

Volume 2, Issue 3

Research Article

Date of Submission: 30 July, 2026

Date of Acceptance: 21 Aug, 2026

Date of Publication: 31 Aug, 2026

Research on the Ancestors of Humankind on Juehua Island — The Coastal Mountain Dwelling Civilization

Jin Chunhua* 

Department of Engineering Management, School of Business Administration, Liaoning Technical University, China

***Corresponding Author:**

Jin Chunhua, Department of Engineering Management, School of Business Administration, Liaoning Technical University, China.

Citation: Chunhua, J. (2026). Research on the Ancestors of Humankind on Juehua Island — The Coastal Mountain Dwelling Civilization. *J Interdiscip Hist Hum Soc*, 2(3), 01-19.

Abstract

Abundant fossil footprints left by shod and barefoot ancient humans have been preserved along the coast of Juehua Island, western Liaoning, China. These footprints exhibit distinct morphological characteristics of different foot types. The general prominent features of primitive footwear are inferred via geometric trace analysis of compression marks produced by shod human steps. Combined with previous relevant research findings and published literature, a preliminary identification is reached: the ancestral humans possessed highly sophisticated material culture and technological civilisation. This geological epoch coincided with a major species radiation event on Earth, during which clan tribes and social division of labour likely emerged. Traces of ancestral human activities have also been uncovered at multiple sites across the Huludao area, which were once dominated by bays and lagoons. For survival and security, the ancestral humans most probably constructed dwellings with stone materials, choosing settlements adjacent to water sources and mountain slopes; this civilization is hereby designated the Coastal Mountain Dwelling Civilisation. Geometric contour and kinematic analysis is conducted on partial details of a mural depicting a female figure riding a horse on a beach. A dragon-like creature appears coiled in the figure's left hand, while a phoenix-like avian creature flies beside her footwear. This female figure is identified as the tribal leader of the ancestral human community, indicating a probable matrilineal society during that period. Evidence from clan labour division demonstrates that these ancestral humans engaged in marine fishing, hunting, crop cultivation and animal husbandry. Accordingly, the discovery of fossil footprints on Juehua Island in western Liaoning, China, provides crucial clues and fossil evidence for research into the origins of humankind and the genesis of human civilisation.

Keywords: Human Fossil Footprints, Coastal Mountain Dwelling Civilization, Clan Division of Labor, Matrilineal Society

Introduction

Historical traces of human mountain-side settlements can be found across the globe. Human habitation in the Alps dates back centuries ago, and mountain architecture embodies multiple values related to historical context, communal regional life, and conventional behavioural traditions [1]. The earliest mountain-dwelling activities in China originated in remote antiquity and were well documented in ancient historical records, for instance, the historical account that "Yao appointed Qi to instruct people to dwell in mountainous areas" [2,3]. In the early 20th century, Zhang Taiyan put forward a relevant viewpoint. In his essay *On the Theory That Emperors Resided in Mountains During the Theocratic Era*, he verified ancient Chinese official systems and concluded that all sovereigns in ancient times lived in mountain dwellings, arguing that "emperors resided in mountains so as to uphold dignity and an air of mysticism" [3,4]. Mountain dwelling has even evolved into a classic theme in culture and art, inspiring numerous qin melodies, landscape paintings and poems. A representative work is *Fu on Mountain Dwelling* composed by Xie Lingyun during the Six Dynasties [5,6]. This settlement culture and corresponding civilization have been passed down in certain regions. The ancestors of the

Hakka people in China experienced several large-scale migrations, leaving the Central Plains for their present habitats. They mostly constructed houses against mountains and subsisted on mountain resources, hence the name “Hakka (Mountain Guests)” [7]. Yangshan Village in Zhenghe Township, Guiyang County, Hunan Province, China, was first built during the Hongzhi reign of the Ming Dynasty. The village faces south with its back to the mountain, where buildings are erected along hillsides and settlements clustered beside watercourses .

Regarding the construction materials of these hillside buildings, stone ranks among the most ancient building materials. Owing to its sturdiness and durability, its material properties align with humanity’s pursuit of permanence, and it has been widely adopted in both Eastern and Western civilizations [8]. Europe is endowed with abundant stone resources. Croatia boasts a long history of stone utilization dating back to the 1st century AD. Its most renowned building material is a hard, high-density ivory limestone, which is still employed in restoration projects in Venice, as it has been proven to be the sole high-quality material for constructing aquatic architectures. Portugal is the world’s fifth-largest producer of natural stone, with marble and decorative stone industries counting among its oldest traditional sectors [9]. For this reason, traditional Western architecture is hailed as “a historical chronicle carved in stone”. Stone buildings erected along mountain slopes are ubiquitous. Following the 11th century, Europe entered an era of stone castles, with a great number of masonry castles erected on mountain tops and hillsides serving as highly defensible strongholds.

The earliest use of stone structures by humans can be traced back to archaic hominins. Constrained by underdeveloped productive forces, early hominins inhabited rock caves, which are regarded by contemporary scholars as the primary residential form of human ancestors. Based on fossil human footprints discovered along the coastline of Juehua Island, this paper identifies the residential patterns and civilizational characteristics of humans during the Early Cretaceous Epoch.

Clan Characteristics and Occupational Division Reflected by Human Fossil Footprints

Shod Footprints

Fossil footprints left by shod humans during locomotion are preserved along the coastline of Juehua Island. Several typical footprints produced by footwear are listed as follows.



Figure 1: Shod Footprint No. 1



Figure 2: Partial Illustrations of Footwear Impressions

Description of Specimen CCD-03

Geometric contour and sole morphology analysis of this footprint reveal no diagnostic features of barefoot compression, which conform well to the characteristics of impressions produced by human footwear, and it bears distinct attributes of a left shoe. The morphological features of the footwear impression are as follows: the forepart of the sole is relatively broad and rounded, with a smooth arc transition along the sole perimeter. These sole signatures reflect the structural properties of the original shoe. Panels A and B in Figure 2 illustrate wula boots, a type of traditional folk footwear in China. Such boots feature a broad and rounded toe cap with an arced transition between the toe and sole, which readily generates footprint impressions highly analogous to the specimen.

Description of Specimen CCD-04

This footprint is also identified as a compression trace from shod human locomotion. The anterior and posterior sections of the impression exhibit greater indentation depth, whereas the central region is shallower. These traits indicate the presence of a heel fixed at the rear portion of the sole. Panels C and D in Figure 2 correspond to two types of traditional high-heeled footwear: Panel C shows a felt high-heeled boot, and Panel D a rubber rain boot for miners. During natural human walking, the heel strikes the ground first, creating a deep pit matching the outline of the heel on the beach sediment. The segment between the heel and forefoot sole is suspended above the ground, resulting in negligible or extremely shallow indentation within this zone. The forefoot section of the sole is likewise broad and rounded with an arced peripheral transition. This morphology indicates a wide rounded toe integrated with the sole via curved blending. When the wearer lifts the forefoot away from loose beach sediment, the tip of the foot bends backward and shears the sediment, leaving curved margins along both the sole edge and the indentation pit.

It can be concluded from the above analysis that this footprint was most likely left by a rounded-toe high-heeled rain boot. This evidence confirms that high-heeled footwear had already emerged during this period, with wide rounded toe and sole structures manufactured via integral one-step forming techniques.



Figure 3: Second Shod Footprint

Both impressions in Figure 3 are flat-soled shoe prints. Specimen WCD-03 is an adult footwear impression whose margins have been eroded by seawater, suggesting it may represent an older trace. Estimated by modern proportional standards, the corresponding individual stood approximately 2 meters tall. Specimen WCD-04 was impressed in muddy sediment within the tidal zone, with residual mud adhering to the sole still preserved. Based on modern body proportion conversion, the maker was roughly 1 meter in height, indicating a child individual.



Figure 4: Shod Footprint No. 3

Description of Specimen CCD-05 This impression is a footwear trace left by an adult individual wearing shoes. The length-width ratio of the shoe print is relatively low, indicating that the shoe maker was an elderly adult with broad feet. This feature also demonstrates the sophisticated shoemaking craftsmanship of that era, which enabled customized footwear tailored to individual foot morphologies.

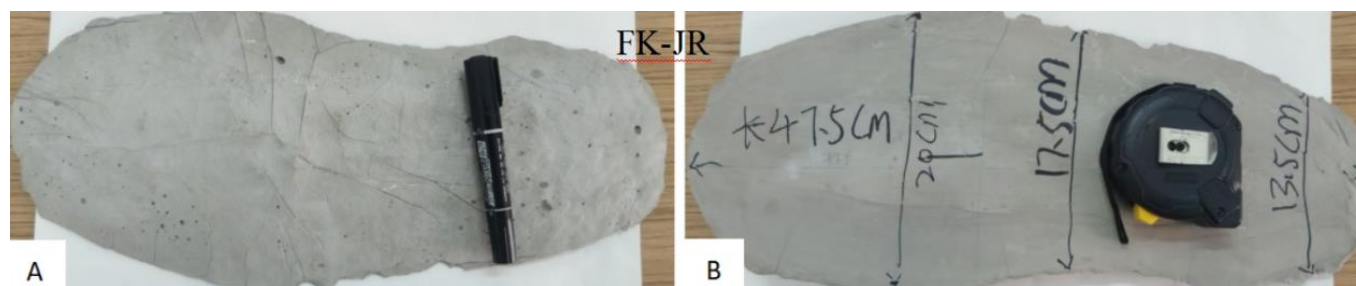


Figure 5: Shod Footprint No. 4

Description of FK-JR

This specimen is a replica derived from a fossilized shod human footprint. Panel A displays one side of the shoe sole with relatively uniform compression depth, which is identifiable as a distinct right shoe impression. This evidence indicates that humans of that era had mastered shoemaking techniques capable of producing properly fitted footwear differentiated for the left and right feet.

In addition, specimens WCD-01, CCD-02 and CGS-03 recorded in Reference also belong to shod footprints. Judging from these shod fossil footprints preserved by ancestral humans, it can be inferred that they had developed mature shoemaking techniques capable of customizing footwear according to age groups, foot morphologies and practical occupational demands, and could produce both flat-heeled and high-heeled styles to meet diverse functional needs. It is highly probable that they had already mastered multi-material and multi-process shoemaking technologies at that stage [10].

Evidence for Occupational Division of Labor

Given the relatively advanced civilization level of ancestral humans, it is necessary to discuss whether specialized skills and occupational division had emerged. On the premise that occupational differentiation existed, the prerequisite conditions for such a division are analyzed as follows.

A Highly Developed Material And Technological Civilization

It can be inferred from the shod footprints that shoemaking craftsmanship had reached a relatively high standard at that time. The costumes and satchel carried by the female figure in the documented mural depicting a woman riding a horse demonstrate that the ancestral humans had mastered the fabrication of garments, headwear and footwear. Such manufacturing capacity relied on a complete supporting system of material foundations and technical means including crop cultivation and textile processing.

Large-sized beach anchors of varying specifications unearthed from ancient Juehua Island confirm the emergence of shipbuilding techniques and navigation, which laid a technical foundation for pelagic marine fishery activities. Apart from wooden vessels, large ships were likely constructed from metals, with corresponding metallic anchors alongside metallic daggers and shovels. These artifacts collectively attest to the existence of geological prospecting, mineral exploration, ore mining and processing, metallurgy, as well as mechanical machining and manufacturing. Furthermore, large vessels could not rely solely on sails for propulsion; it is highly plausible that steam power or fossil energy such as coal mining was utilized to supply thermal energy.

The capacity to evade geological disasters and evacuate in advance required scientific and technological support encompassing geoscience, astronomy, surveying and geological hazard forecasting. The ancestors were able to predict risks beforehand and execute large-scale organized migrations to safe zones in a scientific and orderly manner, a capability that may even surpass that of modern humans. It is further speculated that they possessed the ability for global oceanic exploration and geographical survey, with comprehensive cognition of global topography to determine migration destinations [11].

Judging from the regal attire of the horse-riding female leader, the group had mastered equestrian skills, and presumably developed animal husbandry and breeding techniques as well as sophisticated medical practices. The advancement of human civilization correlates with a growing diversity of specialized occupations and trades, which eventually leads to occupational specialization. This constitutes the fundamental prerequisite and inevitable developmental outcome of a sophisticated civilization.

Massive Population Explosion of Organisms

According to paleogeographic research on the coastal zone of western Liaoning, vast gulf systems were distributed across Huludao and Jinzhou, with swampy delta environments formed where freshwater rivers discharged into the sea along the shoreline. The Xingcheng area featured mangrove wetlands at the confluence of freshwater and seawater, as well as lagoons dominated by freshwater input. Both regions contained extensive coastal mountains and inland mountainous terrains, alongside slopes shaped by arched tectonic structures. Distinct ecological communities developed within these habitats, including nearshore aquatic communities, arched-slope communities, mountain highland communities, mangrove communities, grassland communities, lagoon communities, and coastal wetland plain communities, each sustaining unique assemblages of organisms adapted to local environmental conditions.

The Jehol Biota preserved abundant fossil traces of coeval organisms in the inland parts of western Liaoning. Fossil footprints from the contemporaneous Juehua Island coastline have been identified by Jin Chunhua, with confirmed avian taxa including chickens and ostriches. Recognized mammalian groups comprise monkeys, dogs, cats, large felids, rabbits, horses, cattle, sheep, donkeys, camels, pigs, deer, brown bears, Asiatic black bears, Ailuropoda (giant pandas), rhinoceroses and other species. For detailed analyses and investigations, refer to Jin Chunhua's monograph Coastal Mountain Dwelling Civilization. In addition, a large variety of herbivorous and carnivorous terrestrial, aquatic and amphibious dinosaurs inhabited this ecosystem.

To survive and coexist with numerous wild beasts and dinosaurs in such a perilous environment, ancestral humans had to master a comprehensive set of capabilities including environmental exploration, resource utilization, management, maintenance, territorial defense, risk prevention, animal domestication and predator elimination. The formation of such capabilities was underpinned by sufficient material resources as well as mature technologies for production, processing and manufacturing. The most viable adaptive strategy was the establishment of occupational division of labor, which fostered specialized technical personnel who performed respective duties and collaborated closely, enabling sustainable coexistence with surrounding environmental hazards.

Foot Morphologies Exhibit Typological Characteristics

Modern humans also display diversified foot morphologies, which are heritable traits. Meanwhile, foot morphology is strongly correlated with long-term occupational environments. For instance, fishermen who stand on vessel decks for prolonged periods generally develop broad feet to maintain stable balance aboard ships. Accordingly, variations in foot morphology can to a certain extent reflect differences in occupational activities, namely the differentiation of social division of labor.

Clans and Division of Labor

Geometric outlines of human footprints discovered on Juehua Island manifest distinct foot morphological features. Based on prominent geometric traits of these foot morphologies, the specimens are classified and labeled with clan codes, and corresponding occupational categories are matched to each clan. The term "clan" herein refers to groups connected by consanguinity or those engaged in identical occupations. Note: Most of the following footprints have not been subjected to dimensional measurement.

Clan Σ

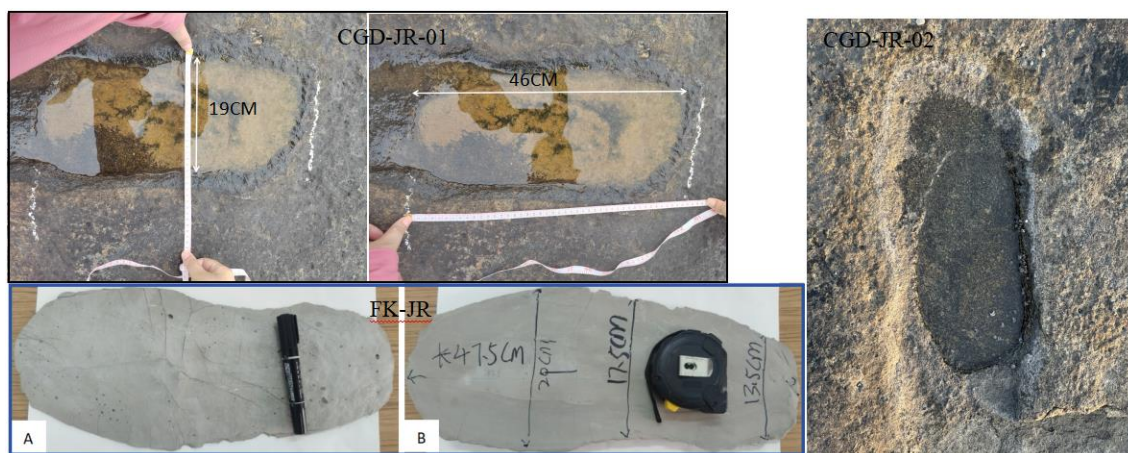


Figure 6: Footprints of Clan Σ

All traces presented in Figure 6 are giant footprints. Specimens CGD-JR-01 and CGD-JR-02 are barefoot impressions replicated from shod footprints. The measured lengths of these footprints are 47.5 cm and 46 cm respectively. When converted using modern human body proportion criteria, the corresponding body heights are approximately 3.3 m and 3.2 m. Owing to their highly similar foot morphologies, this group is defined as the Giant Clan, abbreviated as Clan Σ. The length-width ratio of the giant footprints falls within a normal range rather than a short and broad type. Individuals

belonging to this clan are inferred to be burly and strong laborers, making Clan Σ best suited for labor such as transportation and construction. Given the extremely advanced civilization of these ancestral humans, they undoubtedly possessed the capacity to construct buildings and other architectures.

Clan $\cap$



Figure 7: Footprints of Clan $\cap$

Description of Specimen CGD $\cap$ 01

The middle toe is the longest, with the other toes on both sides tapering sequentially, forming an arc-shaped toe tip. Specimens CGD $\cap$ 11, CGD $\cap$ 12 and CGD $\cap$ 13 are ancient traces preserved along the coastline. Although they have undergone seawater erosion, the arc-shaped toe outline remains distinctly recognizable. This morphotype is designated the Arc Clan, abbreviated as Clan $\cap$. Members of Clan $\cap$ possess an exceptionally broad and protruding forefoot, resulting in a foot morphology that is wide anteriorly and narrow posteriorly, resembling the webbed flippers of divers. The overall contact area of the sole is relatively large, which adapts them to activities within lagoons, gulfs, marshes and subsiding muddy terrain. This structure reduces plantar pressure and prevents sinking into soft ground. Additionally, individuals of this clan are highly adept swimmers. Accordingly, Clan $\cap$ is primarily suited for fishing in marine and lacustrine waters, as well as transportation along coastal and lakeshore zones.

Clan Δ



Figure 8: Footprints of Clan Δ

It can be observed from several barefoot footprints in Figure 8 that the outer contour formed by both sides of the foot together with the toe tip presents a triangle composed of three straight lines, for both adult and juvenile individuals. This population group is defined as the Triangle Clan, abbreviated as Clan Δ .

Judging from the squeezed sediment and indentation depth around the footprint margins, these traces are mostly deeply sunk into the beach sediment; specimen CGD- Δ 3 even shows signs of slipping. Such features indicate that members of this clan were presumably not adept at or accustomed to walking on beach surfaces, thus resulting in sinking and slipping during locomotion.

Furthermore, their feet feature a relatively narrow plantar width, which is adaptive to terrestrial activities. It is inferred that this clan was mainly engaged in processing and manufacturing work. The existence of dedicated production and processing workshops would have been a prerequisite for the construction of large vessels. Additionally, this group was highly likely responsible for weapon fabrication to defend against attacks from dinosaurs and wild animals.

Clan S



Figure 9: Footprints of Clan S

In Figure 9, CGD-S1 and CGD-S2 are adult footprints with relatively deep depressions in the substrate. WGD-S1 and WGD-S2 are juvenile footprints, among which WGD-S2 retains distinct impressions of toes and the heel. It can be identified from CGD-S1, WGD-S1 and WGD-S2 that the footprint makers possessed foot arches, leading to lighter pressure at the arch region during stepping. For both adults and children, the medial outline of the foot exhibits an S-shaped curvature. This population is classified as Clan S.

Females within Clan S were mainly engaged in light manual labor and handicrafts, predominantly undertaking the processing and production of textiles and garments. Males of this clan chiefly took charge of agricultural cultivation and food processing. The capability to produce clothing and staple food enabled these ancestral humans to survive the subsequent glacial period. Clan S is hypothesized to be the primary ancestral group that later evolved into agrarian civilizations.

Clan Π



Figure 10: Footprints of Clan Π

All footprints in Figure 10 are bare human impressions. The sole maintains nearly uniform width throughout the foot, featuring a broad plantar surface with toes arranged in an approximately straight line. This morphotype is named the Broad-Sole Clan, abbreviated as Clan Π. The consistent indentation depth across these footprints indicates poorly developed foot arches. Such foot structure facilitates tight contact with ship decks while standing and enhances bodily stability, representing a typical foot morphology adapted to fishery work. Members of this clan presumably undertook frequent voyages at sea, and seafood supplies for all clans and tribal communities were mostly obtained through offshore fishing and marine hunting conducted by Clan Π.

Clan H



Figure 11: Footprints of Clan H

The plantar surface of footprints in Figure 11 is also broad. Distinct from the foot morphology shown in Figure 10, the hallux and little toe protrude noticeably. As evidenced by specimens CCD-H-01, CCD-H-03 and CCD-H-04, this foot type tends to drag the medial heel against the ground during walking, forming a shallow linear groove. Such grooves are prone to retaining seawater and undergoing erosion until sediment fills the indentation, resulting in incomplete heel impressions. This morphological group is designated Clan H.

Members of Clan H likewise possess wide soles and are inferred to be engaged in navigation-related occupations. Their habitual medial heel scuffing and limited leg lifting during terrestrial locomotion imply prolonged residence aboard vessels with minimal overland walking experience, leading to poor adaptability to land travel. In contrast, Clan Π was tasked with inshore operations involving frequent land movement and exhibits no heel dragging features. Accordingly, Clan H is hypothesized to undertake long-distance ocean voyages and dwell permanently on large ships, specializing in transoceanic exploration and investigation. Their responsibilities included surveying and documenting geographical landforms, marine and terrestrial species, and other natural features across extensive global regions.

Clan A

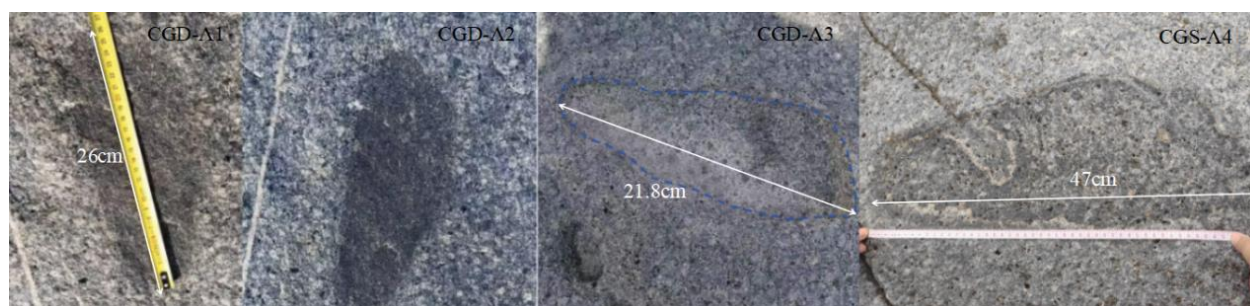


Figure 12: Footprints of Clan A

The human footprints in Figure 12 differ from those of Clan Δ described above. Partial curved arcs appear on the outlines of the toe tip and bilateral foot margins rather than straight lines. This foot morphology features a narrow heel and a broad metatarsal region near the toes, resembling a tapered cone. This morphotype is defined as the Cone-like Clan, abbreviated as Clan A. Tall individuals are also identified within this clan. Their foot arches are flatter compared with those of Clan S, allowing full sole contact with the ground during weight bearing. A relatively high density of ancient footprints preserved along the coastline indicates frequent coastal activities by Clan A. This clan is inferred to specialize in education, culture, science and technology, including astronomy and calendrics, geology and meteorology, sacrificial rituals and ceremonial systems. They systematically integrated knowledge across diverse disciplines. In collaboration with Clan H, they deduced impending major plate tectonic events and the fundamental laws governing global plate movements. Prior to large-scale crustal displacement, all communities evacuated the disaster-stricken zone by ship, accompanied by domesticated animals and all transportable belongings.

During the Coastal Mountain Dwelling Civilization, humans and animals inevitably suffered from illnesses and injuries. Without sophisticated medical systems and pharmaceutical techniques, the survival and reproduction of human populations and fauna would have been impossible. Based on the occupational division among clans, specialized tribal groups were dedicated to medical treatment for both humans and animals. As this civilization was predominantly ocean-oriented, medicinal resources were most likely derived primarily from marine sources, a fact well documented in numerous later classical Chinese materia medica texts. For instance, *Shennong Bencao Jing* (Divine Farmer's Classic of Materia Medica), the earliest extant monograph on traditional Chinese pharmacology, records a wide range of marine medicinal substances of animal, plant and mineral origin, including oyster shell, seaweed, cuttlebone, sea clam, meretrix clam, crude sea salt, bitter alkali, razor clam, crab, cowrie shell and ark shell. In this text, the number of marine animal medicines far exceeds that of marine botanical medicines [12]. Furthermore, traditional Chinese medicine possesses an extensive repertoire of exclusive prescriptions composed entirely of marine medicinal materials. This evidence supports the hypothesis that traditional Chinese medicine originated from an ancient maritime civilization. Guided by the core philosophical principle of mutual generation and restraint among all cosmic entities, Clan A regularly foraged along shorelines to collect marine organisms, investigate their yin-yang properties and pharmacological effects, and formulate medicinal prescriptions as well as therapeutic dietary regimens.

Clan h



Figure 13: Footprints of Clan h

The footprints in Figure 13 are distinguishable from those in Figure 12 by an exceptionally prominent and elongated hallux; this morphotype is designated the Long Hallux Clan, abbreviated as Clan H. Specimen CGA-h1 records traces of an individual running along the coastline, accompanied by a dense cluster of disordered fossil footprints of ancient Juehua Island dogs (enclosed within the red outline), suggesting a collective behavior of chasing or herding certain targets. It is therefore inferred that this clan was professionally engaged in the herding and guardianship of domestic and wild animals including cattle, sheep, horses, donkeys, pigs, deer, camels and hares. These canines presumably assisted Clan H in managing flocks and herds during pastoral activities.

Coastal Mountain Dwelling Civilization

Traces of Human Mountain Dwellings

Humans inhabited Juehua Island during the Early Cretaceous more than 100 million years ago, yet no intact residential sites have survived to the present day. Nevertheless, abundant fragments of snails, seashells and fish bones with weathered rounded edges and faded, ancient hues can be widely found on many relatively high hilltops and slopes of modern Juehua Island. Large quantities of snail and shell fossils have also been unearthed in the Hongluoxian mountainous area of Huludao City. Could these remains be ancient kitchen waste left by humans? Mountain ranges including the Greater and Lesser Hongluo Mountains, Juehua Island Mountains and Tiema Mountain in Hongyazi are all dotted with human footprints and living traces. These mountainous zones were located along ancient gulf, seashore and lagoon coasts in the Early Cretaceous, and their current geomorphology took shape after successive geological events.

Ancestral humans coexisted with dinosaurs, including large herbivorous species, carnivorous dinosaurs and other ferocious beasts. To evade threats and ensure safety, they chose mountain habitats with broad vistas for early danger detection. Mountains surrounded by water on one or multiple sides were particularly ideal, enabling effective defense and flexible retreat. Accordingly, humans of that era resided on mountains adjacent to seas, lakes and bays. Based on this mountain-dwelling pattern of early humans, the author defines the civilization of this epoch as the Coastal Mountain Dwelling Civilization.

Human Footprints and Paleogeography in Hongyui

Cui et al. (2020) collected Early Cretaceous rock samples from Tiema Mountain in Hongyazi, Xingcheng, Huludao, and conducted geochemical analyses. Dark enclaves were identified within the sampled rocks (Figure 14). By comparing these structures with human footprints discovered on the coast of Juehua Island, the researchers inferred that such dark enclaves are likely fossilized human footprints.

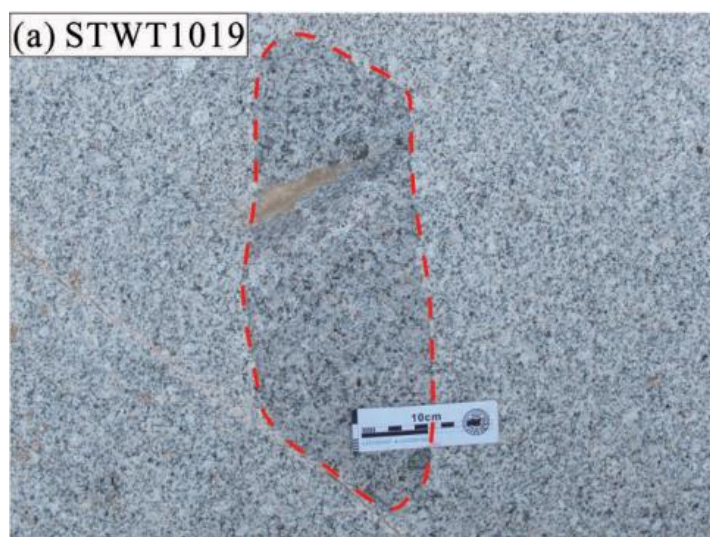


Figure 14: Monzonitic Granite from Hongyazi [13]

This finding suggests that the Hongyazi area was also situated along a paleoshoreline. Field verification and on-site geological surveys were subsequently carried out, and the investigation results are presented in the following figure.

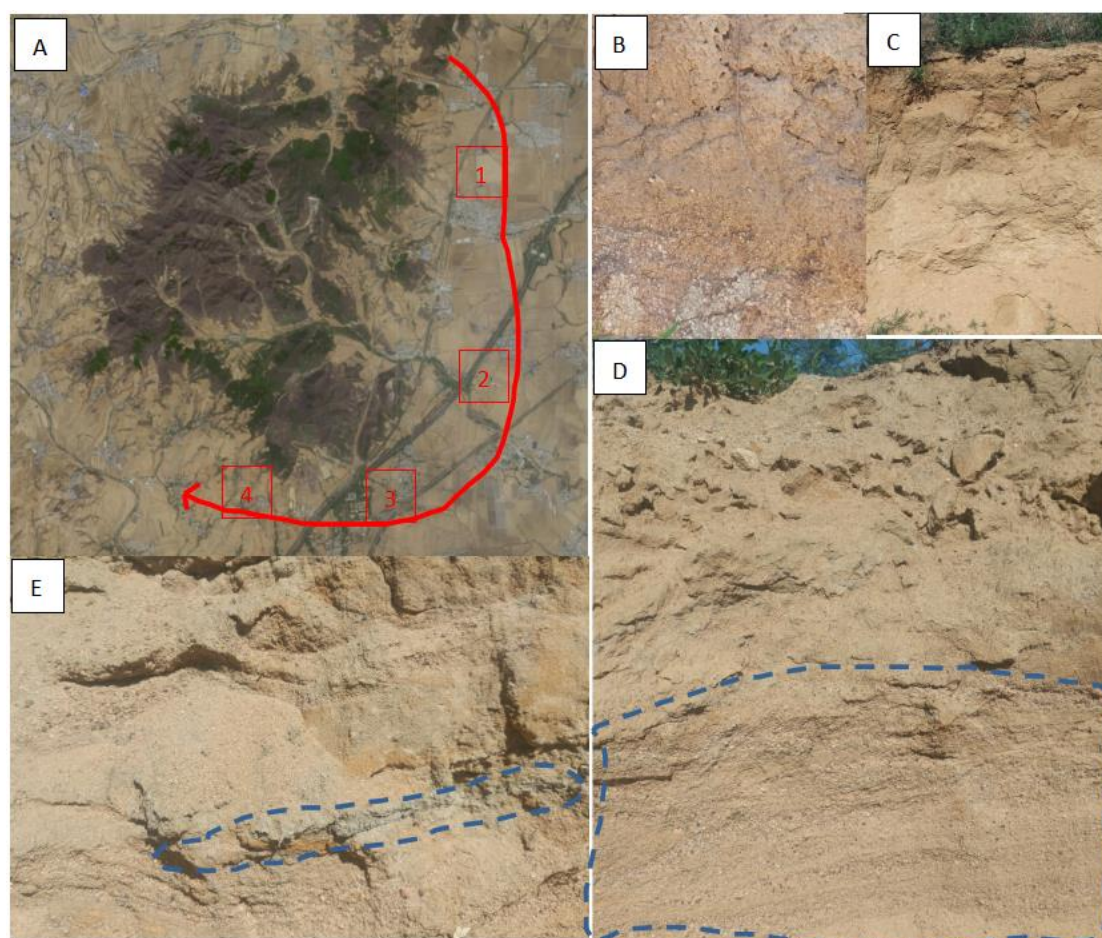


Figure 15: Lacustrine Shoreline Geology

The survey route encircles the rotational core mountain belt of Tiema Mountain in Hongyazi, Xingcheng, following the trajectory marked by the red line in Panel A of Figure 15. The villages passed sequentially along the route are Toutaizi Village, Housanjia Village, Taoyuan Village, Baimiaozi, and Jianjinqiantun. Soil sampling and field photography were conducted between every two adjacent villages. Sample No.1 in Panel A is displayed in Panel B, dominated by silty fine soil interspersed with medium-fine sand grains and gravel clasts. Sample No.2 in Panel A is shown in Panel C, consisting mainly of yellow silty fine soil with a minor proportion of fine sand. Sample No.3 in Panel A corresponds to Panel D, which is primarily fine sandy soil. The surficial sand layer exceeds 1 m in thickness and contains water-laid sand beds as indicated by the blue boxed area. Sample No.4 in Panel A is presented in Panel E, also dominated by fine sand grains with a surficial sand layer thicker than 1 m and identifiable aqueous sedimentary sand strata. In addition, green muddy interbeds are observed within the blue boxed zones, interpreted as residual deposits derived from the decomposition of aquatic plants along the ancient lakeshore.

The yellow silt in Panel C records massive terrigenous yellow silt input during the sedimentary transition from fluvial to lacustrine facies, implying riverine inflow into the lake and a yellow muddy lakeshore on this side. The thick water-deposited sand layers and muddy interlayers in Panels D and E are characteristic of lacustrine shore facies, confirming these sites as sandy lakeshores [14]. The Hongyazi area of Xingcheng also falls within the paleocoastal zone. This region once hosted an extensive lake system connected to the paleocean, forming a lagoon with shallow marine zones and recurrent tidal transition belts at the ocean-lake linkage. A number of tidal flat fossil specimens were collected from Haihu Mountain at the junction between Hongyazi and the ancient coastline. Representative specimens are analyzed and discussed below.

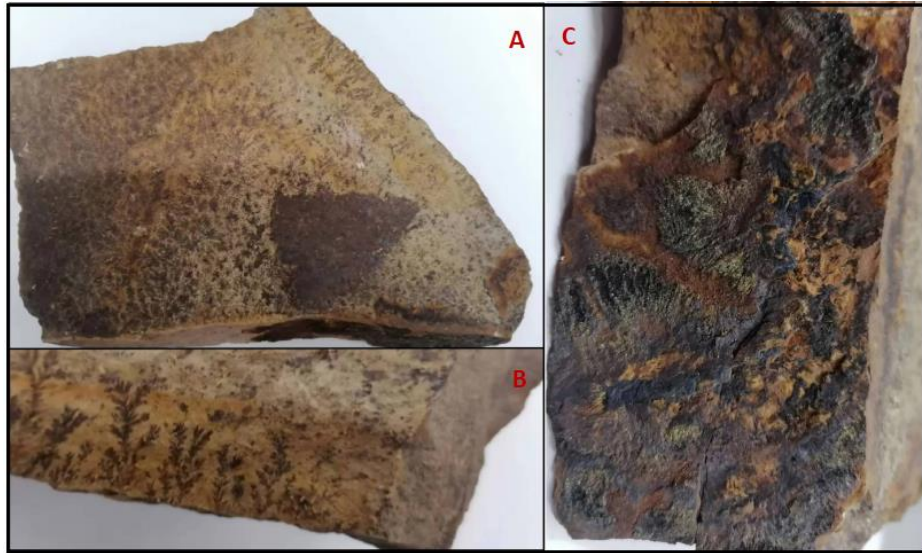


Figure 16: Plant Fossils

Dense plant fossils are preserved in Panel A of Figure 16. Close-up observation of Panel B reveals no distinct differentiation of true roots, stems and leaves. The specimens bear alternate branching patterns without spinose protuberances, and possess linear or narrowly spatulate fronds. These morphological features are highly consistent with the external characteristics of *Sargassum fusiforme* (Harv.).

Panel C exhibits fossil assemblages formed by the concentrated decomposition and fossilization of abundant plant material, with conspicuous green, purple and dark blue coloration. These remains are inferred to be red or brown algae, which contain chlorophyll and are capable of photosynthesis via solar radiation. Such algal taxa typically inhabit shallow marine environments below the low tide line at the interface between ocean and land, where wave energy is relatively moderate [15].



Figure 17: Burrow Structures of Intertidal Fauna (I)

On the right side of Figure 17 lies a white bivalve shell with an elongated oval outline, alongside a fractured specimen with a contour morphologically analogous to modern clams. Mollusks belonging to the family Mactridae, commonly known as surf clams or sand clams, prefer to inhabit the mid-to-lower intertidal zone, shallow muddy-sandy seabeds, and sandy coastal areas near river estuaries [16].



Figure 18: Intertidal Faunal Burrows 2

The marked burrow traces in Figure 18 resemble sunflower seeds in morphology and occur in colonial aggregations of varying sizes, bearing a strong resemblance to modern small surf clams. The shell of the small surf clam is elongated ovate, as shown in the inset at the bottom right corner of the figure. This bivalve species possesses numerous common Chinese names and is taxonomically identified as *Musculus senhousia*. It predominantly inhabits muddy tidal flats subject to frequent tidal fluctuations [17]. The aforementioned fossil assemblages including algae, gastropods and intertidal bioturbation structures share a uniform ecological characteristic: these organisms primarily dwell within intertidal zones, shallow muddy-sandy marine bottoms, and sandy neritic zones adjacent to river mouths. This evidence indicates that the fossil-bearing strata and surrounding areas once constituted a transitional facies where lacustrine, fluvial and shallow marine sedimentary environments interfaced with one another.

Anthropogenic Traces and Paleogeography of Hongluo Mountains

Two prominent mountain massifs, the Greater Hongluo Mountain and the Lesser Hongluo Mountain, are located within Huludao City, Western Liaoning, demarcated by Jiadaogou Valley. A time-honored local folk legend concerning the Hongluo Mountains and the Maiden Hongluo has been passed down through generations: in remote antiquity, the entire Hongluo Mountain region was submerged beneath a vast marine expanse collectively referred to as the Bohai Bay. The King of Bohai, ruler of these waters, fell into conflict with the Maiden Hongluo and attempted to capture her. The maiden hastily retreated into a gastropod shell and fled toward a towering submarine mountain. The King of Bohai then receded the seawater by more than forty li, transforming the area around present-day Hongluoxian Ancient Town into terrestrial land. The mountain where the Maiden Hongluo became stranded was thereafter named the Hongluo Mountains [18].

As late as the 1970s, fossilized seashells and other marine mollusk remains could still be found atop the peaks of Hongluoxian. Lacking geological understanding of how the ancient gulf evolved into land, local communities wove this mythological narrative to interpret the preserved geological relics.

Concrete traces of human activity are preserved across the Hongluo Mountains. On the Lesser Hongluo Mountain lies the so-called Dressing Table: an exceptionally smooth granite outcrop shaped to resemble a traditional lady's vanity table. Additionally, horse-hoof impression fossils are etched into bedrock on the mountain slopes. A massive granite boulder on the Greater Hongluo Mountain bears a distinct impression interpreted as a urinary trace left by a female individual, as illustrated in Panel A of Figure 18. The concave urination pit is clearly defined with raised rims surrounding the depression, indicating the urine was deposited onto a pile of loose dry sand. The footprints produced by squatting are enclosed within the blue outlined region.



Figure 18: Urination Pit Left by a Female Individual on the Greater Hongluo Mountain (Image Source: Sina Weibo)

These lines of evidence corroborate that the Hongluoxian and Hongluo Mountain areas were indeed an embayment during the Early Cretaceous. The bedrock bearing anthropogenic traces on the Hongluo Mountains originated as beach sediments, which underwent lithification via cementation, followed by compressional and rotational tectonic activities to become the mountain bedrock observed today.

Stone Architecture

As demonstrated in the foregoing analyses, the ancestral humans of the Coastal Mountain Dwelling Civilization possessed sophisticated material processing techniques and presumably the capacity to construct dwellings. Their building materials were sourced locally from naturally available stone and timber, consistent with the construction materials adopted by ancient human communities across the globe. Timber components of these dwellings have completely degraded without identifiable traces over geological time. Some stone building units bear signs of artificial modification. Subsequent compressional tectonic events led to the total collapse of all architectural structures. Marine

flooding triggered debris flows and other geological hazards across the mountainous terrain, transporting demolished architectural debris predominantly inland away from the paleoshoreline, where these relics were eventually buried within the coastal Xingcheng area. Extensive and deep excavation activities for modern construction may occasionally expose fragmented stone architectural remnants and artifacts preserved from the Coastal Mountain Dwelling Civilization.

Such Lithic Relics Generally Exhibit the Following Diagnostic Characteristics:

- The raw stone material formed in geological periods predating the Cretaceous;
- Visible breakage or fragmentation;
- Rounded abrasion and surface wear resulting from rolling and frictional transport;
- Severe weathering and apparent corrosive alteration indicative of great antiquity;
- Stylized carvings and lithic forms that differ markedly from those documented in later historical records [19].

Several fragmented stone specimens collected by local residents from the wild terrain of Xingcheng are presented and discussed below.



Figure 19: Remnant Lithic Artifacts

FS-00 and FS-01 are two stone architectural components morphologically analogous to the roof ridges of traditional ancient Chinese buildings. Drainage chutes carved with tile ridges are distributed on both flanks of the roof ridges, while FS-03 constitutes a fragmented section of a building eave. These two stone ridge pieces are standardized prefabricated parts with mortise slots at both ends, implying on-site assembly via stone tenon-and-mortise jointing technology. The fractures on these carved stone building blocks are irregular, attributed entirely to natural weathering and geological destruction. The host rocks are primarily Jurassic sedimentary rocks and andesites formed prior to the Cretaceous Period. Prolonged burial underground has resulted in rust staining and corrosive pitting on some specimens. Archaeological excavations of several-thousand-year-old ancient Chinese architectural ruins have yielded predominantly pottery tiles and tile ends, whereas carved stone tile roofs assembled with tenon-and-mortise structures are extremely rare. FS-04 is a plinth stone made of Silurian volcanic rock with substantial surface abrasion.

Specimen MS-00 is fashioned from Jurassic sedimentary rock and suffers severe damage from rolling friction, with all edges and corners thoroughly rounded. Two large boreholes penetrate its two sides, and the inner walls of the holes display polished surfaces from long-term frictional wear. This artifact is inferred to function as a stone hitching post for tethering horses, whose design differs distinctly from the horse hitching posts documented in later Chinese historical records. It is attributed to the Coastal Mountain Dwelling Civilization, as equestrian travel had already been adopted by human communities during that era. Specimen GS-00 bears such extensive damage to its carved relief that the original motif can no longer be identified.

SS-00 is a stone mortar and pestle, a daily utensil widely used by the Chinese people throughout history. Such mortars are conventionally employed for pounding small batches of unhusked rice, coarse grains, rice flour and wheat flour. This mortar exhibits impact-induced breakage and a prismatic base that suggests portability, representing the first documented discovery of a mortar of this specific configuration. Written human history in the Xingcheng area of western Liaoning spans over one thousand years, so this artifact likely originates from a far earlier epoch; it was presumably preserved by natural processes shortly after limited periods of use following an abrupt catastrophic event.

Numerous clans and tribes coexisted during the Coastal Mountain Dwelling Civilization. Reliance solely on marine foraging was insufficient to sustain the population's basic subsistence demands. The existence of garments and footwear corroborates the emergence of primitive agriculture, including crop cultivation and grain processing, which necessitated

a comprehensive suite of essential domestic implements.

The Coastal Mountain Dwelling Civilization

The Coastal Mountain Dwelling Civilization featured a highly developed material civilization. This section further explores its political system, social structure and spiritual civilization.

Identification of Figure Identity

A pictograph depicting a female figure riding a horse has been discovered in the shallow offshore waters along the coastline of Juehua Island. Previous literature has conducted research on the figure's attire and equestrian posture. Nevertheless, certain details within the pictograph remain undetermined and unanalyzed. This part carries out magnified observation and identification on the two areas enclosed by yellow frames in the pictograph.

1—Mo'e guan 2—tassel 3—cotton robe 4—cloud collar 5—object held in the left hand 6—belt 7—back of the hand 8—fingers 9—pistol 10—crotch-seamed pants 11—boots 12—stirrups 13—dart bag

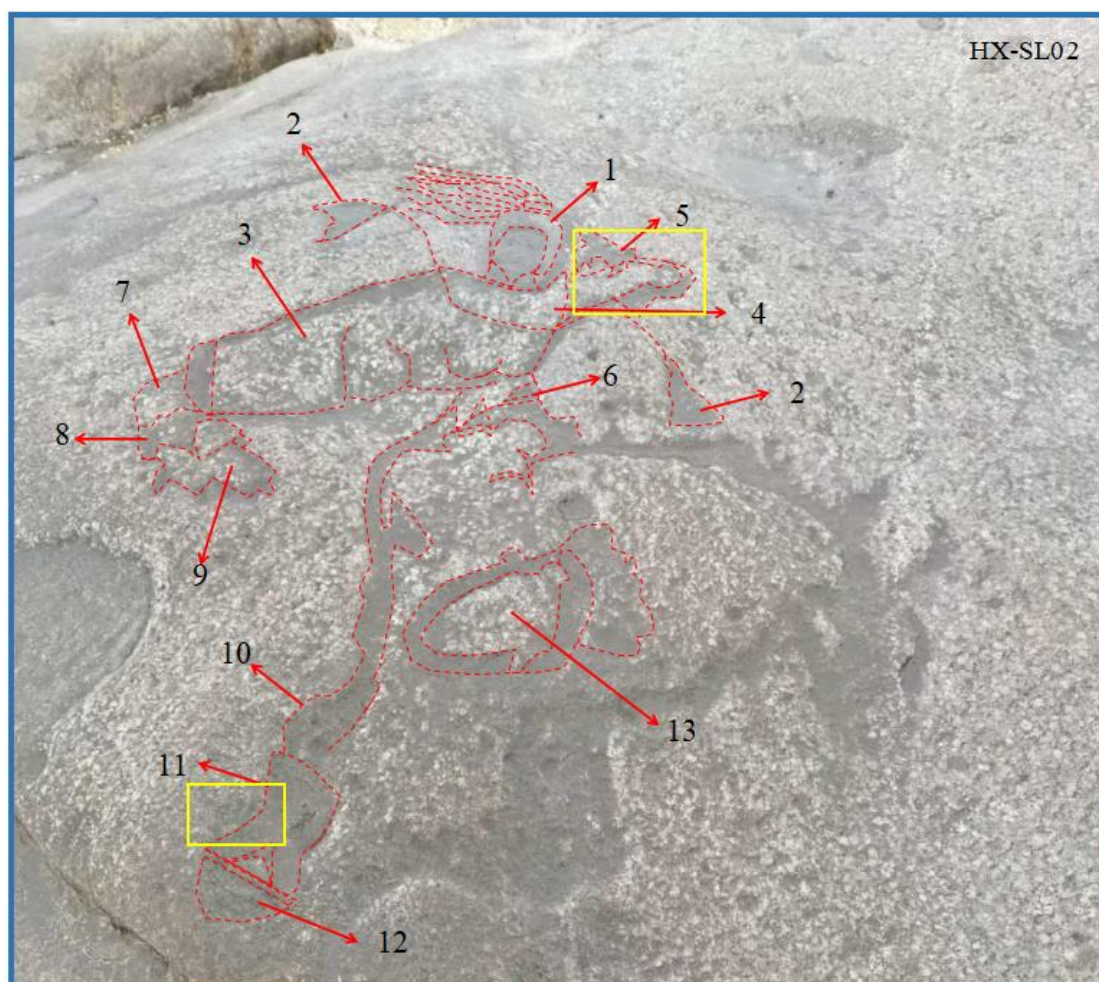


Figure 20: Anthropomorphic Pictograph on Beach Facies

Larger Yellow Frame The female figure holds an unidentified object in her left hand.

this area is Magnified and Outlined with a Yellow Dashed Line as Shown Below

1 – Dragon ear 2 – Dragon horn 3 – Dragon eye 4 – Dragon nose 5 – Whisker 6 – Upper jaw of dragon mouth 7 – Aquatic barb 8 – Lower jaw of dragon mouth 9 – Dragon tooth 10 – Dragon claw 11 – Dragon body 12 – Dragon claw 13 – Dragon claw 14 – Dragon tail

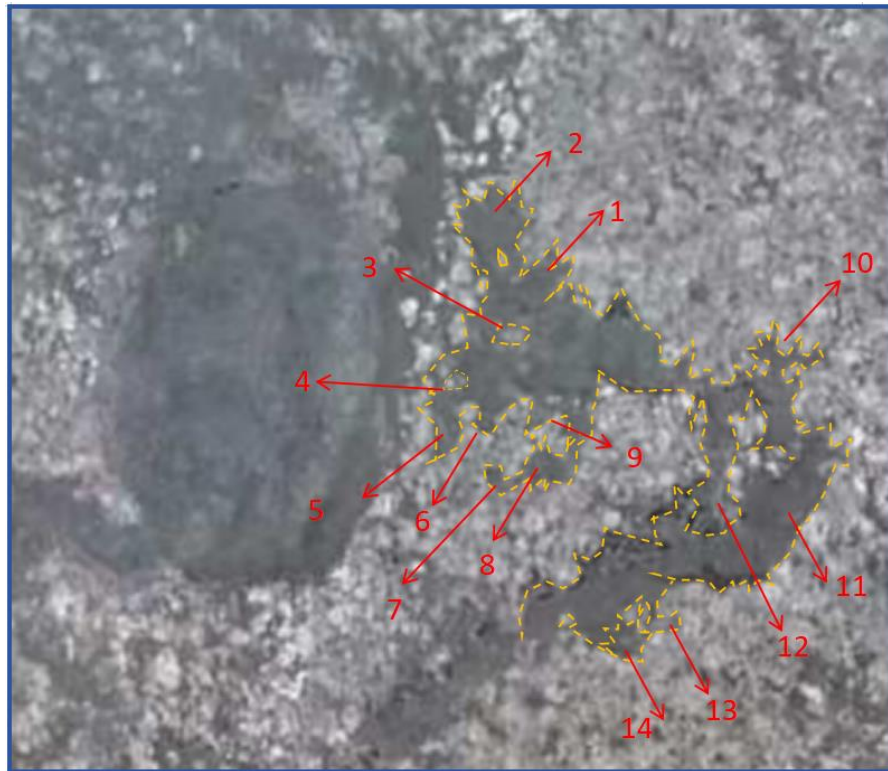


Figure 21: Object Held in the Left Hand

Description for Figure 21

Its morphological characteristics bear a high degree of consistency with the dragon imagery in traditional Chinese mythology. Modern dragon motifs are almost entirely artistic creations devised by humans based on legendary records. It is therefore worth exploring whether this specimen represents an authentic dragon form. The female figure only grasps a segment of the dragon's trunk with her left hand, while the majority of the dragon's body coils around her arm. The dragon's head twists backward to face the woman's head. A pronounced constriction occurs on the trunk beneath the dragon's head, resulting from a sharp torsion of the body at this position. Claw No. 10 clearly exhibits five toes, which raises the question of whether this corresponds to the legendary Five-Toed Golden Dragon. The entire trunk of the dragon assumes a sinuous and contorted posture, with its tail also curving toward the figure.

Judging from the intricate and dynamic morphological features, this figure does not resemble a rigid artificial dragon crafted by human craftsmanship. Instead, it appears vivid and lifelike, depicting a living dragon in motion. Myths and written records concerning dragons have persisted globally since ancient times. It is highly plausible that this depicts a genuine dragon coiled upon the woman's arm.

Small Yellow Frame Protruding ornamental attachments are visible beside the female figure's boots.

The area within the Small Yellow Frame is Magnified and Outlined, as Presented below

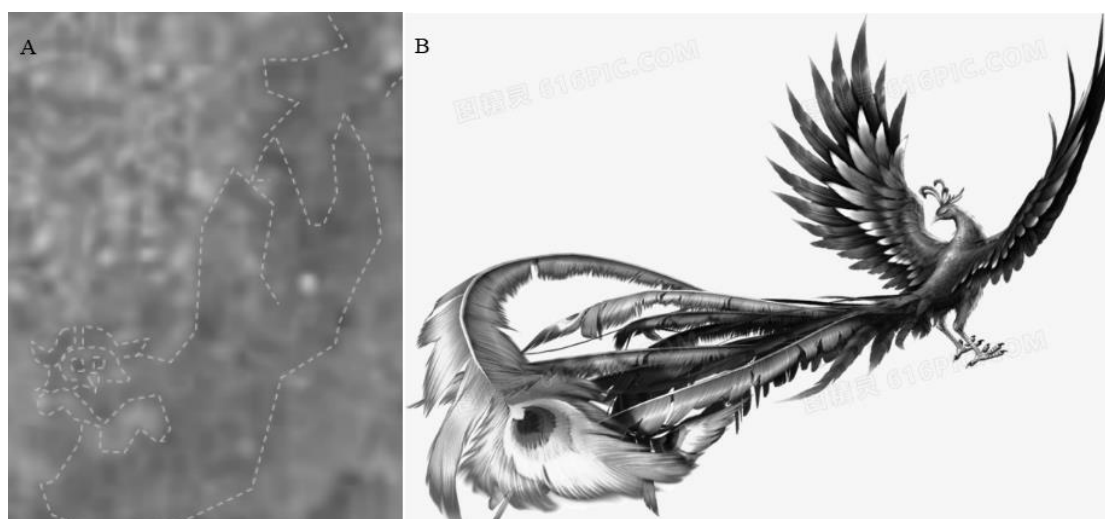


Figure 22: Avian Pattern (Source of Panel B: <https://616pic.com/>)

Description for Figure 22

The cranial features of the avian motif reveal two round eyes and a distinct avian beak, with feather plumes extending from both sides of the crown. Its torso, wings and tail are partially obscured by the figure's boots, leaving only the head fully exposed. Nevertheless, the tail retains the elaborate long tail plumes characteristic of the Chinese fenghuang (phoenix) shown in Panel B, indicating strong morphological similarities to the mythical fenghuang. This avian form bears striking resemblance to the legendary fenghuang, and is preliminarily identified as a fenghuang figure.

Fenghuang motifs have long served as decorative emblems throughout Chinese history. Unlike conventional fenghuang patterns embroidered onto boot uppers, this specimen depicts the bird in mid-flight along the side of the boot; notably, the fenghuang twists its head backward, whereas all surviving ancient fenghuang ornaments feature forward-facing heads. This suggests the image portrays a living fenghuang circling and dancing beneath the woman's feet.

What social status did this figure hold? Was she merely an ordinary woman of that era? Her attire lacks distinctive features compared with preserved depictions of ancient human figures. Her unique trait lies in her symbolic pairing with dragon and fenghuang: a genuine dragon coils around her left arm, twisting its body with bared claws, its head turned toward the woman's face. In ancient Chinese political ideology, only virtuous and capable leaders commanded universal public support, meriting the attendance of a divine dragon and possessing the legitimacy of supreme rule—this embodies the core connotation of the divine mandate of sovereignty.

In traditional Chinese culture, the five hues of the fenghuang's plumage symbolize the five core Confucian ethical virtues: Virtue (De), Righteousness (Yi), Ritual Propriety (Li), Benevolence (Ren), and Trustworthiness (Xin), which underpin harmonious and stable ancient societies. The fenghuang also symbolizes the formidable spiritual power of rebirth and serves as an auspicious omen denoting universal peace. The character "huang" (凰) is phonetically identical to "huang" (皇), signifying supreme sovereignty. From the Pre-Qin period onward, fenghuang patterns adorned jade ware and bronze ritual vessels, artifacts embodying regal authority. Since dragons and fenghuang jointly symbolize supreme sovereign power, this woman, unified with both dragon and fenghuang iconography, must have been the paramount tribal ruler of her epoch, titled the Di (Sovereign). Ancestral humans carved this figure on the beach rock to transmit a record of their settlement to subsequent generations. This raises a critical question: did early ancestors coexist with real dragons and fenghuang? Might these mythical, fantastical creatures once inhabit the earth in remote antiquity, rather than being purely fictional fabrications conceived by ancient people?

Matrilineal Society

During the Coastal Mountain Dwelling Civilization, women held the supreme political power as the Sovereign (Di). This may constitute the earliest fossil evidence of a matrilineal society ever discovered on Earth. The character Di originally denoted the earliest celestial deity and supreme ruler, and etymologically refers to the common ancestral matriarch of tribal communities in matrilineal societies. Its oracle bone pictograph "𠂔" has been interpreted by numerous scholars throughout history as a symbol associated with female reproduction, representing the primordial female ancestor of humankind and indicating that the earliest deity worshipped by humanity was feminine. Furthermore, she was revered as the Mother of All Things in nature, from whom all flora and fauna originated and multiplied [20].

Historical research confirms that major ancient tribes in Chinese civilization evolved from matrilineal clans. The veneration of female progenitors and female genital symbols constituted a prominent feature of primitive societies [21]. The Yanhuang Culture originating in the Heluo Region is conventionally dated to the patrilineal clan society. Nevertheless, an analysis of the birth narratives, marital practices, social context and archaeological sites related to Emperor Yan and Emperor Huang strongly suggests that the Yanhuang Era more likely belonged to the matrilineal phase of primitive society [22]. A Comprehensive History of China, chief-edited by Bai Shouyi, states that "the legendary abdication system of Yao and Shun in ancient China essentially reflected a democratic electoral mechanism within tribal alliances" [23].

The above conclusions are derived from documentary records and archaeological relics. In 2025, a Chinese research team pioneered the application of high-resolution ancient DNA kinship identification alongside interdisciplinary integrated analyses on the Fujia Site, definitively verifying the existence of a prehistoric matrilineal social organization [24]. The Fujia Site is situated in Guangrao County, northern Shandong Province, merely 40 kilometers away from the Bohai Sea coastline. Two large-scale archaeological excavations were conducted at the site in 1985 and 1995, unearthing more than 300 tombs together with ash pits, storage pits, water wells, house foundations and other cultural features. Chronological dating places the site in the late Dawenkou Culture, spanning 4750 to 4500 years before present. Genetic analyses reveal a remarkable correlation between the spatial zoning of burials and matrilineal hereditary patterns [25].

In 1861, the Swiss anthropologist Johann Jakob Bachofen put forward the theory that a matrilineal stage prevailed in early human societies worldwide. In 1871, the American anthropologist Lewis Henry Morgan established an evolutionary model depicting societal transition from matrilineal to patrilineal organization. In 1884, Friedrich Engels further emphasized in his work *The Origin of the Family, Private Property and the State* that matrilineal clans constituted a core feature of primitive communist societies [26].

It remains to be clarified why ancient humans adopted a matrilineal social structure and what advantages enabled humankind and other species to reproduce and thrive sustainably. Research on the Fujia Site has provided partial explanations for this question. "The research team collected numerous soil and plant samples from the surroundings of the Fujia Site for strontium isotope analysis. Test results indicate that the inhabitants of the Fujia Site had a confined activity radius of approximately ten kilometers and maintained a highly homogeneous lifestyle. This population exhibited minimal social stratification and negligible wealth disparity, yet did not suffer from material scarcity. Sufficient nutritional intake was secured through millet cultivation, pig husbandry and marine fishing, resulting in a tall and slender physical stature among the residents. No archaeological evidence of warfare has been uncovered at the site; community members labored and resided together on a small plain. Elderly women administered communal affairs, and some presumably possessed sophisticated medical expertise. Men formed transient relationships with different women, while female residents were free to enter and terminate romantic unions. This mode of social organization persisted for more than two centuries." [27].

This case demonstrates that matrilineal societies differed fundamentally from patrilineal systems, in which male elites monopolized power across all social spheres, suppressed the opposite gender, and wielded absolute and unchallenged authority. It is critical to distinguish matrilineality from matriarchy. The sovereign figure (Di) in this civilization functioned primarily as a clan head or paramount leader of all affiliated tribes. The authority they exercised centered on administration, accountability and communal nurturing, rather than coercive domination, enslavement, appropriation and arbitrary control inherent to despotic power [28].

Patriarchal hierarchical systems tend to incite rivalrous expansion, warfare, slaughter and plunder among clans, ethnic groups and polities. Such social turbulence may lead to the extinction of human subgroups, inflict harm upon other organisms, and disrupt the ecological equilibrium of the planet. Within the Coastal Mountain Dwelling Civilization, all clans stood on equal footing, with no hierarchical distinction between diverse occupations and specialized crafts. No social hierarchy existed between individuals or between men and women. The supreme leader titled Di governed with compassion rooted in the belief in equality for all living beings and acted in accordance with natural laws.

During the heyday of Earth's species radiation, a multitude of life forms converged and settled within the limited coastal zone of ancient Xingcheng in western Liaoning. Sustaining the survival, reproduction and development of all life forms within this constrained territory demanded extraordinary wisdom and benevolence, alongside comprehensive proficiency across diverse vocational and technical fields, qualifying the leader as a versatile generalist. Only with such a broad perspective and thorough insight into the essence and superficial manifestations of all matters could the sovereign formulate maximally rational, evidence-based, systematic and strategically far-sighted policies to facilitate harmonious coexistence and sustainable development of all creatures. This constitutes the core criterion by which ancestral human communities selected their leaders: possession of both moral integrity and competent governance capability.

Sacrificial Rituals

Sacrificial rituals have constituted a prevalent collective practice and form of spiritual belief among ethnic groups worldwide since ancient times down to the present day. In contemporary Chinese academia, many scholars argue that ruling elites established covert, divinely sanctioned connections with deities, heaven, earth, mountains and rivers through a variety of sacrificial ceremonies, so as to secure legitimate dominion over land and populace [29]. Put plainly, sacrificial rites are regarded as a superficial veneer legitimizing sovereign rule, a means of social manipulation, harmful feudal superstition, and an idealistic doctrine contradictory to scientific principles. Accordingly, such sacrificial traditions and culture are often dismissed outright.

It is commonly acknowledged that sacrificial ceremonies originated in remote antiquity. A portion of scholars attribute their emergence to the limited cognition and primitive conditions of early ancestors: lacking adequate understanding of natural phenomena and driven by existential fear, they subjectively invented a pantheon of nature gods. Nevertheless, the ancestral humans of the Coastal Mountain Dwelling Civilization in the Early Cretaceous were highly sophisticated, with all dimensions of their civilization reaching an advanced level. They did practice sacrificial offerings, for their livelihood and sustenance were entirely bestowed by the ocean, nature (heaven and earth), and mountains. Their sacrifices stemmed from gratitude for these gifts, alongside a mindset of cherishment and intergenerational inheritance, rather than the blind superstition as narrowly interpreted by certain modern viewpoints. Hence, human civilization is inherently intertwined with sacrificial culture, and well-ordered sacrificial traditions deserve to be passed down through generations.

Ancient Chinese texts preserve detailed records of sacrificial customs. For instance, the *Shuowen Jiezi* · Radical Shi encapsulates the core connotations of archaic sacrificial culture, tracing its evolutionary path from nature worship to ancestor veneration. It establishes a tripartite sacrificial system encompassing celestial deities, terrestrial spirits, and ancestral ghosts, documents diverse ritual procedures, ritual spaces and sacrificial offering regulations, and mirrors the ancient comprehension and implementation of sacred cosmic order. This document chronicles the gradual institutionalization and politicization of folk sacrificial beliefs, profoundly embodying the ethos of revering heaven and honoring ancestors, and serves as a pivotal source for interpreting prehistoric religious ideologies and ritual-musical institutions [30].

Conclusions

Fossil human footprints are found not only on the coastline of Juehua Island in Huludao, western Liaoning, China, but human traces also occur in Hongluo Mountain and Hongyazi. These areas were formerly gulfs and lagoons. To secure a safe dwelling environment, ancestral humans settled on mountains beside water. They adopted high-strength stone raw materials and erected buildings by chiselling tenon-and-mortise structures for assembly.

These ancestors boasted highly developed material and technological civilisation. Their era coincided with a major faunal radiation on Earth. In addition to the Jehol Biota, the local fauna included chickens, ostriches, monkeys, dogs, cats, large felids, hares, horses, cattle, sheep, donkeys, camels, pigs, deer, brown bears, Asiatic black bears, giant pandas and rhinoceroses. Prior to catastrophic geological events, humans guided these animals to migrate to safe zones. Such large-scale coordinated activities relied on social division of labour and collective collaboration. The preserved human footprints display distinct morphological types, implying the formation of clans and occupational specialisation among ancestral groups. Some groups specialised in offshore fishing and oceanic exploration; others conducted fishing and hunting around lakes and gulfs; certain communities were responsible for grassland herding and ecological conservation; still others engaged in crop cultivation. These livelihood patterns later evolved into agricultural civilisation, maritime civilisation, fishing-hunting civilisation and nomadic civilisation. Over the past millennia of human history, these civilisations have frequently confronted, fought against and repudiated one another.

In truth, each subsistence mode devised by ancient humans represented the most rational and adaptive survival strategy tailored to the local topography, natural resources and climatic conditions of that time. All civilisations were equal without hierarchical superiority or inferiority. They were neither isolated nor static, but evolved dynamically in response to natural environments. Accordingly, humankind ought not to be divided into numerous races, ethnic groups or even national borders, nor should different groups confront one another, seal themselves off, or deliberately label and glorify their own identity.

The female figure riding a horse in the beach pictograph has a mythical dragon-like creature coiled around her left hand, alongside a phoenix-like bird flying beside her boots. This female individual is presumed to be the paramount leader of the ancestral human population. The society of this period was likely matrilineal, featuring universal equality and respect for every member. It was free from commercialisation, wealth rankings, capitalists, aristocratic clans and rigid social stratification; the only differences lay in occupational division. The leader's authority was not rooted in domination, enslavement, seizure or arbitrary control, but centred on administration, accountability and nurturing.

Ancestral humans upheld genuine equality among all beings and maintained harmonious coexistence with all living creatures, rather than seizing resources through plunder, suppressing, enslaving or killing other lifeforms. They never exploited, eliminated or preyed upon their own kind under the guise of advanced technology. They understood a plain ecological truth: if wolves are exterminated for humans to monopolise grasslands, the degraded grassland ecosystem will ultimately bring ruin to humanity itself. Only through harmonious development and compliance with the natural cycle of birth, ageing, sickness and death can the Earth's ecological balance be maintained, climatic conditions remain favourable, and human civilisation be passed down through generations. The harmony between humanity and nature embodies the supreme wisdom for human survival and reproduction.

Reference

1. De Rossi, A., & Dini, R. (2015). Regenerating the Alps: Mountains as a Place to Live. *SHIJIE JIANZHU*, (9), 124-127.
2. Xu S. Shuowen Jiezi (说文解字) (Xu X collated). 459 (Shanghai Classics Publishing House, Shanghai, 2007). (in Chinese)
3. Cui Y. The Study of Mountain Dwelling Narratives in the Six Dynasties [Master's thesis] (Jilin University, Changchun, 2025). (in Chinese)
4. Tyan, J. A. (2003). *A performer's guide to selected Chinese art songs by twentieth-century Chinese composers*. The Southern Baptist Theological Seminary.
5. Gu S.B. Annotated Complete Works of Xie Lingyun, 447 (Li Ren Bookstore, Taipei, 2004). (in Chinese)
6. Dou H.J. Study of works themed "Living in the Mountain": Taking Mountain Dwelling Ballad and Mountain Dwelling Painting as examples. *Ethnic Arts Res.* 6, 83-89 (2018).
7. Li, L. (2021). An Exploration of Intergenerational Hakka Maintenance and Shift in Guangdong.
8. Pan M.S., Wang C. Analysis on the culture of Chinese and Western stone buildings. *Shanxi Archit.* 47, 19-22 (2021). (in Chinese)
9. Anon. Long history of limestone architecture in Croatia. *Stone* (2006).. (in Chinese)
10. Jin C H. Research on the Origin of Humans — The Discovery of Human, Dinosaur, and Monkey Footprint Fossils on the Coast of Juehua Island in Western Liaoning[J]. *Journal of Interdisciplinary History and Human Societies*, 2026, 2(2):1-29.
11. Jin C H. Civilization of Coastal Mountain Dwellings[M]. Beijing: China Science and Culture Audio-Visual Publishing Co., Ltd., 2025:P292. (in Chinese)
12. Liu, J. Y. (2013). Status of marine biodiversity of the China seas. *PLoS One*, 8(1), e50719.
13. Cui F.H., Xu X.C., Zheng C.Q., et al. Paleo-Pacific subduction and rollback in the eastern North China Craton: Records and insights from Late Mesozoic granitoids in Xingcheng, western Liaoning. *Acta Petrol. Sin.* 36, 2463-2492 (2020).

(in Chinese)

14. Jin C H. Civilization of Coastal Mountain Dwellings[M]. Beijing: China Science and Culture Audio-Visual Publishing Co., Ltd., 2025:P36. (in Chinese)
15. Baidu Encyclopedia. Seaweed [DB/OL]., accessed 12 July 2026. (in Chinese)
16. Baidu Encyclopedia. Clam [DB/OL]., accessed 12 July 2026. (in Chinese)
17. Baidu Encyclopedia. *Musculus senhousei* [Online database]. Available at (accessed 12 July 2026). (in Chinese)
18. Sina Blog. Legend of Hongluo Mountain IV: Fairy Urinating Stone (Old Mother Stone) [EB/OL]. (in Chinese)
19. Jin C H. Civilization of Coastal Mountain Dwellings[M]. Beijing: China Science and Culture Audio-Visual Publishing Co., Ltd., 2025:P293. (in Chinese)
20. Wu D C. Notes on Chinese Characters[A]//Ding S. Research on Ancient Chinese Religion and Mythology[M]. (No specific publishing information provided), P.181. (in Chinese)
21. Li S P. Goddess Worship in Primitive Matriarchal Society of China[J]. Journal of Beijing Institute of Graphic Communication, 2003, 11(1):36-41. (in Chinese)
22. Ding L. A Study on the Yan-Huang Era as a Matriarchal Society[J]. Journal of Luoyang Institute of Science and Technology (Social Science Edition), 2010, 25(6):1-4. (in Chinese)
23. Bai S Y (Ed.). General History of China[Z]. Shanghai: Shanghai People's Publishing House, 1994:202. (in Chinese)
24. Fu X L. The Abdication System of Ancient China as the Queen Consort Selection System of Gaoxin Tribe in Matriarchal Society[J]. 2009(1):133-137. (in Chinese)
25. Shao K. World's First: Chinese Scientists Confirm the Existence of Prehistoric Matrilineal Social Organization[N]. Xinhua Daily Telegraph, 2025-06-05(005). (in Chinese)
26. Wang H Z. The First Discovery of Prehistoric Matriarchal Society: Will Human History Be Rewritten?[J]. Humanity, 2025(6):62-63. (in Chinese)
27. Wang H Z. The First Discovery of Prehistoric Matriarchal Society: Will Human History Be Rewritten?[J]. Humanity, 2025(6):62-63. (in Chinese)
28. Ding L. A Study on the Yan-Huang Era as a Matriarchal Society[J]. Journal of Luoyang Institute of Science and Technology (Social Science Edition), 2010, 25(6):1-4. (in Chinese)
29. Yang Y L. An Interpretation of Sacrificial Ritual Nomenclature in The Book of Rites[J]. Journal of Chengdu University (Social Science Edition), 2013(4):45-49. (in Chinese)
30. Hu Y J, Zhang M H. Research on the Shi Radical in Shuowen Jiezi and Ancient Sacrificial Culture[J]. Journal of Luohe Vocational and Technical College, 2026, 25(1):12-14. (in Chinese)

Author Contributions

Jin Chunhua conducted literature retrieval and in-depth review. This researcher designed and completed geotechnical experiments, carried out a series of studies on the mechanical behaviour between particles, and was responsible for the full manuscript preparation.

Competing Interests

The author declares no competing interests.