Ledergerber 2006; Lara 2010; Rostain and De Saulieu, 2013), shows a complex past and present social structure, which can be interpreted as a cultural continuity of settlement patterns in the region. The current expansion of agricultural frontiers over ancestral territories has facilitated the identification and exposure of cultural evidence of the pre-Hispanic times. Researchers were able to register architectural complexes and multiple ceramic and lithic remains. This set of data, based on different theoretical approaches, shows environmental adaptation, landscape construction, and expansion of settlements. This evidence, in addition to those identified through current studies, have increased our understanding of the historical and cultural processes of the ancestral populations of the region.

According to Valdez (2013), "the first *agro-alfareras* (agrarian and pottery producers) societies were established in the upper Amazon, in a semi-sedentary manner, about 6,000 years ago. By 5000 B.P., they already had a solid social structure, capable of establishing villages". Furthermore, Valdez proposes that the upper Amazon and the lower Amazon basin "were never isolated from the Andean cultural context" (p. 73). From the results of his studies and the different analyses, he notes that the evidence "outlines a complex society, where the notion of social stratification is present, at least incipient [stratification]" (p. 72).

For thousands of years, since 10000 B.C., human groups settled along the river basins and inland. This occupation confirms a horizon of original occupations in the Amazon region (Montane-forest, upper

"Tropical forest" societies are of continental but not coastal origin (Lathrap, 2010).

A.D.*. After Christ Amazon, and lower Amazon). The early people from this region developed different settlement patterns, socially organized, modified the landscape, adapted the environment to the needs of their society. In addition, these societies made good use of resources from the forest and rivers, used raw materials offered by the soils and subsoils, and exchanged products with people located at short and long distances.

Furthermore, for the Ecuadorian case, the archaeological research carried out in the foothills of the *Cordillera del Condor* is a theoretical contribution to understand and explain the processes of historical development of pre-Hispanic societies.

In the archaeological study, INVACMA* has identified a model of occupation called "Montane-forest riverside settlement pattern" (patrón de asentamiento ribereño de ceja de montaña). The most relevant characteristic of this model is the use of riverside and inland spaces as a single unit. Over thousands of years, societies occupied both upland and lowland territories while developing a close relationship with their environment.

The results of more than ten years of archaeological research carried out in the territory between the Machinaza and Zamora rivers show a historical and social process of human groups that occupied this space. These communities experimented, understood, and made good use of environmental resources. Through time, these groups of people came to build a complex society, which in the framework of this research has been called "Machinaza culture".

The occupational sequence of the Machinaza culture is in two climatic zones -low and high. The occupation model 'Montane-forest riverside settlement pattern' is attributed to the Machinaza culture.

It begins in the east, during the early Paleo-Indian period, and advances westward up to the beginning of the Spanish colonial period. The archaeological evidence recovered in this territory speaks of this model of movement in the landscape.

Archaeological research linked to infrastructure work involves the stages of archaeological identification, survey, excavation, or rescue, monitoring and management or enhancement of heritage assets. Given their scientific and systematic nature, they require the participation of specialists from various scientific disciplines. The objective of this program of study is to identify, reconstruct, and preserve the evidence related to socio-historical processes that Amazonian peoples endured over time. Moreover, their history and material expressions are part of the social heritage of Ecuadorians.

INVACMA*.

Archaeological and Cultural Investigation CIA. LTDA.

Methodology of Salvage Archaeology

In Ecuador, since 1979, there have been academic and legal concerns regarding the archaeological studies in the face of earth removal processes for infrastructure and development works. In fact, in 1981, a meeting of specialists called "Rescate Arqueológico del Nuevo Mundo" (Archaeological Rescue of the New World) was held in Quito. This group of researchers discussed the imminent need to carry out "rescue or salvage" studies to recover cultural or heritage resources that are at risk of destruction or disappearance due to *huaquerismo* (clandestine excavations), agricultural activities, and infrastructure works.

In response to academic and legal concerns, since 1984, the National Institute of Cultural Heritage (INPC) has issued authorization for rescue (or salvage) archaeology, thus endorsing the position of safeguarding archaeological assets with the application of relevant methodologies and techniques, in a short and planned time before earth removal.

During the nineties, several Latin American countries, such as Mexico, El Salvador, Colombia, Argentina, among others, created public agencies in charge of the control and, in some cases, of archaeological rescue studies. Conceptually and in practice, the policies of the States guide the processes of rescue or salvage studies for their execution. Particularly in Ecuador, during that decade, the Cultural Heritage Law ruled the protection of archaeological heritage. Based on this law, the INPC enforced the mandatory protection of archaeological heritage and urged companies carrying out development projects to develop



cultural (archaeological) investigations along with environmentalimpact studies, regulated by other State agencies.

The actions of the INPC are aligned with international norms and the policies of international cooperation, which in some cases finance development projects. This confluence of national and international actions can be considered the genesis of what now constitutes the current Ecuadorian legislation, which controls, preserves, and disseminates the cultural heritage of the country.

A technical team carries out field work within the archaeological research program that was developed in the foothills of the Cordillera Del Condor Mountain range, before the mining activities.



Visit of INVACMA's technical team during archaeological identification in the study area.

Scholars within the archaeological discipline continue to debate on to what conceptually, salvage archaeology represents. However, there is agreement on the ultimate goal, which is to preserve, conserve, and safeguard the archaeological heritage.

Thus, since 2004, Lundin Gold, aware of the respect given to heritage and cultural assets, has been carrying out specific archaeological studies that over time have evolved into a sustained program that includes all phases of salvage archaeological research.

Beyond the debates, coincidences or dissidences, this archaeological research program has aimed to follow the different stages of a scientific study. The program is initially based on bibliographical review of

the field research. Through archaeological survey we identify the archaeological potential of the area. The next steps are archaeological excavations and monitoring. Finally, during the heritage management phase, the objective is to give the community the opportunity to look at their past, enrich their knowledge, value their ancestors, take ownership of their history, and empower their social identity.

In order to implement the archaeological research program, it has been necessary to manage and maintain a comprehensive approach that combines the research design, working along the design of infrastructure works, time management, and development of health and safety policies. The archaeological rescue or salvage has the *sine qua non* condition of being carried out in the shortest possible time and before earth movements. Another condition, although not decisive, is to carry out the archaeological investigation in specifically delimited areas.

It should be noted that INVACMA, within its scientific orientation, worked in an interdisciplinary and inter-institutional manner. In this line, the project generated new concepts, techniques, and methodological resources. The research also effectively ensured safeguarding of heritage assets found during the development of the Fruta del Norte project. Likewise, the regulatory institution INPC-Z7 (2017) standardized the conceptual criteria and technical processes for the monitoring phase of the archaeological research. Undoubtedly, these guidelines contribute to the methodological applications of the studies.

The archaeological rescue or salvage has the *sine qua non* condition of being carried out in the shortest possible time, and before earth movements, in a technical and systematic way, in order to safeguard the archaeological heritage.

As has been shown, the archaeological study linked to infrastructure works has the primary objective of applying mitigation measures, based on a scientific and systematic work, to avoid the destruction of the cultural legacy of aboriginal peoples. Recovering archaeological information is not only a scientific procedure, but also involves an ethical approach, as Zelaya (1981) indicates: "As peoples, we are today the sum of what we have been. Ignoring what comes from the

Figure 2. Archaeological research process.

past, letting it be lost through inertia, or destroying it in the name of progress, diminishes and mutilates us as peoples and as nations".

The archaeological investigation linked to infrastructure works has a scientific and systematic process, in which five defined and sequential phases are considered. The first four phases are related to fieldwork and procedures taking place in the lab (Figure 2).



Conservation, enhancement

Keep the archeological assets, share the information, and enhance the value of cultural property.

Prepared by: INVACMA, 2020

3.

An encounter with the legacy of the Machinaza culture

The adverse climate affected the life of aboriginal societies.

The climatic changes that occurred in South America since the second half of the Holocene, which are temporally and culturally located from the Paleo-Indian-Preceramic period until the Spanish conquest, marked dry and humid climates. This climatic variability must have generated environmental modifications and influenced the lifeways of the pre-Hispanic societies.

The climatic variations may have generated catastrophic effects, such as the migration of human groups to safer locations. This reveals the occupation of *tolas* (mounds) located on ridges, which were used as spaces for permanent and temporary dwellings, showing the human adaptation to the Amazonian warming and cooling cycles. In these places, due to the environmental conditions, the aboriginal societies of that time had to face the severity of the environment.

The social groups of these periods shared two microclimates, which make up the Montane-forest - the mountain ridges and the alluvial valleys. In the places with mountain ridges (locally called "cuchillas" for its similarity to an irregular edge of a blade), there are small and flat areas -natural and anthropic- with easily eroded soils.



The occupation of these flat areas is recurrent, generally surrounded by steep slopes that form deep ravines and are located near watercourses, relatively distant from the animals' habitat. These characteristics are favorable for human habitation.

Two microclimates make up the Montane-forest: the topography of the mountain ridges and alluvial valleys.

> The INVACMA - Lundin Gold team's objective was the encounter of the Amazonian societies' cultural legacy

In the alluvial valleys, on the other hand, the land is relatively flat. The soils are rich in nutrients, with alluvial and colluvial inputs that give rise to the development of flora and fauna and allow agricultural activities. In addition, being located next to rivers of great flow facilitates communication, interchange, and access to their territory.

In such environmental and geological conditions, the population generated knowledge, experimented, made good use of available resources, and created a way of life. Nowadays, this is reflected in construction, lithic pieces, ceramic utensils, big carved stones, metal pieces, vegetal charcoal and more data obtained from the area.

One of the objectives of archaeological research is to locate, in time, the cultural materials produced by the activities of aboriginal groups. Radiocarbon dating (C14) is the procedure that allows us to approach its temporality. The charcoal recovered and analyzed, as well as the descriptions and characterization of other archaeological evidence, provide information to reconstruct the ways of life and settlement patterns of these groups, their development over time (chronology), and their local and regional relationships (chorology).

In order to understand the historical process of the societies that inhabited the current Ecuadorian territory, a chronological model (temporality) has been adopted, which marks a point before and after the Spanish conquest. At the same time, the following guide, synthesized from several studies, details a sequence of established archaeological periods in the Ecuadorian territories (see Table 2).

Cultural Chronology of Ecuador (periods and epochs)

PERIODS	Preceramic period	12000-8000 B.C 4000-3500 B.C.
	Formative period	400-3500 B.C 300 B.C.
	Regional Development period	300 B.C A.D. 800
	Integration period	A.D. 800 - A.D.1500
	\longleftrightarrow	Inka Conquest ; 1460 - 1532 ?
	\longleftrightarrow	European Conquest (16 th centu
	Colonial	European Conquest (16 th centur) 16 th , 17 th , 18 th , 19 th century
SHO	Colonial Republican	European Conquest (16 th centur) 16 th , 17 th , 18 th , 19 th century 19 th century
POCHS	Colonial Republican Modern	European Conquest (16 th centur) 16 th , 17 th , 18 th , 19 th century 19 th century 20 th century
EPOCHS	Colonial Republican Modern Contemporary	European Conquest (16 th centur) 16 th , 17 th , 18 th , 19 th century 19 th century 20 th century Late 20 th to 21 st century

The Ecuadorian pre-Hispanic cultural history could be explained as a continuous process of transformation from approximately 10000 B.C.* to A.D. 1500. The material evidence and the available information have established temporal periods (Paleo-Indian, Formative, Regional Development, and Integration), with particularities that mark differences over time. However, in this continuum, certain cultural manifestations are maintained, and others evolved. These cultural manifestations are displayed within daily activities, administrative, political, and ceremonial expressions, etc.

The Ecuadorian pre-Hispanic populations present continued cultural history from about 10000 B.C. to about A.D. 1500.



Table 2.Prepared by: INVACMA, 2021

B.C.* Before Christ The approach to understand the chronology of Ecuadorian societies has gone through the evolutionist framework, diffusionist thought, Marxist approach, and even those elaborated from the purely technological postures. All approaches maintain a line of analysis based on the temporal and thematic, which have facilitated the grouping and division of the historical progressions and have also helped to understand local development and establish macro-regional links.

The theoretical concepts and studies that have been carried out since the beginning of the 20th century indicate a marked tendency to analyze the human groups that inhabited the Coastal and Highlands regions, but not those of the Amazon region. In the last decades of the present century, archaeological studies have increased in the Amazon region due to the development of infrastructure works, the obligatory nature of the law, and the need to preserve the cultural heritage. A vast array of investigations, proposals, inferences, dating, specialized analysis, among others, have been presented. It is important to highlight the contribution of Pedro Porras (1987), one of the first researchers who emphasized the urgency of studying the Amazon region, and his dedication to the investigation of the Amazon for several decades. His results have become primary sources of human presence in the Montane-forest.

The exploration of the Montane-forest or foothills are in the southern territory of Ecuador, province of Zamora Chinchipe, parish Los Encuentros. In recent decades, studies have provided archaeological, geological, biological, and radiocarbon dating information. Thus, a chronological and documented model has been configured that offers more information about the region.

Several researchers have systematized information on historical events; this is their scientific contribution to understand the societies of the past. There are still areas to be studied in the Ecuadorian territory, which challenges both researchers, companies, and the Ecuadorian State on the need to recognize the significance of our archaeological heritage.

The studies offer a chronological and documented model of the study area and contributes to the vast literature of the Amazon region.

Los Machinazas (Machinaza culture) over time

The archaeological research carried out over a decade in the Fruta del Norte project has provided chronological and chorological information on the historical process of human occupation. The results of these investigations show that the mountain ridge or foothills were inhabited by aboriginal societies from the Paleo-Indian or Preceramic period (7000 B.C.) to the Integration period (A.D. 1500), before the Inka and Spanish conquests.

There are several contributions to better understand the development of aboriginal societies. Based on the analysis of archaeological materials and radiocarbon dating, it was concluded that human groups inhabited the area of study between 7000 B.C. and A.D. 1500. During this timeframe, they advanced from the east (Machinaza River) towards the west (Zamora River). As part of the investigations, the radiocarbon dates were contrasted with environmental information related to the climatic phenomena El Niño (high rainfall) and La Niña (low rainfall), as well as other events, such as the volcanic eruptions of the Sangay Volcano. Natural phenomena might be related to processes of human displacement in this territory.

The dates obtained from the charcoal samples determined the chronology of the cultural evidence produced and left by native societies.



Los Machinazas inhabited the area of study between 7000 B.C. and A.D. 1500. The associated and correlated results make it possible to reconstruct ways of life and patterns of settlement or occupation as they develop over time.

Table 3 presents a group of dates obtained during the archaeological investigation.

Archaeological periods of Amazonian societies

	Paleo-Indian / Preceramic Period 10000-8000 B.C 4000-3500 B.C. –	Formative Period — 4000-3500 B.C 300 B.C. —	Regional Development Period 300 B.C A.D. 800	A.D. 800 - A.D. 1500	Contact - Colonia A.D. 1500-183
Southern	Quimi River (Molestina and Castillo, 2004)	Upano I, Pre-Upano, (Porras, 1987), Cuyes river valley (Lara, 2010), Quimi- Colinas river (Villalba, 2019); Santa Ana - La Florida, Palanda (Valdez, 2013); La Selva and El Remanso (Ledergerber, 2006); Pre-Upano y Upano (Rostoker 2005)	Upano II (Porras, 1987); La Lomita (Rostain, 1999); Rio Quimi- Colinas (Villalba, 2019)	Huapula (Rostain, 1999); Upano III (Porras, 1987; Salazar, 1998; Rostain, 1999); La Lomita (Salazar 1998); Cuyes river valley (Lara, 2010), Quimi-Colinas river (Villalba, 2019); Santa Ana - La Florida, Palanda (bracamoro) (Valdez, 2013); Huapula (Rostoker 2005)	Cuyes river valley (Lara, 2
Machinaza study strip	4990-4720 B.C. cal. 5490-5290 B.C. cal. 5750-5630 B.C. cal. 6680-6480 B.C. cal.* 7950-7590 B.C. cal.*	849-756 B.C. cal. 816-743 B.C. cal. 899-796 B.C. cal. 1053-845 B.C. cal. 1265-1110 B.C. cal. 1515-1382 B.C. cal. 3650-3510 B.C. cal.	 A.D. 680-880 cal. A.D. 650-770 cal. A.D. 620-670 cal. A.D. 425-585 cal. A.D. 410-545 cal. A.D. 270-330 cal. A.D. 260-280 cal. 210-58 B.C. cal. 	 A.D. 1425-1475 cal. A.D. 1410-1450 cal. A.D. 1300-1404 cal. A.D. 1394-1446 cal. A.D. 1330-1340 cal. A.D. 1315-1360 cal. A.D. 1184-1275 cal. A.D. 1160-1260 cal. A.D. 1042-1206 cal. A.D. 780-900 cal. 	A.D. 1502-1594 cal A.D. 1440-1520 cal A.D. 1436-1640 cal

Various studies Southern

> Dates obtained in the Machinaza study strip



Table 3.

Source: INVACMA, based on the results from Beta Analytic Inc. 2010-2019.

*Take these dates with caution

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4. What does the archaeological evidence show us?

There was a human-nature coexistence model.

The archaeological research carried out in the study area has shown the social and historical process of aboriginal peoples settled in these territories. Through the cultural evidence and the information collected, one of the objectives of the study has been fulfilled: to recover the historical memory as a legacy of the peoples.

Another achieved purpose has been the dissemination of the results, as part of the legacy of their ancestors, available to the descendent communities. Through this contribution to the local knowledge, the people of this territory take ownership of their history and heritage, with an ultimate goal to defend, preserve, and care for it.

The evidence of human occupation recovered in the study area and presented as the investigation's results corresponds to all periods of the aboriginal era, which explains the development of these societies. It is important to emphasize that, during the advance from east to west, human groups had a comprehensive knowledge of their environment.

The people of this region experimented, planned, produced, developed, and materialized their ideas in a variety of constructions and objects, made of diverse local raw materials. The combination of these technological advances allowed a model of human-nature coexistence until they consolidated complex social organizations.



Through knowledge, people appropriate, defend, preserve, and care for their history.



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Figure 3. East-West Human Occupation and Mobility

White: Geographic Coordinates WGS 84



AIA* Archaeological Interest Area

Legend

Sectors AIA* Pindal-Machinaza road Populated area ---- River or stream Main river

Routes

_	Primary route
	Secondary route
	Paths

Elevation meters above sea level

2,026 - 2,280
1,773 - 2,027
1,520 - 1,774
1,266 - 1,521
1,013 - 1,267
760 - 1,014



Paleo-Indian



Regional Development



Formative



Integration



In this scenario, the people generated adaptation strategies, such as a broad knowledge of their environment and a selection and modification of different spaces. In addition, they developed socio-economical dynamics, which included domestic activities, rituals, and exchange. They also obtained and processed local raw materials, such as clays to produce utensils. These human groups could recognize the properties of rocks. In addition, they observed, experimented, gained knowledge, manipulated, and consumed plants and animals.

In relation to the adaptations and use of the environment, the people of this region transformed the terrain and intentionally leveled small areas. These surfaces were arranged on the top of the hills, where they settled their permanent and temporary dwellings, an optimal location to protect themselves from natural events and the attacks of the fauna of the area. In this context, they built communal areas and spaces for ritual activities. In the alluvial valley, they built tolas (mounds) or rectangular and guadrangular mounds of low and medium height, as well as constructions under semicircular surfaces.² In the alluvial valley, as well as in the embankments, post holes were found, suggesting the use of space for habitation, ritual, and communal functions.

The distribution of the space kept harmony between the environment and their way of life, as they used the territory, located in the high climatic zone to establish structures related to economic activities and metal extraction. In the low climatic zone -alluvial valleys of the Zamora River-, they built mounds for multiple uses, including housing. These were strategically located, both for spatial control and habitation. In relation to spatial control, they kept watch on river circulation, and

on the access to the areas of exploitation of the resources related to the two climatic zones.

Small stone mounds were located on top of the semicircles. It is inferred that this kind of place would have served as a pond to raise fish and Charapa turtles (Arrau turles). This approach is strengthened by what is described in the account of Pedro de Orsua's trip to the Marañón River³, in which it is pointed out that the settlers built artificial ponds to raise turtles (charapas?). Ethnographic research also reports the existence of charapas in the study area⁴. The research has also provided data related to the construction of a stone pedestrian path over flooded zones to facilitate transit in the areas of social use. It is also inferred that the low area was flooded in the past, as it is today.

All the construction features identified in the lower area of the archaeological survey are associated with each other, and their distribution establishes three areas of occupation that denote planning and order. The designs, dimensions, and materials of the features demonstrate that they were possibly built at different times. The work force and the surplus were oriented towards the planning and construction of tolas (mounds) as multifunctional buildings. Therefore, this study infers the existence of a structured and complex social organization.

When speaking of the three occupation areas or settlements⁵, it is important to mention that each one is formed by a group of anthropic modifications, such as embankments, tolas (mounds), semicircles, other small mounds, habitational areas, and a trail. Settlement 1 comprises a group of anthropic modifications of embankments and three mounds of different sizes.

2.

Called 'semicircles'. These are anthropic depressions dug below ground level, forming a semicircular slope with an inclined surface whose deepest area reaches the center of the slope; as it moves away from this point, it reaches ground level defining the end of the slope.

3.

Collections of the Manuscript Division Library of Congress, Washington. "Del Rio Marañon y de su descubrimiento y sus nacimientos y de otras muchas otras muchas particularidades del y de la jornada que hico Pedro de orsua...", The Hans Kraus Collection No. 140-147, Shelf No. DM 14,833, Reel No. 2, Feet 116, No. 141 (1580-1600) [Transcription M. Aguilera V. 1990].

4

Interview with Mrs. María Teresa Chiriapo. from the Shuar ethnic group (July 19, 2019).

5.

The tolas and semicircles that correspond to the settlements are located on a private property near the study area. They were recorded during the archaeological investigation of the road. Area Pindal- Machinaza, 2011 CHAPTER IV









These constructions are in the alluvial valley, parallel to the right bank of the Zamora River, which suggests that tolas were used for social and personal purposes. The embankments are located at the back of the tolas. One of them is so strategically located, providing a good view of the rest of the structures and the river, a large part of the alluvial valley. Undoubtedly, the location facilitated the control of the area.

Settlement 2 is a group of three tolas and a semicircle with an opening parallel to a present road and towards a ravine. The first tola is in a flooded area, the second at the end of a ridge, and the third to the northeast of the semicircle. The three mounds were placed in such a way that they allow a visual domain from their highest point. From this settlement, the embankment of settlement 1 can be observed. The position of these structures is strategic for communication with each other and for controlling the environment.

Settlement 3 is a group of two tolas, two semicircles and three intentional stone piles. One of the semicircles has an opening towards the present road, and in the highest part, there is an intentional accumulation of stones. The second semicircle, with an opening in the opposite direction of the first one, has an accumulation of worked stones in the center, and is located with its opening towards one of the tolas, which, in turn, has an accumulation of stones very close to it. Another tola is placed at the end of a ridge (a "cuchilla"). All these elements, as a whole and associated with each other, have a water source nearby. There are large quadrangular or rectangular worked stones with a concave surface located in most of these tolas. They might be used to grind different vegetable and mineral products.

The distribution and association of the elements in each settlement reveals a social organization with a power structure and in intimate

relationship with nature. At the same time, it shows how the organization responded to multiple needs and functions.

The elevated structures, built in what today are waterlogged spaces, that may have also been in the past, must have responded to the need to create appropriate living conditions, i.e., to be in a high location away from moisture. The depressed semicircles were built to drain the flooded areas and use them as artificial lagoons.

In addition to the modifications of the geographical environment, a distinctive use of space could be considered a process of adaptation to the environment, where the flora and fauna provided elements for survival. This is demonstrated by the results of specialized studies of soil samples and petrographic analysis to examine temper, charcoal, and other elements of the pottery.

The botanic environment according to archaeological evidence

The archaeobotanical analysis of phytoliths and starches revealed the presence of edible plants, cultivated in small farms (*chacra*) or collected in the forest. In addition, the results speak of the use of forest trees for construction, the elaboration of useful artifacts and the extraction of resins. Identified evidence of exogenous trees from the ecosystem referred as *páramo*, found in the high Andean plateau, indicated interethnic or inter-regional connections and trade (Table 4). The interethnic relations between the highlands and the lowlands represent one more argument to reaffirm the idea that the populations that occupied the area maintained a complex social organization.

Of all the plants that formed the basis of the diet of the native peoples, maize is a very important reference, as it has been cultivated and adapted to all the climatic zones of the current Ecuadorian territory. During the archaeological excavations carried out in the area, botanical macro-rests of carbonized maize were recovered, classified as "primitive"⁶. It is a hard corn, consumed, according to radiocarbon dates, in the year A.D. 680, corresponding to the Regional Development period.

The aboriginal social groups that inhabited the area of study contributed, through agriculture, to the development of the community's diet by producing foods such as maize, supplemented with seasonal gathering in the forest of the two climatic zones. We do not rule out the possibility that maize was also a symbolic element of rituality.

Evidences of identified plants

COMMON NAME	SCIENTIFIC NAME
Maize	Zea mays
Beans	Phaseolus vulgaris
Sweet potato	Ipomoea batatas
Yucca	Manihot esculenta
Yam or potato	Solanum tuberosum
Pumpkin	Cucurbita cf. moschata
Caimito	Pouteria cf. caimito
Ovo	Spondias cf. Purpurea
Atzera or achira	Canna sp
Fern tree	Cyathea sp
Cedar	Cedrela sp
Palms	Bactris gasipaes
Huambula	Minquartia sp.
Ampakai, sweet palm	Ireartea deltoidea
Achiote	Bixa orellana
Quishuar (sacred tree)	Buddleja sp.
Polylepis (paper tree)	Polylepis sp.

6.

Primitive maize is characterized by small-sized cobs.

HABITAT	ZONE
Small farms (chacra)	
Forests	Montane-forest
Forests	Endemic of the Andes(páramos)

Table 4.

Source: Romero M. 2011 and 2017 and Vásquez and Rosales 2019 Prepared by: INVACMA, 2021

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Botanical macro-remains of carbonized corn. It is a "hard corn"; according to radiocarbon dating and corresponds to the year A.D. 680.

> Regarding the preparation of food, two ways have been determined: one through cooking in ceramic pots, and the other through direct cooking in the fire. In addition, evidence indicates that yucca, corn, and sweet potato were cooked for rituals. Ethnographic references indicate that, at present, communities in the area prepare *chicha* (traditional bear) for festivals or rituals, with these three plant products, indicating an enriched and maintained cultural continuity for thousands of years.

> The results of the specialized analyses indicate significant consumption of maize and sweet potato, followed by yucca. Maize has been consumed in the three regions of the country since early times. Plants from the area have also been used to varnish and waterproof ceramic artifacts. It is possible that they prepared a vegetable resin that, when intentionally placed on the ceramic artifact, formed a coating film.

The use of wood is varied in pre-Hispanic societies, as a bowl worked in *chonta* was identified, which may have had a utilitarian or sumptuary function (Figure 4).

Figure 4. Carbonized wood artifact, and tentative reconstruction of the bowl.



Ethnographic studies conducted by Steward (1963) and Bianchi et al. (1982) in the upper and middle Amazon report seats or benches, figurines, bowls, among others, made of wood. Currently, there is a cultural continuity in the Shuar territory, such as the use of wooden bowls in domestic activities. Likewise, the Shuar use wooden seats or benches as household furniture,⁷ which is part of the cultural traits inherited from their ancestors.

l.

Prepared by: INVACMA, 2019

Observed by the team of technicians in Yukiantza, Morona Santiago 2014.

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7.

Faunal presence according to archaeological research

On the other hand, the archaeological study has identified some of the animal species that native peoples cohabited with. An applique of sloth arms and hands was identified, arranged in the upper area of a pot. This artifact was part of a set of three pots placed one inside the other, found in a sacred place.

According to the cosmovision of Shuar people, the sloth is a sacred animal. During the passage from puberty to become adults and warriors, they celebrate a feast that includes the practice of head shrinking (*tzantza*) (Bianchi et al., 1982)⁸. Likewise, another of the findings of the study is the figure of a head, recreated in a large rock that may be that of a tapir⁹.

8.

Karsten (2000,228), Sobre los mitos Shuar (On Shuar myths).

9.

Personal communication with Tatiana Dávila, biologist.



Vase with appliqués of hands and arms of a sloth.

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Figure of a tapir head carved in a rock.

These faunal representations expose the cosmovision of human groups, in which they and animals interrelate and establish rituals and sacred bonds.

The knowledge of past societies was profound and millenary, just as it is today in the groups of the study area. Their worldview is one of unity, nothing is separate or excluded, they are one with nature, hence everything that makes up the forest (trees, birds, mammals, insects, rocks, water, wind, among others) is part of their spiritual world and, therefore, is sacred.

Hunting is framed in terms of power and the fauna is related to an oneiric and symbolic practice. An example of this is the tapir, considered a mythical animal. The Shuar and Achuar believe that the tapir is evil because it embodies the dead and is classified as a demonic animal (Descola, 1996).

The worldview of past societies is one of unity with nature. It is part of their spiritual world, it is sacred.

Everyday life and its utensils

The classification of material evidence is a crucial to obtain information about significant traits about human behavior. Material remains are relevant to characterize a social group that produce and use these goods.

The transformation of tools and manufacturing techniques, shape, size, decoration, and style of object are based on the knowledge and experience that people inherit and acquire. As this happens, the society, their perspective of its environment, world, ritual acts, and relationships with other human groups also are transformed. During the times of adaptations and transformations, societies produced objects made from clay, stone, metal, or wood. Archaeological research has recovered about 200,000 pieces of cultural evidence that constitute the testimonies of the life of ancient societies.

We recovered around two hundred thousand pieces of cultural evidence that constitute testimonies of the life of ancient societies. The raw material used to make ceramic artifacts is local and of low quality. However, the settlers were very creative and skillful in making the artifacts and impregnating decorative motifs, which shows greater dedication and effort. They produced vessels of various sizes and shapes, with smoothed and polished surfaces, and some with decorations. There are rims of pots bent towards the interior and others towards the exterior, with appliqués and painting. Most of the vessels have been elaborated with the technique of hand building and coiling.



INVACMA's technical team analyzes the ceramic materials.

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Most of the pots found were made using the techniques of hand building and coiling.

The evidence of dyes produced from local minerals that are applied to the pots demonstrates a profound knowledge of the Amazonian environment and the need to materialize new ideas. They created sets of brown and black strips, which form geometric decorative fields. Table 5 shows a classification of ceramic production. According to this table, from one type of artifact, they elaborated diverse forms and there is a relationship between form and function.

Classification of ceramic production

TYPE OF ARTIFACT	QUANTITY OF FORMS	FUNCTION	OBSERVATIONS	
Pots	77 forms	Cooking of food, storage of products, and storage or transportation of liquids.	Some have concentrations of charcoal on the exterior; others have paint, appliqués and decorative motifs.	
Bowls	32 forms	Dry food and liquid containers	Some show concentrations of charcoal on the exterior; others on the exterior and interior, and others only on the interior. In addition, there are several bowls with decorative motifs.	
Plates	16 forms	For serving food	Some shapes have decorations.	
Spindle whorl	2 forms	Weight used in spindle works	Simple and decorated. Until recently, spindle whorls were made of tortoise shells ¹⁰ , which are known today as "charapas". ¹¹	
Figurines	2 forms	Symbolic use	Representation of feet and eyes.	
Ornaments	1 form	Symbolic or sumptuary use	Geometric and decorated shape.	

Table 5.

Prepared by: INVACMA 2021

10.

In Bianchi et al. (1982, 10).

11.

Personal communication by María Teresa Chiriapo, Shuar community (July 19th 2019).

An example of what is mentioned in Table 5 can be seen in Figure 5, where three different vessel forms and their varieties are presented. According to the analysis the potters hand made the artifacts whose forms were appropriately designed for their function. The pottery with concentrations of charcoal on the exterior had a domestic function, as it shows evidence of having been exposed to fire for cooking food. On the other hand, ceramic remains with concentrations of charcoal on the inside wall would have been used in the burning of resins, wood, or aromatic herbs for symbolic acts within rituals. It could also have been used to transport embers to spaces where temporary activities such as hunting and gathering took place. Another use of ceramics with concentrations of charcoal in the interior could be related to mining activities. Among other utensils recorded are bowls that, because of their size and shape, were essentially for domestic use, to contain small amounts of liquids or solids. The plate as a container for food for immediate consumption is another ceramic artifact recorded.



Figure 5.

Source and elaboration: INVACMA 2021



Restored vessel, recovered during the archaeological rescue for the layout of the Pindal-Machinaza road.



Ceramic base discovered during the archaeological rescue for the layout of the Pindal-Machinaza road



Spindle whorls used in spindle works.

Special mention should be made of the so-called 'torteros' (spindle whorls), which are related to spinning activities; they were used as part of the spindle, a tool with which they produced threads to make fabrics. Several of these artifacts have decorations; from this, it can be deduced that they must have had a symbolic meaning within the community.



An important finding are two representations in clay of feet with stylized toes. It is deduced that these are elements of possible human-shaped figurines, probably linked to ritual and sacred activities.

Figurine foot.



Stone axes.

Since the Paleo-Indian times, the pre-Hispanic societies from this area went through a process of observation and experimentation to learn about their environment, particularly to work with rocks. They knew the characteristics of this raw material and transformed the stones to obtain the first tools; later they prepared them, through polishing and carving, to produce artifacts with diverse functions for daily activities, and as part of their symbolic world. The used raw material was easy to acquire, as it was found in rivers and slopes of this region.



The results of the research determined that the lithic pieces were elaborated on rocks from local geological formations or from riverbeds within the region. The inhabitants of the area took the elements and used them, both in their natural state and with modifications oriented towards activities such as cutting, reducing, grinding, crushing, and plowing, as well as for use in ritual events. Table 6 shows the lithic findings with their characteristics and functions.

The axes of various shapes and sizes, common in the area and made of rocks of different hardness, were used as working tools, and others as artifacts for symbolic activities. Thus, it is suggested that artifacts made from hard rocks were used in activities involving strength, while those of lesser hardness or soft rocks were linked to activities associated with healing. Likewise, they made and conditioned artifacts such as grinding *manos* and *metates*, considered indicators of activities related to the processing of grains, tubers, and herbs.

Lithic findings

ARTIFACTS	NUMBER OF FORMS	FUNCTION
Monoliths	1 form	Symbolic
Petroglyphs	1 form	Symbolic
Axes	10 forms	Productive and symbolic activities
Metates	1 form	Food processing
Manos (metates hands)	2 forms	Food processing supple- ment
Maray (Manual/Sway rock crusher)	4 forms	Processing rocks to obtain metals
Crushers	1 form	Tool for obtaining metals
Ornaments	1 form	Symbolic

FEATURES

Human representation Functional representation

Geometric composition

Geometric shapes

Rectangular shape

Rectangular and quadrangular shapes

Ovoid, rectangular, circular, and quadrangular shapes

Curvilinear shape

Trapezoidal shape

Table 6.

Source and Elaboration: INVACMA 2021



A Maray (Manual/Sway rock crusher) recovered in the "area of study" related to a pre-Hispanic mining activity.

Millenary Mining

The lithic artifacts with polished contours, referred to as "crushers", were tools for reducing rocks to extract metallic minerals such as gold, silver and copper. Of the set of artifacts, those that stand out are those with unique characteristics in terms of composition, shape, size, and weight. They are large rocks, 1.20 m long, with horizontal surfaces and one or more shallow concavities. These artifacts have been defined as '*Maray*' (Manual/Sway rock crusher).

Crushers and *Maray* are tools used for exerting force and pressure, used to reduce, and pulverize rocks containing metallic mineral particles.

To corroborate the information, the crushers were subjected to analysis in specialized laboratories. The results reveal that the polished area (active area) of the artifact contains particles of silver, copper and gold, not as components of the rock, but as microscopic residues of ancestral metal extraction activities. Table 7 presents the results of specialized analysis of *Sample N. 17-05* from a crusher.

Presence of trace metals

SAMPLE 17-05	Copper, Cu (%)	Silver, Ag (%)	Gold,
1	3.71	96.28	
2	1.96	98.04	
3	19.37	80.63	
4	3.98	96.02	
5	8.86	14.88	76
6	n.d.	100	
7	13.73	13.90	72
8	n.d.	100	
9	3.24	96.76	
10	11.53	16.32	72
11	20.58	79.82	
12	4.61	95.39	
13	< 1 %	99.61	
14	< 1 %	97.42	

25 Marays and 35 crushers were recovered in this area and belong to the areas of pre-Hispanic mining activity.

Table 7.

Source: INPC Research Laboratory, June 2017

Evidence of metal ore residue in a crusher

Table 7 shows the results of the analysis of 14 microdeposits of the sample. Three of them evidenced the presence of the three metals, where gold (Au) is identified in predominant percentage, as shown in Figure 6.





Source: Romero and Tello. CPI, 2017.

Specialized analyses allow us to infer that the extractive activity is related to the period of Regional Development (A.D. 680). The result of the specialized analysis allows us to infer that these societies extracted metals for local use and possibly for short and longdistance exchange. It is necessary to mention that the tools used to extract metals are concentrated in an area where mining works were carried out. However, Marays with a single concavity were found in the upper part of most of the *tolas* (mounds). Based on this analysis, the people who occupied the *tolas* were linked to the mining activity, perhaps as overseers of the process.

The presence of metal pieces in the area of study allows us to infer about one more step in the socio-cultural division of labor and, therefore, in the diversification of productive activities in these organized societies. It is very clear that these peoples developed innovative knowledge of their environment to take advantage of natural resources, in this case metals. From the results of the specialized analysis of the tools, it is inferred that extraction of the metals is related to the period of Regional Development (A.D. 680).

The mining activity might have developed along goldsmithing. Using this technique, the people of this region made sumptuary, utilitarian, and everyday artifacts such as two axes¹² and an awl, temporarily related to the Integration period and the early years of the Spanish conquest.

The societies of that time built a complex social structure, expressed in, 1. the development of tools, 2. specialization in work, 3. distribution of space with allocation of habitational, communal work, metal extraction, goldsmithing, spinning, and ritual areas, 4. construction of multifunctional structures, 5. development of interregional exchange activities, and various forms of control and order.

The region in which the area of study is located, rich in resources, suffered the Inka and the Spanish incursions of conquest. There is limited information regarding the Inka expansion. Spanish chroniclers from the first years of conquest, collected data on the failed attempts of the Inkas to conquer the territory of the "jíbaros".

During the first contacts of the Spaniards with the natives of the American coasts, the conquers were amazed about the amount of gold ornaments that the chiefs wore. This provoked ambition I and eagerness to obtain information about the mines and the activities around the extraction of metals and precious stones. In what is now Ecuadorian territory, companies were formed, and expeditions were undertaken

In relation to these pieces, Wierhake (1985, 52) points out that "for the 16th century, but exclusively for the southern region, we find small copper axes. For the first time they are mentioned by Céspedes for the region of Zamora [...] Judging, according to the reports, we can only say that they were used as weapons, as a common characteristic".

12.

to the Amazon region, with the aim of obtaining the metals so highly prized by foreigners.

During the colonial period, the *Cañari* communities facilitated the access of the Spaniards to the regions later known as auriferous and even helped the Spaniards to obtain labor. The actions of people that knew their neighbors and the territories around them were crucial for the Spanish conquest and foundation of cities around the 'discovered' mines. Thus, in 1549, the city of Zamora was founded, knowing the gold wealth of the area. The mines of the area became very important, since other Spanish cities developed around them.

The gold mines in Zamora were known to the Spaniards as early as 1523 (Caillavet, 2000, p. 274). It is said that they obtained the references from the original inhabitants of those territories. The indigenous people of the area were the labor force in the mines and played a transcendental role in mining and complementary activities. In 1558, when several people were called to testify about the founding of Zamora, almost all of them stated that they were present at its foundation (1549) and at the discovery of the mines (Anda Aguirre, 1989, pp. 29-30).

Castro (2002, p. 33) points out that "in Zamora, the most important mines were those of Nambija and Magdalena", and Ginés de Hernández indicates that since 1563 gold was exploited in rivers and hills.

According to ethnohistoric data, 1563 would be a late year for the beginning of mining in the area. Ginés de Hernández points out that gold mining did not only take place in the hills, but also in the

rivers. These forms of gold extraction are still maintained among the inhabitants of the Ecuadorian Amazon and in the canton of Yantzaza.

As noted, the objective of the Spaniards when they conquered the southeastern territories of present-day Ecuador was to take advantage of the resources and labor for their own benefit, and that of the Crown. In the 16th century this territory was the "focal point of attention of the explorers". The first city foundations were based on mining activities, to such an extent that the cosmographer of the Indies, Juan López de Velasco, called them 'cities of gold mines'" (Castro, 2002, p. 33).

In the narratives of the Spaniards, we can read how much they collected of the coveted metal (gold), to send to the king. Gil Ramirez, for example, asked for a 700-peso piece of gold and a 500-peso piece of gold to be sent to him (Anda Aguirre, 1989, pp. 26-27). The metal must have been taken from the mines of Zamora, since "near the city, there was a great quantity of metals, the work and benefit of which would increase the royal crown" (Castro, 2002, p. 28).

Anda Aguirre (1989) refers that the mines of Nambija, Chungada and Chupanamá were the most famous of the time in the area. He emphasizes that the royal duties or tributes were paid with "tejos de oro" (Ingots of gold). The list of taxpayers was long, most of them were Spaniards; however, among them, there were three Indigenous individuals identified as Damián (Yanacona Indian), Francisco and Andrés (Cañaris Indians), who possibly held different ranks from the rest of the indigenous population and paid taxes from their mining activity. In the area around the city of Zamora, mining activity boomed and generated significant surpluses for the Crown during the first half of the 16th century. This led to the immediate establishment of the "Cajas Reales" (Royal Tresury) in Jaén, Valladolid, Zamora, and Santiago de las Montañas. In addition, parallel activities were developed in the sector to supply the population with consumer goods (Castro, 2002).

As Castro (2002, p. 36) points out, "the labor force that used to work in the mines was made up of the indigenous people of the area, as well as those brought from the highlands". The Indigenous people designated for mining work were called "curicamayos". The group of curicamayos formed a crew that worked seven months of the year. Initially, the age of the indigenous people for mining work was between 14 and 25 years old, but later the minimum age for working in the mines was set at 20 years old (Castro, 2002). This must have been because of health problems, mainly due to forced labor.

The chronicler Antonio de Herrera (1730, p. 41) notes in his accounts that at the time there were three ways of extracting gold:

- 1. In nuggets or flecks (as pumpkin seeds), pieces without mixture of other metal.
- 2. Vein, difficult to work with.
- 3. Gold dust, recovered in rivers or in places where rivers have passed through (alluvial deposits).

From this production, by the end of the 16th century, the remnant of the mining and other economic activities "was channeled in part to the Convent of the Nuns of the Conception, in the form of donations, inheritances and dowries" (Caillavet, 2000, p. 297).

In the first decades of the 17th century, mining activity maintained its importance within the economy of the colonial period. Under this context, the convent had become a lender. However, the convent failed to recover much of the capital in motion, so it entered into a process of seizure of the means of production, such as land and houses, which affected the mining activity and meant the beginning of its decline.

Another factor in the decline of mining production was the defrauding of the Royal Treasury by its officials, smelters and even the "neighbors of the town" (Anda Aguirre, 1989). In addition to this, there were some Spaniards who were not happy with their situation. The revolts also caused labor shortage, among other aspects. This is what María Soledad Castro (2002, p. 72) states:

> "The natives flee from their Encomiendas (granted lands), becoming part of those who will be impossible to subdue, offering permanent resistance..., in the mines, there are generalized uprisings of the natives, with the death and destruction of the Spanish populations."

In the following centuries, a legendary image of the region was forged, based on the news of the abundance of gold and the "ferocity of the jíbaros". The latter would prevent us from knowing more about the people who lived in those territories.

In the area around the city of Zamora, mining activity boomed and generated significant surpluses for the Crown during the first half of the 16th century

The mining tradition of the region, then, dates to before the Inka and Spanish conquests. In the colonial period a merciless exploitation was carried, until it led to the debacle, caused by the own actions of those in power. In spite of this, the mining activity survives until the present time with a different character, and in accordance with the socioeconomic and political changes in the region.



A Maray discovered in the area of study.



Recreation of the milling process to obtain metallic minerals.

The world of the symbolic

Symbolism could be defined as a set of forms of expression to represent ideas and facts through symbols. In this sense, humanity, from its beginnings, has created symbols to materialize its thought. The symbolic world of the social groups in the study area is expressed in different elements, such as body ornaments, monoliths, petroglyphs, figurines, appliqués and decorations in ceramics, lithic and metal pieces.

Among the lithic pieces, there is a very elaborated cylinder that may have been used as a body ornament for rituals, as a *bezote* (chin ornament) or a pendant.

There is also a monolith representing the distal end of a phallus. It is in a strategic place of transition between the two climatic zones, on a ridge ("cuchilla") with several embankments, with wide visibility towards the alluvial valley of the Zamora River. This place is an obligatory passage towards the zone of the Machinaza River, in which are the areas of hunting, harvesting, and extraction of metals, among others.

The site where the monolith is located allows to monitor economic activities, obtaining forest resources, and controlling the use of sacred waterfalls. Waterfalls are recognized as such by the communities in the present. It is also inferred that ritual places and their ceremonies served to have some form of control over the community.

Moreover, the elements located around the distal end of the phallus are considered offerings of a ritual-sacred place. Among these, a set of three vessels were identified, one inside the other¹³. In the interior of one pot, the analysis of micro remains identified maize, sweet potato, and yucca¹⁴. According to present inhabitants of the area, these plants are ingredients to prepare a feast drink. In the past, this preparation would have been related to sacred and ritual moments. Adjacent to the monolith, there were post holes of a structure for ritual activities or the home of one or several individuals who guarded this access.

As mentioned above, past social groups observed, knew, and transformed materials such as rocks. A large natural stone of cubic shape with numerous small indentations, product of erosion, was identified. It is observed that these depressions were connected to each other with straight lines, made on purpose. The group of elements on this stone may have an ideological, geographical or religious context, a fact that has not yet been deciphered.

13.

This cultural behavior was also recorded in the alluvial valley, where a set of three vessels, one inside the other, was recovered in a previous study.

14.

Results of specialized analyses on samples taken from inside the pots.



Figure 7. Cut section of the monolith





Monolith representing the distal end of a phallus, located in an area considered as a place for ritual activities.

Figure 7.

Representation of the distal end of the phallus.

Machinaza Architecture

These societies or groups that inhabited the area of study were skilled builders from early to late periods. Several holes or post holes used to build dwellings and spaces for community use were identified in the embankments and the alluvial valley. Based on this evidence, these pre-Hispanic sites were occupied and reoccupied, part of a cultural continuity that still subsists.

Figures 8-10 display illustrations made from the identified post holes. Based on the location and distribution of the holes, three houses have been projected; and, in order to interpret their forms, an analogy was made with ethnographically reported structures in the region.



Representation of a pre-Hispanic house from the projection of post holes.

Figure 8. Plan and projection of a structure, house 1





This illustration was made from the projection of house 1, with an estimated area between 8 and 9 m². This construction might have been exclusively residential, as ceramic fragments showing domestic activities were identified in the interior of the structure.

Elaboration: INVACMA 2020

MACHINAZA CULTURE

CHAPTER IV

Figure 9. Plan and projection of structure, house 2







House 2, also illustrated from a projection, is a construction possibly without walls. It resembles present-day Shuar community constructions. From the distribution of the post holes, it can be deduced that the building had an oval shape, with an area of 18 m², for communal use. It is probable that mining activities were developed in this space; this is inferred from the finding of a Maray and a crusher adjacent to the structure.

Elaboration: INVACMA 2020

Figure 10. Plan and projection of structure, house 3









From the layout of the post holes, it can be stated that the structure's floor plan was formed by nine elements (holes) that form an oval shape, extended to the southwest and slightly to the east. An attached or independent structure is observed, possibly for a complementary activity. The spatial distribution suggests a domestic use of this structure.

Local and regional exchange

The identification of Andean species such as polylepis (*Polylepis* sp.) and quishuar (*Buddleja* sp.) in the area of study demonstrates the existence of trade between the societies of the Andean lands, the Montane-forest, or the Amazonian piedmont. The human groups that inhabited this area travelled long distances in search of resources and established exchange relationships with Andean and Amazonian peoples, along with intermediate social groups, who were the "facilitators of these interethnic exchanges" (INVACMA, 2018, p. 70). Some researchers propose that "the Jibaros" used the high part of the Andes Mountain range, above 2,800 meters. Based on this reference, these people might have taken advantage of the botanic resources and carried them eastward, to their usual territories. True or not, the two mentioned Andean species provide information on the knowledge and use of two different ecosystems.

Montane-forest riverside settlement pattern

Considering the results of the studies developed within the Archaeological Research Program of the FDN* project, this research states that there was a cultural practice that included use of the landscape, spatial distribution, and socio-economic development, which was forged over time. This cultural practice has been called the 'Montane-forest riverside settlement pattern' (Figure 11), which constitutes a methodological interpretation to define and understand the historical-cultural process of the pre-Hispanic societies that occupied the area under study.

A first cultural indicator is the occupation of the natural space by early human groups. Another trace of the use of the space is found on the ridges ("cuchillas"), in which, intentionally, embankments have been adapted. In these places, sets of post holes have been found, showing the existence of dwellings. At the same time, the ridges ("cuchillas"), due to the geomorphology of the area, are in the direction of both the Machinaza River and the Zamora River. These people were adapted to two climatic zones, the high rainy and cloudy zone, and the low or alluvial valley, a hot and clear zone. Therefore, they maintained a vertical control and direct access to the diversity of resources. As organized societies they managed the environmental resources in a complementary manner.

Other indicators that characterize the settlement pattern are the constructions of tolas or artificial mounds and the depressed constructions. In addition, places for ritual activities and surveillance demonstrate cultural traits and patterns of daily activities, a legacy for future generations. Additionally, another characteristic of the settlement model is the link between the architectural components -embankments or tolas- and their peripheral areas where several subsistence activities were carried out.

Figure 11 shows a representation of the use and exploitation of space in the two climatic zones. In the upper zone, where ridges ("cuchillas") are found, they adapted to build embankments and settle their dwellings; in the lower zone or alluvial valley there are the tolas and semicircles.

The historical development of society is due to its constant activity of adaptation, experimentation, broadening knowledge, and extraction and modification of natural resources to meet the individual and community demands.

The human groups that inhabited the area of study traveled in search of resources, and established exchange relations with Andean and Amazonian peoples.

FDN*. Fruta del Norte There was a cultural practice use of the landscape, spatial distribution, and development, which was forged over time. This cultural practice is called "Montane-forest riverside settlement". Graphic scheme

Figure 11.

Montane-forest riverside settlement pattern Source: Lundin Gold and INVACMA 2020



in the

5.

Conclusions: Archaeological Contributions, Mining and Culture

Radiocarbon dates confirm human presence since the Paleoindian.

Knowing the ways in which human beings relate to their environment in each era allows us to understand their process of observation, experimentation, accumulation of knowledge and patterns of use. In addition, we gain a better understanding about how they took advantage of the environmental resources to satisfy individual and collective needs; in short, their socio-economical development.

The most relevant research question of this project has been to define the settlement pattern as the model of occupation in pre-Hispanic times. This was characterized by the use and exploitation of the alluvial valleys located in the lowlands and the irregular terrain -mountain ridges- in the highlands. Pre-Hispanic societies developed here, and its temporality covers the four great periods that mark and characterize the Ecuadorian archaeology: Preceramic or Paleo-Indian from 10000-8000 B.C. to 4000-3500 B.C.; Formative from 4000-3500 B.C. - 300 B.C.; Regional Development 300 B.C. - A.D. 800.; and, A.D. 800 - A.D. 1500. The radiocarbon dates show that human groups of the early period (Preceramic or Paleo-Indian) were in the east of the studied territory, while the evidence is recorded in a westerly direction, that is, on the left bank of the Zamora River, the dates are associated with the late period (Integration). This archaeological data suggests mobility of populations in a specific time and space. The material evidence - pottery, lithic, wooden artifacts, and metals - recovered, analyzed, and correlated with radiocarbon dating, imply a development of these societies during thousands of years, from east to west.

Over the course of thousands of years, these societies knew, experimented, modified, constructed, learned, and took advantage of the environmental resources to cover individual and collective needs. As a society becomes more complex, new needs are generated, as well as new techniques and ways of producing its goods. Economic activities different from the usual ones are incorporated, and exclusive sacred areas are established. In the dynamics of growth, development and mobility, these societies interacted with other local human groups and, over long distances, with highland and *paramo* societies in the Eastern Cordillera. This is shown by the evidence of high-altitude Andean plants, considered sacred to this day, such as, the *quishuar*.

Regarding the occupation of the earliest period, Paleoindian, the evidence points to the use of regular and natural surfaces. On the other hand, for the following archaeological periods, intentionally flattened surfaces, known as embankments, have been identified along the mountain ridges. In these spaces, different types of permanent and temporary structures were built.

This conclusion is reached based on the presence of imprints of wooden posts. These show the existence of living structures for



INVACMA team recovering pot from the area of study

daily life activities; communal enclosures for productive activities; temporary camps associated with hunting and gathering of complementary products for their daily life; and enclosures for ritual activities.

In the alluvial valley they erected groups of buildings including *tolas* (mounds), small piles of stones, semicircles constructed below ground level and internal road. These modifications to the landscape surely required a strong and sustained work of the inhabitants of the

area, which speaks of a social and political organization with sufficient resources and knowledge of the environment.

In addition to the architectural evidence, a large and complex set of artifacts was identified, produced with diverse local raw materials. The ceramic artifacts, abundant, varied, and recurrent, express the habits and realities of native peoples.

The ceramic utensils, such as pots, bowls, plates, ornaments, and fragments with figurative representations, have been produced with clay of poor quality; nevertheless, they are well elaborated and some of them are decorated. The technique used to manufacture this artifact and at the same time to decorate it is coiling; generally, the finishes are of smoothed and polished surfaces. There are also artifacts with incisions and excisions that form decorative motifs, as well as some with appliqués and painting. In general terms, the ceramic tools present simple patterns in terms of their construction.

The different analyses carried out on the set of ceramics allow us to establish some links with daily activities. Preparation of food might be related to the presence of soot adhered to the exterior surfaces of vessels. Temporary economic and symbolic activities are related soot in the interior of vessels. Likewise, studies have revealed ornamented artifacts with special surface treatment for use in ritual activities. Examples are faunal motifs, such as the recreation of arms and hands of a sloth on a vessel, and recreations of human feet on possible figurines, among others.

On the other hand, the ceramic assemblage includes the so-called "torteros", which complemented the spindle whorls in the spinning mill, with their own functions within the production of threads, with

The ceramic artifacts, abundant, varied and recurrent, express the habits and realities of native peoples. which they could make textiles. Since several of these artifacts have decorations, it can be inferred that they must have had a symbolic meaning within the community.

Regarding the lithics assemblage, a group was linked to subsistence activities. Among them, a *metate* and grinding hands with modified, polished surfaces, and the presence of points of percussions, were identified; all of them have been used to reduce and produce food. A second group of lithic artifacts, related to activities to obtain metallic raw materials were found. Thus, those defined as 'Maray' (Manual/ Sway rock crusher) and 'crushers' were identified, which together operated to reduce rocks. A third group of these artifacts was related to ritual activities, as a production chain was identified, with the structural modification of some axes. Starting with defined forms and polished surfaces, underwent modifications through the carving technique to be reused and possibly associated with ritual processes.

Monoliths carved in rock make up a fourth group of lithic evidence and have also been considered symbolic in nature. In this category we find the distal end of a phallus, located in what has been defined as a sacred-ritual area.

In this area, lithic and ceramic objects were identified, intentionally deposited as offerings. The location of this space is strategic for control of the landscape.

In addition to the study of the material evidence recorded in the archaeological excavations, specialized analysis of soil samples, dating of burned organic materials -charcoal-, identification of botanical species, identification of metal micro-remains, pigment tests, and chemical tests of metals were carried out. The results have made it possible to establish the inferences reached in the archaeological study.

The archaeological research in the area of study contrast with the proposals of researchers of the last century, who stated that the inhabitants of the Amazon were only capable of adapting and accommodating themselves to the surrounding environment, since the ecological conditions of the Amazon did not make it suitable for the development of complex societies.

Social Identity (Cédula Social)

The past and the present of a community

All Ecuadorians carry an identity card, which contains our basic data and that allows other people to recognize us. The social identity is born from the same principle, but as a society, what is the data that allow us, as a society, to recognize and distinguish ourselves from others?

The social identity constitutes all the knowledge that contributes to a socio-cultural and historical process of the country as a whole. Each of the inhabitants of our territory since pre-Hispanic times has contributed with their presence, knowledge, and experience to be who we are today.

The social identity constitutes all the knowledge that contributes to the socio-cultural historical process of Ecuador

Archaeological research linked to the construction of infrastructure and development works, carried out in a serious and scientific manner, gives us the opportunity to visualize the presence of societies in remote, apparently unpopulated places, and to reveal their knowledge and culture; thus, contributing significantly to the construction of social identity.

The term social identity has been coined from previous years based on the experience, knowledge, and reflection of the archaeologists of this research program. It is a set of elements of the socio-historical process of a human group, which is reflected in its worldview, cultural expressions, organization, identity, cultural practices, and relations with other human groups.

Archaeology is the science that studies, describes, and interprets the historical changes of past societies through the vestiges of human activity. The investigation of the area of study has fulfilled the postulates of studying, describing, and interpreting the ways of life of the societies that occupied this territory from the Paleo-Indian period to the Integration period.

The results of archaeological studies speak of societies that had ideas to create, to transform and to take advantage of what the environment offered them; this determined their development, their way of looking at and relating to the world, their cultural habits, and their ways of transmitting their knowledge. Disseminating the recovered information is a responsibility towards society. This is how archaeology contributes to the appropriation and strengthening of the social identity, which is a set of elements of the socio-historical process of a human group, containing elements generated and bequeathed through time. In this continuum, societies create, transform, adapt, and develop strategies to sustain life and satisfy human needs.

Disseminating this study becomes a responsibility towards society.

SOCIAL IDENTITY



Beautiful ceramic vessels, result of a restoration; today, they are part of the national heritage of the Ecuadorians.

The social identity also includes the cultural identity as a set of values, traditions, beliefs, symbols, and customs; it also incorporates the ways of producing material goods, of relating to nature and human beings, and the perception of belonging to a human group.

Archaeology and history play a transcendental role in helping people recognize their social identity, a dynamic, changing, and driving component of their existence. For current generations, knowing their social identity means valuing the legacy of their ancestors, the obligation to enrich it and to empower themselves with this heritage, to increase their sense of belonging.

Gallery: Heritage expressions of the Machizana Culture

During the ten years of research in the study area, cultural evidence was found that demonstrates the presence of human beings in the area for thousands of years.

With a careful and methodical excavation, around two hundred thousand archaeological material remains were recovered, including ceramic, lithic, metal objects, and information.

In this publication you will be able to see part of this cultural evidence. These discoveries suggest that part of the ancestral identity of Ecuadorians comes from the Amazon.

> In this section, place the cursor on the archaeological piece, wait a moment and additional information will appear.



MACHINAZA CULTURE



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MACHINAZA CULTURE

GALLERY



MACHINAZA CULTURE

GALLERY



Acknowledgements

More than 200 people from the area of influence in the Fruta del Norte project actively participated in this archaeological research program.

They were part of INVACMA's team, integrated by archaeologists, historians, anthropologists, geologists, conservators, geographers, paleontologists, chemists, biologists, designers, communicators, technicians, and administrative personnel. The results of the specialized analyses carried out at the Escuela Politécnica Nacional (National Polytechnic School), at ESPE - Innovativa - EP, at INPC, at Beta Analytic and at ArqueBios, contributed to important conclusions about the societies settled in the studied territory, all of which allowed the research program to conclude successfully. An important part of this process was, without a doubt, the professional team of Lundin Gold's Environment and Permits Department.

We would like to thank the people, institutions and organizations that contributed to the execution of the program and reiterate our commitment to continue with the challenge of ensuring the protection of archaeological heritage.
Glossary

Absolute chronology

It refers to the ages of archaeological materials, with approximate dates. It is established through scientific processes on the results of which relationships and inferences can be determined.

Alluvial plain

Valley floor formed by sediments deposited when the river rises above the banks, which rise a few feet above the usual bed. The alluvial plain is subject to flooding typical of the fluvial water regime and, consequently, to lateral channel erosion processes. The alluvial plain, associated with the terraces of the Zamora River, has a flat to semi-flat topography, with small swampy sectors and the presence of water erosion processes; colluvial deposits and recent landslides occasionally appear here, forming small mounds and soils with agricultural aptitudes.

Alluvial valley

Depression of the surfaces located on the banks of rivers delimited by hills or mountains, whose slopes descend towards a body of water - river or lake. This geological formation is caused by water erosion.

Archaeobotany

This subdiscipline studies botanical elements of the past, both macroremains (carbonized wood, seeds, charcoals) and microremains (phytoliths, pollen, etc.) related to archaeological evidence (Pearsall, 2000). The results of these analyses provide information on agricultural activities, food production, forest harvesting, paleoclimate, and presence of exogenous species, as well as changes in the ecosystem due to anthropogenic and natural factors. These analyses are performed by a specialist.

Archaeological data

Tangible, measurable, concrete object or artifact that is part of a context. It is the reference to decipher, illustrate or reconstruct a social fact.

Archaeological monitoring

Technical observation during earth removal. Its objective is to systematically record and recover any cultural evidence that has not been identified in previous archaeological study phases.

Archaeological rescue or excavation

An emerging systematic study, in a short and planned time, applying scientific methods to recover archaeological evidence and associated information. Archaeological excavation is usually applied when the archaeological evidence may be altered by human action. Archaeological rescue is one of the mitigation measures.

Archaeological survey

Systematic search for archaeological evidence, both on the surface and underground, based on techniques of identification and recovery of material and information from past societies. Archaeological survey can be of two types: intrusive and non-intrusive. It is the procedure by means of which the archaeologist contacts the place in which the vestiges of the social activity are located. These places include the natural environment or habitat, the existing resources and the spaces modified by man, such as settlements, roads, irrigation works, or cultivation fields. The illustrations, recorded descriptions, and taken measurements must be made as neatly as those carried out in an excavation (Lumbreras, 2005, p. 90).

Archaeology

A social science that studies, describes and interprets the changes in the historical process of past societies. It obtains information from cultural vestiges that display the material transformation generated by human activities in a given time and space.

Area of study

Methodologically, this is the name given to the area that is the subject of the research. It extends from the Machinaza River in the east to the Zamora River in the west, practically horizontally; it is approximately 17 km long by 2 km wide -in a straight line-(Aquilera, 2016).

Artifacts

Elements that show patterns of human production, and attributes linked to productive, domestic, or ritual activities.

Chorology

Spatial distribution of the types of artifacts in a region. The types are the forms with which a society manifested itself during a historical moment and that, at the same time, differentiated them from other societies. Chorology makes it possible to establish the characteristics of the cultural areas that represent the territories over which an ethnic group acted, that is, the ways or forms in which a society expressed itself at a given moment in its history and which made it different from others (Childe, 1973; Echeverría, 2011, p. 76).

Crusher

Lithic artifact of ovoid or rectangular shape of different sizes and dimensions that allows manipulation. The use of this type of stone is linked to rock or sand grinding activities to extract metallic minerals. The perimeter exposed to work presents a polished area, product of friction (Invacma, 2018).

Depressed construction

Anthropic excavations open below surface level, semicircular in shape and of varied sizes and functions, recorded in the archaeological research of the area of study in the province of Zamora Chinchipe.

Ecofacts

Non-cultural elements, i.e., not intentionally produced by humans, for example, sediments, soils, carbonized seeds, charcoal. However, they provide information for correlating, inferring, and establishing relationships within archaeological studies.

Embankment

Anthropic adaptation of the terrain, especially in sloping topography, which always forms a slope and a flat part, generating a 90o angle. It is a space of occupation, essentially habitational or ritual (Aguilera, 2016).

Facilitators of interethnic exchange

For the purposes of this study, this has been called the settlers settled in intermediate spaces, who in past times facilitated the exchange of goods between the Amazon and the Inter-Andean region or in the Littoral and vice versa (Invacma, 2017).

Heterarchv

Subsystems or organizational networks whose components share the same position of power and authority, are equal and maintain a horizontal relationship, which is why they are considered in opposition to hierarchy (Perlo et al., n.d.). Other researchers posit that hierarchy and heterarchy can coexist in a society (Dillehay, 2006; Izquierdo and De la Cueva, 2018).

Maray (lithic) (Manual/Sway rock crusher)

They are large stones with concave surfaces -from one to four hollows-. They are generally rectangular, quadrangular and in a few cases oval; these tools must have been used as a base for crushing rocks and obtaining minerals (Echeverría, 2011; Lira, 1982; Moreno, 1955).

Metate(lithic) (Mealing stone)

Stone used intentionally to grind or crush vegetables and minerals; it is used in domestic activities to this day. It has a complement, the grinding hand, also made of stone.

Monolith

Monument made of a single piece of stone (Diccionario de la Lengua Española, RAE (Dictionary of the Spanish Language, RAE)).

Montane-forest riverside settlement

This category was incorporated into archaeological studies. It is defined as a cultural behavior of the aboriginal peoples who inhabited the mountain ridge. An essential part of this behavior is the transformation of the landscape, the occupation of valleys, embankments, alluvial terraces, and mountain ridge lines, to take refuge from the inclement environment, and to form temporary and permanent occupations. In the process, it generated a more complex social structure (INVACMA, 2016).

Mound

Construction above ground level, hemispherical in shape, made of stone, earth or mixed.

Natural event

Refers to mass movements, volcanic eruptions, lahars, floods, erosion due to hydrological and aeolian agents that alter natural and cultural strata. They are of interest for the studies since they could have disturbed the life of the societies of the past.

Periods of the Ecuadorian archaeology

These are the stages in the development of humanity. A period is a range of time during which activities or events of human groups have developed. The periodization of Ecuadorian archaeology was first discussed by Jijón and Caamaño (1997 [1952]). Later Estrada (1962), Evans and Meggers (1958), Porras (1987) and Ortiz (1981). In 1996, the Central Bank of Ecuador -through the Anthropology Unit- proposed a periodization that is currently used by most researchers. Thus, the periods of Ecuadorian archaeology are four: Preceramic or Paleo-Indian from 10000- 8000 B.C. to 4000-3500 B.C.; Formative from 4000-3500 B.C. - 300 B.C.; Regional Development 300 B.C. - A.D. 800, and A.D. 800 - A.D. 1500.

Phallus

Symbol of the representation of the virile organ, used by ancient societies in festivals and ceremonies. It is venerated in various cultures and since ancient times (Echeverría, 2011).

Phytoliths

Microbodies of varied size and shape that are produced in the plant organism as a consequence of a mineralization process; they remain in the place where the plant of the area or exogenous plant was found, transported anthropically. Their presence in cultural strata and archaeological contexts is due to these "three characteristics of phytoliths: perdurability, inalterability and the ability to offer a general anatomical representation and a broader taxonomic coverage" (Zurro, 2006). These microscopic elements make it possible to identify the plant or vegetable to which they correspond.

Plan of structure

Surface bounded by post holes or walls that maintain rectangular, quadrangular, circular, and oval patterns. These structure plans are one of the pieces of evidence of the cultural behavior of the societies of the past.

Post hole

Also referred to as a post footprint, it refers to the imprint left by vertical supports driven into the ground; they are generally considered marks of a structure plant. Post holes may contain stones that at one time would have been used as wedges.

Relative chronology

It is established through a procedure by which two or more artifacts can be compared and allows sequential and temporal order. The contemporaneity of the artifacts is determined.

Ridge ("Cuchilla")

An elongated undulation in the terrain, found between rivers, streams or estuaries, and bifurcating into secondary branches. In the case of this study, the ridges ("cuchillas") are oriented towards the alluvial valleys and, therefore, towards the rivers.

Salvage archaeology

Salvage archaeology (or Cultural Resource Management) consists of a systematic recovery of archaeological evidence, in the shortest possible time, based on appropriate techniques for identification and recovery of material remains and other information from ancestral peoples. It allows reliable results to interpret tangible and intangible evidence of socio-cultural processes (Aguilera, 2006, p. 3).

Settlement

Space of occupation of a human group, which includes artifacts and ecofacts (ceramics, lithics, bones, metals, wood, shells, among others) and anthropic adaptations (rests of structures, roads, etc.). The information gathered in the archaeological study allows us to understand the historical process of peoples and the human-environmental interaction. An archaeological settlement can be recorded and analyzed based on the following elements: a) artifacts, b) ecofacts, c) anthropic alterations, d) cultural deposits, and e) archaeological contexts.

Tola (Mound)

Artificial mound that usually appears in a set of several units and, in some cases, as one. It can be of different heights and geometric shapes -rectangular, quadrangular, with ramp, without ramp among other characteristics-. A tola is generally multifunctional.

Tortero (ceramic) (Spindle whorl)

Ceramic artifact, rounded in shape, perforated in the center. It is part of the spinning tool -huso- and its function is to facilitate the rotary movement to elaborate the thread. In the Amazon, in the mountainous region, the Shuar communities call it "charapa" (Arrau turtles).

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