دانشگاه بوعلی سینا

پژوهش‌های باستان‌شناسی ایران

۴۹

انجمن علمی باستان‌شناسی ایران

شماره شاپای چاپی: ۲۳۴۵-۵۲۲۵ شماره شاپا الکترونیکی: ۲۳۴۵-۵۵۰۰

فصلنامهٔ علمی پژوهش‌های باستان‌شناسی ایران شمارهٔ ۴۹ دورهٔ شانزدهم ۱۴۰۵

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ویژگی‌های کلی مقالهٔ مورد پذیرش

هدف نشریهٔ علمی‌پژوهشی *پژوهش‌های باستان‌شناسی ایران*، انتشار پژوهش‌ها و تجربه‌های علمی در زمینه‌های باستان‌شناسی، تاریخ هنر و معماری است.
نوشتار باید نتیجهٔ پژوهش‌های نویسنده (یا نویسندگان) بوده و در نشریهٔ دیگر منتشری نشده باشد.
پذیرش مقاله برای چاپ پس از داوری و با تأیید در جلسهٔ هیأت تحریریهٔ مجله است.
مسئولیت درستی نوشته‌ها با خود نویسنده (یا نویسندگان) مقاله است.
مقاله باید بر یک روی صفحهٔ استاندارد A۴ (۳۰×۲۱ سانتی‌متر) و با اندازهٔ (سایز) ۱۳ و قلم (فونت) B Mitra با فرمت ۲۰۰۳ و ۲۰۰۷ WORD و حواشی ۲/۵ سانتی‌متر تنظیم شده و در نهایت کل مقاله نباید از ۲۰ صفحهٔ استاندارد (۲۴ سطری) و از ۷۰۰۰ کلمه بیشتر باشد.
صفحهٔ اول باید شامل نام و نشانی کامل و شماره تلفن نویسنده، پست الکترونیک و محل خدمت و مرتبهٔ علمی وی (با دو زبان فارسی و انگلیسی) باشد.
در صورتی که مقاله برگرفته از پایان‌نامهٔ نویسنده باشد، مجوز و ذکر نام استاد راهنما الزامی است.
نوشتارها باید به‌ترتیب شامل: عنوان، چکیده، مقدمه، پیشینهٔ تحقیق، مبانی نظری، بدنهٔ تحقیق شامل: موضوعات مختلف، نتیجه‌گیری، سپاسگزاری، پی‌نوشت، فهرست منابع و بخش انگلیسی (مقالهٔ کوتاه ۱۲۰۰ کلمه‌ای) طبق راهنمای شیوه‌نامه باشد.
- «عنوان» شامل: موضوع مقاله، نام و نام خانوادگی نویسنده و مرتبهٔ علمی و دانشگاه محل تدریس و تحصیل وی است؛ عنوان مقاله باید گویا و بیانگر محتوای نوشتار باشد.
- «چکیده» شرح مختصر، اما جامعی از مسایل محتوایی و نوشتاری شامل: بیان مسئله، اهداف، ضرورت، سؤال، فرضیه، روش پژوهش، نکته‌های مهم و نتیجهٔ بحث است. چکیدهٔ فارسی نباید بیشتر یا کمتر از ۳۰۰ کلمه باشد.
- «واژگان کلیدی» شامل چهار تا شش واژهٔ تخصصی که بسامد و اهمیت آن در متن مقاله بیش از سایر واژگان بوده است.
- «مقدمه» شامل طرح مسئلهٔ اصلی است که مورد پذیرش و هدف پژوهشگر از بررسی و انتشار آن است؛ در این بخش باید به اجمال بیان مسئله،اهداف، ضرورت، سؤال، فرضیه، روش تحقیق و پیشینهٔ تحقیق، مشخص گردد که در طی بررسی به آن پرداخته شود.
- «روش تحقیق» شامل ذکر بسیار مختصر روش و ابداعات نویسنده در پژوهش در این زمینه است.
- «نتیجه‌گیری» شامل جمع‌بندی بحث متن مقاله با روش منطقی و مفید و روشنگر مسئلهٔ مورد پژوهش است و می‌تواند با جدول، تصویر و نمودار و.. همراه باشد.
- «سپاسگزاری» در پایان این بخش نویسنده، راهنمایی دیگران -که در نوشتن مقاله مؤثر بوده‌اند- را یادآوری و از ایشان مختصراً سپاسگزاری می‌نماید (در صورت تمایل).
عناوین جدول‌ها با ذکر شماره در بالا و تصاویر، نقشه‌ها، طرح‌ها و نمودارها با ذکر شماره (توضیحات و ذکر منابع) در پایین ضروری است.
مجموع تصاویر، جداول، نمودارها، نقشه‌ها و طرح‌ها نباید درمجموع بیشتر از ۱۲ عدد باشند و همچنین باید در داخل متن قرار گرفته و یک نسخه از آن‌ها به‌صورت مجزا در یک فایل جداگانه، با فرمت JPEG و کیفیت DPI ۳۰۰ همراه مقاله در وب‌سایت نشریه بارگذاری گردد.

بخش خلاصهٔ انگلیسی:

این بخش باید به‌همراه مقاله در یک فایل جداگانه (Word) به‌عنوان مقالهٔ کوتاه انگلیسی به دفتر نشریه ارسال شود؛ که دربردارندهٔ مشخصات نویسندگان و ترجمهٔ کاملی از خلاصهٔ مقاله (به‌صورت مقاله‌ای کوتاه) در ۱۲۰۰ کلمه، شامل: چکیده (همان چکیدهٔ ۳۰۰ کلمهٔ فارسی و شامل: طرح و بیان مسأله، اهداف و ضرورت پژوهش، پرسش و فرضیهٔ (اصلی) پژوهش، روش تحقیق و مهم‌ترین یافته‌ها و نتیجه‌گیری)، مقدمه (۴۰۰ کلمه و شامل: طرح و بیان مسأله، اهداف و ضرورت پژوهش، پرسش و فرضیه (اصلی و فرعی) پژوهش، به‌صورت جامع)، متن مقاله (۳۰۰ کلمه)، نتیجه‌گیری (۲۰۰ کلمه) و تمامی منابع فارسی و انگلیسی مورداستفاده در تحقیق باشد.

شیوهٔ ارجاع به منابع:

ارجاعات مندرج در مقاله، مستند و مبتنی‌بر منابع خواهد بود و از معتبرترین منابع استفاده شود.
درباره آثار مفقود و نیز منسوب، به منابعی که از آن‌ها یاد کرده و یا توضیحی داده‌اند، ارجاع داده می‌شود.
ارجاع داخل متن مقاله: نام خانوادگی نویسنده، سال چاپ اثر: شماره صفحه یا صفحات؛ مثال فارسی: (نگهبان، ۱۳۷۸: ۱۱۲)
دربارهٔ استفاده از سنت شفاهی (مصاحبه با افراد خبره و صاحب نظر) به‌صورت زیر ارجاع‌دهی صورت گیرد و در بخش تشکر از ایشان سپاسگزاری شود. (حسینی، مصاحبه‌شونده، ۱۳۹۰/۱/۱۲).

ارجاع پایانی متن مقاله (منابع):

فارسی:

ارجاع به کتاب:
- نام‌خانوادگی، نام؛ و نام‌خانوادگی و نام سایر افراد دخیل؛ تاریخ چاپ اثر، *نام اثر (ایتالیک)*، ترجمه‌ی...، تعداد جلد...، نام محل نشر: نام ناشر.
ارجاع به مقالات دانشنامه‌ها (دایرةالمعارف‌ها) فصلنامه‌ها، مجلات و نمونه‌های دیگر:
- نام‌خانوادگی، نام، تاریخ چاپ اثر، «نام مقاله»، *نام مجموعه مقالات (ایتالیک)*، تعداد جلد، محل نشر: ناشر، شماره صفحهٔ آغاز و پایان مقاله.

لاتین:

در کتاب‌نامهٔ لاتین حروف اول باید بزرگ باشد و بین فواصل ویرگول قید شود.
ارجاع به کتاب:

Ward-Perkins, J. B., 1990, *Roman Imperial Architecture London*, Penguin Books.

ارجاع به مقالات مجله‌ها:

Trinkaus, E., 1982, "Artificial Cranial Deformation in the Shanidar 1 and 5 Neanderthals", *Current Anthropology* 23 (2): 198-199.

ارجاع به مجموعه مقالات:

Liverani, M., 2003, "The Rise and Fall of Media", Continuity of Empire (?): Assyria, Media, Persia, (Lanfranchi, G.B and others) eds. Padova, 1-12.

ارجاع به پایان‌نامه‌ها:

Blom, D.E., 1999, "TIvanaku Regional Interaction and Social Identity, a Bioarchaeological Approach", Ph.D. Thesis, Department of Anthropology, University of Chicago.

نکات دیگر در باب ارجاع به منابع:

- منابع مقاله به‌صورت الفبایی و براساس نام مؤلف تنظیم می‌شود؛ منابعی که در پایان مقاله ذکر می‌شود، همان منابعی است که در داخل متن استفاده شده است.
- در صورتی‌که یک نویسنده منابع متعدد مربوط به سال‌های مختلف استفاده کرده، باید به‌ترتیب تاریخ انتشار باشد.
- در صورتی که از یک نویسنده منابعی ذکر شود که مربوط به یک سال شمسی یا میلادی است به این صورت عمل شود: (مجیدزاده، ۱۳۸۷الف: ۱۵) و (مجیدزاده، ۱۳۸۷ب: ۳۵).
- در صورتی که مؤلف منبع اثر، معلوم نباشد، نام اثر جایگزین نام مؤلف می‌شود.
- عنوان کتاب‌ها و مقاله‌ها در منابع پایانی مقاله به‌طور کامل ذکر خواهد شد.
- منابع غیر فارسی، پس از منابع فارسی و به‌ترتیب: عربی، انگلیسی، فرانسوی و... آورده شود.
- هر توضیح دیگری غیر از ارجاع به منابع مورداستفاده، در پی‌نوشت، ذکر شود.
- تمامی منابع فارسی نیز باید به‌صورت ترجمه شدهٔ انگلیسی در مقاله آورده شود.

نحوهٔ ارسال مقاله:

- مقاله‌های علمی‌پژوهشی را همراه با درخواست کتبی نویسنده و یا نویسندگان، فقط از طریق وب‌سایت نشریه و به‌نشانی: **nbsh.basu.ac.ir** ارسال فرمایید.



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شاپای چاپی: ۵۲۲۵-۲۳۴۵
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ناشر: دانشگاه بوعلی‌سینا




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شمارهٔ ۴۹، دورهٔ شانزدهم، ۱۴۰۵

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انجمن علمی باستان‌شناسی ایران

دانشگاه بوعلی سینا

پژوهش‌های باستان‌شناسی ایران ۴۹

شاپای چاپی: ۵۲۲۵-۲۳۴۵
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مقالات مندرج لزوماً نقطه نظر فصلنامهٔ پژوهش‌های باستان‌شناسی ایران نیست و مسئولیت مقالات به عهدهٔ نویسندگان گرامی می‌باشد. استفاده از مطالب و کلیهٔ تصاویر نشریه با ذکر منبع بلامانع است.



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بسمه تعالی

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پژوهش های باستان‌شناسی ایران

با صاحب امتیازی **دانشگاه بوعلی سینا** بر اساس آیین‌نامه نشریات علمی مصوب ۱۳۹۸/۰۲/۰۹ در ارزیابی سال ۱۴۰۴، موفق به کسب رتبه **الف** شده است.

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Reassessing the Distribution of Lapui Pottery Across the Highland Zagros: Archaeological Evidence from Khanmirza

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Abstract

The natural environment of Khanmirza County, including access to permanent and seasonal watercourses, fertile soils, and favourable topography, has contributed to the formation of important settlements from prehistoric times to the present. With the onset of the Neolithic and the emergence of regional and interregional networks, which intensified during subsequent periods, particularly in the fifth and fourth millennia BCE, the southern part of Chaharmahal and Bakhtiari Province, and Khanmirza in particular, became especially well-suited to investigating these cultural and economic interactions. In the southern Zagros, corresponding broadly to present-day Fars Province, the fourth and third millennia BCE are represented in more specific archaeological terminology by what is known as the Lapui phase, regarded as one of the most important phases in the prehistoric chronology of the region. Published archaeological fieldwork concerning the social, economic, political, and religious dimensions of life during this period in the Central Zagros, particularly southern Chaharmahal and Bakhtiari Province, remains extremely limited and, in many cases, incomplete. Much of the existing information on the characteristics of the Lapui phase in the Bakhtiari region derives from Zagarell's early reports, which have subsequently served as sources for numerous publications. The conclusions of some of these studies, however, differ markedly from the new archaeological evidence. Drawing on recent archaeological findings, this study characterises Lapui pottery from the southern Highland Zagros and reassesses the distribution, geographical extent, and sphere of influence of the Lapui phase in this region. Field-survey results and the typological study and classification of the ceramic material undertaken by one of the authors in southern Chaharmahal and Bakhtiari indicate that Lapui pottery from the study area can be classified into two groups: fine and coarse wares. Comparative analysis reveals close similarities between these assemblages and Lapui pottery from Fars. Surface collections from 27 archaeological sites, some preserving evidence of occupation from the Neolithic through the Islamic period, yielded diagnostic Lapui pottery. The mapped distribution of Lapui sites indicates that the cultural influence of the Lapui phase extended beyond Fars in the southern Zagros into parts of the Central or Highland Zagros, reaching its southernmost sector along the border with Khuzestan.

Keywords: Lapui Phase; Khanmirza; Late Chalcolithic Period; Pottery; Highland Zagros.

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Introduction

The Chalcolithic period has long occupied a distinctive place in Iranian archaeology because of its central importance for understanding the development of urban culture and civilisation and the processes underlying the transition towards urbanism. Existing archaeological knowledge of this cultural period is based on absolute and relative chronological frameworks, the results of which have been published for different geographical regions. Owing to its strategic location and distinctive natural and cultural resources, the Central Zagros, also referred to as the Highland Zagros, has accommodated diverse human groups since the Paleolithic, as attested by the presence of several prominent archaeological sites. Within this broader geographical zone, archaeological research has concentrated heavily on Khuzestan and Luristan and, to a lesser extent, Fars, while the southern Highland Zagros has received comparatively little attention. Given the region's importance as a corridor of communication, the historical role of mobile communities in cultural exchange between the Bakhtiari highlands, the lowlands of the Khuzestan Plain, and the plains of Fars, and the subsistence practices that continue to characterise the region, examining successive phases of human occupation, particularly the Chalcolithic Period, is essential for understanding the nature of these interactions.

Much of the available information concerning the prehistoric chronological sequence of Chaharmahal and Bakhtiari derives from the work of Alan Zagarell. Zagarell began his archaeological investigations in the Bakhtiari region in 1974. Through comparative analyses of the region's Stone Age lithic assemblages, particularly those dating to the Paleolithic and Epipaleolithic, his research team identified and described the technological characteristics of stone-tool production during these periods. The results concerning the Neolithic and Chalcolithic periods, however, followed a somewhat different pattern. Zagarell employed local names and terminology to designate these cultural phases, using the Qaleh Rostam culture, the Eskandari culture, the Chellegah and Qaleh Afghan cultures, and the Shahrak culture to denote, respectively, the Neolithic and the Early, Middle, and Late Chalcolithic periods (Zagarell, 1982: 33, 35, 40).

Over the past two decades, the introduction of new methods and comparative analyses of archaeological material has demonstrated that many of the attributes originally used to define the region's ceramic cultures, the Qaleh Rostam, Eskandari, Chellegah and Qaleh Afghan, and Shahrak cultures, display close affinities with contemporaneous cultural traditions in Fars and Khuzestan. Laboratory analyses and absolute dating can therefore provide a firmer basis for examining the interactions associated with each

phase. One of the most important chronological phases of prehistory in Fars and the southern Iranian Plateau takes its name from Lapui, a site in the Kur River basin of Fars Province (Langsdorff & McCown, 1942). This phase was initially distinguished based on marked differences in the ceramic material recovered from the upper level of Tall-i Bakun A, which differed from the underlying strata and was designated Bakun A.V. During Sumner's surveys of the Kur River basin and the Marvdasht Plain, pottery comparable to Bakun A.V was identified at several archaeological sites around the village of Lapui in the Zarqan district of Fars, close to the Kur River. Because remains dating to this phase were particularly concentrated around the village, Sumner named the phase after Lapui.

Sumner and other researchers date the Lapui culture to approximately 3900–3400 BCE, placing it within the fourth millennium BCE and between the Bakun and Banesh cultures (Qasemi *et al.,* 2019: 42). On the basis of ceramic evidence from his field surveys, Zagarell attributed several sites on the Khanmirza and Lordegan plains to the Late Chalcolithic Period and compared their pottery with Lapui ceramics and the pottery from Tall-e Geser (Ibid: 43). During surveys conducted in 2010, 2011, and 2012, Hassan Rezvani classified diagnostic Lapui pottery as Late Chalcolithic and attributed 14 sites in Khanmirza County to this period (Rezvani, 2011). In 2024, one of the authors conducted two field seasons under the title "Reassessment of Archaeological Surveys in Southern Chaharmahal and Bakhtiari" and identified 27 sites in the Khanmirza region as belonging to this period on the basis of diagnostic Lapui pottery. Published information concerning the Late Chalcolithic ceramics of Chaharmahal and Bakhtiari, particularly those from Khanmirza County, and the Lapui ceramic tradition of Fars demonstrates that these two ceramic traditions are directly comparable.

Research Questions and Objectives: To what extent do the ceramic characteristics of the Lapui culture in Fars resemble those documented in Chaharmahal and Bakhtiari? How can the new findings support a reassessment of the geographical extent of the Lapui culture and the identification of a broader sphere of influence?

Research Method: The field survey of Khanmirza Plain was designed with consideration for the region's topography, geographical extent, practical constraints, and archaeological potential. Our approach was based primarily on pedestrian survey across different landscape zones. For this purpose, the survey area was divided into three principal environmental units: mountains, valleys, and plains. Different proportions of each unit were examined according to the time available, the number of team

members, and the prevailing topographical conditions. To develop a more detailed understanding of the region, we used 1:25,000-scale topographic maps. Before beginning each day's fieldwork, the relevant section of the map was carefully reviewed. Consequently, no part of the survey area represented on the maps accompanying this report remained unexamined on foot.

Surface sampling at the sites was conducted randomly, although efforts were made to include examples from every ceramic group in the collected assemblage. Once an archaeological site had been identified, sherds representing all ceramic categories were initially collected. After an on-site ceramic reference collection had been established, priority was given to diagnostic types; non-diagnostic sherds were not retained and were returned to the site surface. Overall, efforts were made to collect diagnostic examples from every ceramic category. Their attributes were recorded on purpose-designed forms, and the sherds were digitally drawn using Corel software. Finally, the locations of the archaeological sites were recorded with a GPS device, while the photographer assigned to each team took and organised general photographs of the sites from the cardinal directions.

Research Background

A review of the history of archaeological research in Fars Province shows that numerous Iranian and international scholars have contributed to identifying and characterising the Lapui culture. Nearly all these studies are discussed, either directly or indirectly, in the sections addressing Lapui chronology and cultural characteristics. By contrast, relatively little research has been conducted in Chaharmahal and Bakhtiari, and most available studies have focused primarily on presenting the results of earlier surveys. This section therefore considers only the research directly relevant to the subject of the present article.

In 2019, Alirezazadeh Nowdehi and colleagues published an article entitled "The Lapui Culture and Its Sphere of Influence in the Mountains of Chaharmahal and Bakhtiari." Drawing on the published results of surveys and excavations conducted by Zagarell, Khosrowzadeh, and Jolaei, they attempted to define the sphere of influence of the Lapui culture within the province (Alirezazadeh Nowdehi *et al.,* 2019). In another article, entitled "A Comparative Study of Lapui Pottery from Chaharmahal and Bakhtiari and Northern Fars Using Petrographic Analysis," the authors (Alirezazadeh Nowdehi *et al.,* 2020) presented the results of their laboratory investigations. In 2019, Qasemi and colleagues (Qasemi *et al.,* 2019) published "A Brief

Review of Cultural Similarities and the Distribution, Expansion, and Influence of the Lapui Period in Fars Based on Archaeological Evidence." Alongside examining the geographical extent of the Lapui culture in Fars, they reviewed published evidence from neighbouring regions, including Chaharmahal and Bakhtiari. Their study, however, largely reiterated the conclusions of earlier researchers. This latest study referred only to sites attributed to the Late Chalcolithic Period during Zagarell's and Rezvani's field surveys. By contrast, the present article re-examines the available information and draws on archaeological evidence from recent fieldwork to introduce additional sites that extend the documented distribution and sphere of influence of the Lapui culture. It should be emphasised that previous publications addressing the geographical reach of the Lapui culture relied exclusively on information derived from earlier surveys. The present study instead focuses on new archaeological evidence, which provides the basis for reassessing the distribution and geographical extent of the Lapui culture.

An Overview of the Chronology of the Lapui Phase

The fourth millennium BCE was a crucial period of social, economic, and political transformation in Western Asia, including Iran. In Fars Province, the Late Chalcolithic Period represents an important stage in the emergence of early complex societies. The chronological sequence of Fars is based largely on the soundings undertaken by Louis Vanden Berghe in 1950 (Vanden Berghe, 1952). Although his investigations remain valuable because of the quantity of data they produced, they also present several major problems, particularly regarding the classification of the chronological sequences of Fars and the Marvdasht region. Even the subsequent excavations and research conducted by Sumner did not fully resolve these difficulties.

Sumner was the first archaeologist to examine systematically the sequence of prehistoric cultures in Fars. Through his survey of the Kur River basin and his reassessment of earlier excavations and surveys, he proposed a general chronological framework for Fars that remains an important reference for archaeologists working in the region (Sumner, 1972: 162). In Sumner's classification, the cultures of the fourth and third millennia BCE in Fars are known respectively by the local names Lapui, Banesh, and Kaftari (Mansouri, 2019: 228). The Lapui culture has also been identified in the stratigraphic sequences of several archaeological sites in Fars dating to the fifth and fourth millennia BCE (Habibi *et al.*, 2015: 2).

Following its identification and study, the Lapui phase was incorporated into the archaeological chronology of both Iran and Fars Province as an important prehistoric period. Nevertheless, despite several decades of research, relatively little is known about its defining material and cultural characteristics or its duration, conventionally placed between 3900 and 3400 BCE. According to Sumner, the origins, persistence, and decline of this phase remain poorly understood. Even less is known about the extent of its cultural connections, traditions, industries, and material characteristics (Qasemi *et al.,* 2019: 41). This period witnessed the emergence of some of the world's earliest urban centers, hierarchical administrative structures, and writing systems in several regions. These developments ultimately contributed to the formation of powerful states and flourishing civilisations, including Elam in the third millennium BCE (Petrie, 2013: 1).

Characteristics of Lapui Pottery in Fars Province

The discovery and identification of Lapui pottery, together with establishing the criteria that distinguished it from the ceramics of other periods, constituted the most important step in the initial study of this phase in the archaeology of the southern Zagros and Fars. Plain red pottery, subsequently designated "Lapui pottery," was observed and documented during surveys in Fars and neighbouring regions by Stein, Vanden Berghe, Schmidt, and Herzfeld. Diagnostic red-burnished Lapui pottery was first identified in the disturbed upper levels of Tall-i Bakun A[1]. On the basis of its findspot and stratigraphic context, this phase was initially designated Bakun A.V (McCown & Langsdorff, 1942). Sumner, however, identified a cluster of sites yielding red Bakun A.V pottery near the village of Lapui in the Zarqan district and consequently adopted the name "Lapui" for the phase (Sumner, 1988: 23–41). Following his study of the pottery, Sumner divided it into two groups: 1) fine ware, characterised by a uniform red or buff fabric containing calcareous inclusions. The vessels were generally fired sufficiently to produce a uniformly red or buff core, and their surfaces were usually polished or bore traces of firing; and 2) common ware, characterised by a red fabric with black sand inclusions and a coarser texture than the fine ware. Its core was invariably grey, while its vessel forms resembled those of the fine ware. The principal differences were that hole-mouth or narrow-mouthed storage jars occurred less frequently, whereas low-pedestal bases were considerably more common.

Aspas ware constitutes one subgroup of Lapui pottery. On the basis of soundings at Tall-e Kureh, Alden assigned this ware to the Late Lapui

phase (Alden, 2003: 187–198). Aspas ware has a buff fabric containing sand inclusions and is generally well-fired, while its vessel forms resemble those of the fine Lapui ware. Painted decoration in red, brown, and black occurs on the upper parts of these vessels. Sumner made the most extensive contribution to the identification and study of Lapui pottery. Of the 101 Lapui-period sites he identified during his survey of the Kur River basin, 35 yielded red pottery displaying characteristic Lapui attributes (Sumner, 1972: 41). Gotch identified 18 sites containing characteristic Lapui pottery during his survey of the Persepolis Plain (Gotch, 1968: 16). Zeidi divided Lapui pottery into "fine" and "coarse" wares (Zeidi, 2004: 58). During the systematic survey of Tepe Lapui, its pottery was classified into three groups: "fine," "medium," and "coarse" wares (Habibi, 2013).

Yashmi's study of pottery from Tepe Lapui introduced minor revisions to the conventional classification, dividing the pottery into "coarse" and "fine" wares, five further subtypes, and an additional problematic ceramic category (Yashmi, 2015: 149–150). A general review of the classification and typology of Lapui pottery therefore reveals several competing schemes; a situation also encountered in the study of most diagnostic ceramic traditions. Most archaeologists agree on the necessity of studying pottery recovered from excavations and surface surveys; their principal disagreement concerns how these valuable materials should be analysed. This lack of consensus has led to the development of numerous methods and approaches to ceramic analysis. A review of published corpus reveals considerable variation in ceramic description, classification, and typology. These differences arise from the absence of a standardised method and general analytical framework and, in some cases, from the influence of individual preferences. Because archaeological research in Iran consists predominantly of field surveys, ceramic sherds inevitably constitute the largest category of recovered material. There is therefore a pressing need for a clear scientific framework for ceramic analysis, encompassing description, classification, and typology. Such a framework cannot be established without consultation and cooperation among specialists. Qasemi and colleagues also addressed the divergent approaches to the typological study and classification of Lapui pottery. They observed that, alongside the architectural evidence, the diverse material assemblage from Tepe Lapui, of which pottery forms the largest sample, includes numerous forms belonging to fine, medium, and coarse wares. Typologically, the ceramic vessels can be classified into several principal groups: open forms, including various bowls and cups;

vessels with vertical or upright rims, such as goblets; and closed forms, including simple jars and storage jars. Differences among the proposed manufacturing categories, thick or coarse, medium, and fine wares, whether plain or coated, and their respective subtypes are minimal. More importantly, the potters do not appear to have reserved particular vessel forms for specific ware groups; instead, ceramic attributes and vessel shapes were applied with broadly comparable frequency across the assemblage (Qasemi *et al.,* 2019: 18).

Mirzaei also discussed the difficulties associated with the typological study, classification, and identification of Lapui pottery and provided a more detailed account of the Lapui ceramics recovered from Jelian. The second category of prehistoric pottery identified at Jelian consists of the widely attested ceramics of the Lapui period, named after the village of Lapui (Vanden Berghe, 1954: 401). Based on surface survey evidence, subsequent publications classified Lapui pottery into common ware and fine ware, both distinguished principally by their red color and polished surfaces. The use of monochrome red as a defining criterion for this period was intended to distinguish it from the predominantly buff pottery of the preceding Bakun period. Archaeologists employed this contrast in their reports to separate the two chronological phases. The distinction was first introduced by the excavators of Tall-i Bakun and was subsequently adopted by Vanden Berghe in differentiating these phases within the prehistoric chronology of Fars. Painted decoration clearly played little role in the new ceramic tradition designated as Lapui, except in a limited number of cases such as Aspas ware.

Recent archaeological investigations and excavations of Lapui-period deposits have nevertheless revealed a considerably broader range of ceramic colors at sites such as Tall-e Nurabad (Roustaei & Potts, 2006: 174), Tall-e Espid (Petrie *et al.,* 2007), Tepe Mehr Ali and other sites (Sardari, 2013), Tall-e Khari (Sardari & Mousavi, 2018), and possibly Tepe Lapui, Tall-e Suzu, and Tall-e Bandu. These assemblages include buff, red, orange, brown, and grey Lapui pottery, although orange is the predominant color, followed by red. Accordingly, when analysing and classifying the excavated Lapui pottery from Jelian, the authors followed Sumner's classification and distinguished between fine Lapui ware and common or coarse Lapui ware, irrespective of variations in fabric and surface color (Mirzaei & Sardari, 2021: 42). Unlike Bakun pottery, Lapui vessels are generally plain and display marked uniformity in their rim forms, together with traces of regular striations. These characteristics

may indicate that Lapui potters used the potter's wheel and sought to standardise vessel forms (Petrie, 2006: 175). Lapui pottery appears to have included both handmade and wheel-made vessels. At Jalian, the predominance of homogeneous and standardised forms with regular, rounded, and smooth rims and bases further supports the use of the wheel in ceramic production (Roustaei & Potts, 2006: 175). This evidence may also indicate specialised mass production in response to population growth (Sumner, 1988; Petrie, 2011: 174). The Jalian assemblage also contains sherds bearing mesh-like textile or basket impressions, comprising eight body sherds and one vessel base. These impressions may indicate that baskets or coarse sackcloth-like textiles were used to support vessels during manufacture. The extent to which this classification can serve as a foundation for broader studies of Lapui pottery ultimately depends on the analytical approach adopted. Given that only a few Lapui-period sites have been excavated and that Lapui pottery displays relatively limited variation, as is also evident at Jalian, it remains difficult to propose a typological system substantially different from that developed by Sumner (Mirzaei & Sardari, 2021: 43).

Geographical Extent and Sphere of Influence of the Lapui Culture in Fars Province

Pottery is particularly important because it provides valuable information about subsistence practices and the political, economic, cultural, and technological conditions of ancient societies. As one of the earliest and most enduring forms of human material production, pottery has remained a fundamental source of archaeological evidence for identifying cultures and cultural periods. It has been used so extensively to classify and date other finds and archaeological contexts that ceramic traditions are often treated as direct expressions of the material culture of a particular period or ethnic group. Perhaps more than archaeologists working in any other region, specialists in the Southwest Asia have used pottery and ceramic styles to interpret cultural, sociopolitical, and economic change. This approach has become so deeply embedded in archaeological practice that cultures are sometimes implicitly equated with the colors and types of pottery associated with them. This interpretative model, however, has long been questioned. Accurate interpretation of ceramic assemblages requires modern scientific analysis and ethnoarchaeological research into the mechanisms of pottery production and their relationship with broader cultural systems (Alizadeh, 2004: 1). Before Sumner's investigations, knowledge of the Lapui phase

was limited to general observations concerning settlement patterns and its diagnostic pottery, while discussions of its economic and social organisation remained largely speculative (Alizadeh, 2004: 78).

Despite the research outlined above, the geographical extent and cultural influence of the Lapui phase have yet to be clearly defined. Scattered evidence exists concerning ceramic and cultural similarities between Lapui sites and neighboring settlements in the Kur River basin, the southern plains of Fars, and even the northern frontier zones represented by the intermontane plains of the southern Zagros in Fars, situated between cold, temperate, and warm climatic regions. Unfortunately, this evidence has not yet been systematically assembled and classified. Information from the limited number of excavated sites in Fars preserving archaeological deposits and material culture from this phase, together with surface material recovered through archaeological surveys, has nevertheless contributed to explaining the formation and extent of the Lapui cultural sphere. Before proceeding further, the geographical distribution and sphere of influence of the Lapui phase, long examined primarily through surveys of the Kur River basin, generally regarded as its principal center of origin, must be considered from both internal and external perspectives. The internal category comprises sites located within the modern geographical boundaries of Fars and its constituent counties. The external category encompasses the much broader distribution of pottery, the principal diagnostic feature of this phase, throughout neighbouring regions, extending from northern Fars southwards and across both western and eastern Iran (Qasemi *et al.*, 2020: 46).

In considering the geographical distribution and cultural influence of the Lapui culture, it should also be recognised that archaeologists such as Sumner and Alizadeh proposed a transformation in settlement patterns and a shift towards pastoral mobility during this phase. Evidence indicates that Lapui settlement patterns differed from those of the preceding Bakun phase. Drawing on a model of increasing mobility, Alizadeh and Sumner interpreted this transformation as an abrupt response to the rapid decline in environmental productivity. They attributed this decline to the adverse consequences of excessive exploitation of agricultural land, environmental resources, and irrigation systems (Sumner, 1972). Pastoral mobility during the late fifth and early fourth millennia BCE has also been identified as an important factor in the socioeconomic and political development of inland regions and in the transmission of cultural traditions to neighbouring areas. The mountainous regions of Iran, particularly Fars Province and

the highlands of Chaharmahal and Bakhtiari, were not excluded from this process (Alizadeh, 2004: 21).

Within the internal geographical zone, evidence of the Lapui phase has been documented through surveys of the mounds and sites of the Murghab Plain at Pasargadae; the plains of Shiraz and Marvdasht (Gotch, 1968–1969); and the Marvdasht Plain and Kur River basin (Sumner, 1972). Further evidence derives from the renewed survey of the Marvdasht Plain, the Kur River basin, and Sivand, including Tall-e Charkhu, Tall-e Balguni, Tall-e Ashki, Tall-e Bakan, Tepe Qasr Dasht, Tall-e Aq Qaleh, Tall-e Gap-e Nazarabad, Tall-e Shanguli, Tall-e Kharistan-e Sofla, Kushk-e Zar B, and Tall-e Kamin (Alizadeh, 1997). Additional sites were identified during the joint Iranian–French survey of the Marvdasht Plain in 2005 and 2006 (Boucharlat & Feyzkhah, 2006); the 2006 survey of the Shiraz Plain, including Tall-e Tit, Tall-e Poustchi, and Tall-e Badi (Barfi & Bidari, 2006); the 2006–2007 archaeological survey of the Kamfiruz district of Marvdasht, including Tall-e Gorgi (Asadi, 2007); and the 2002 survey of the Dorudzan district of Marvdasht, including Tall-e Qadamgah (Heydari & Soltani, 2002).

Surveys of the Sarhad region and Eqlid County conducted between 2005 and 2009 identified further evidence at Tepe-ye Gharbi-ye Kharistan-e Sofla, Tepe Sabz Ali, Tall-e Pasgah-e Aspas, Tepe Raeisi, Tepe Havakhsh, Tepe Bidi, Tepe Naqqareh Khaneh, Tepe Leh Cheraghi A, and Tepe Mehr Ali (Sardari, 2011; Rezaei, 2009). Lapui material was also recorded during the 2006 survey of the Ramjerd district of Marvdasht at Tall-e Ziyareti A (Asadi, 2006); archaeological surveys of the Fasa Plain at Tall-e Na'laki A, Domaneh, Tall-e Zahhak, Seh Tall, and Tepe Qobadi (Miroschedji, 1973–1974; Asadi, 2009; Mansouri & Asadi, 2012); and the 2010 survey of the western slopes of Kuh-e Rahmat, which included renewed investigations of Tall-i Bakun A, Tall-i Bakun B, Tepe Hajiabad, Tall-e Nokhodi, Tall-e Shamsabad, and Tall-e Qaleh Hasanabad (Zare, 2010). Archaeological surveys in Mamasani County identified six sites on the Rostam 1 Plain and seven on the Rostam 2 Plain.

Lapui pottery and other associated material were also identified by Khanipour during archaeological surveys conducted in 2014–2015 in the central and Mazayjan districts of Bavanat County. The sites included Kol Hashem, Kotkotu, Tall-e Pashangi, Jafarabad-e Sofla, Qanat-e Now 2, Pahrin, and Tonb-e Qaleh (Khanipour, 2015). Tonb-e Qaleh is one of the most prominent Lapui-period sites in the Bavanat region. The presence of several Late Bakun sherds, the high concentration of Lapui pottery,

and several meters of cultural deposits suggest that the transition from the Bakun to the Lapui phase may be preserved at this site (Qasemi *et al.,* 2020: 49). All sites yielding Lapui pottery have been included in this section to provide a clear understanding of the distribution of the Lapui culture across the geographical region of Fars.

Environmental Setting of the Study Area

Chaharmahal and Bakhtiari Province covers 16,532 km² and lies between 31°09′ and 32°48′ N and 49°28′ and 51°25′ E of the Greenwich meridian, in the southern Zagros of south-western Iran. The province has highly rugged terrain: mountains and hills account for approximately 74% of its area, while its plains consist primarily of small intermontane basins (Gitashenasi Provincial Atlas). Khanmirza County borders Borujen County to the north-east, Kiar County to the north-west, Falard County to the south-east, Lordegan County to the south and south-west, Semirom County in Isfahan Province to the east, and Ardal County to the west. The county covers approximately 936 km² (Fig. 1; Deputy Directorate for Remote Sensing and Geography, General Directorate of Geography, 2000: 437–440). Until 2019, Lordegan County comprised three districts: Central, Khanmirza, and Falard. Following subsequent administrative reorganisation, Khanmirza was separated from Lordegan in 2019, followed by Falard in 2023.

The study area encompasses two markedly contrasting environments: its northern sector is dominated by mountains and elevated foothills, whereas its southern sector consists of extensive, level plains (Fig. 2). This part of the Zagros follows the range's general northwest–southeast orientation and comprises a series of parallel valleys. Geomorphologically, the landscape combines high mountains, deep valleys, and alluvial plains that support diverse forms of land use (Zagarell, 1982: 23). The area encompasses varied geomorphological and geological landscapes and lies within the central and, to some extent, southern Zagros. Its principal morphological characteristics reflect those of the Zagros as a whole: intermontane plains and valleys occur alongside parallel mountain ranges or anticlines. The relief of this part of Chaharmahal and Bakhtiari Province consists primarily of limestone mountains. These mountains contain various geological formations, some of which, notably the Bakhtiari Conglomerate, are archaeologically significant because they contain high-quality lithic raw materials exploited by prehistoric communities for stone-tool production. A clear example is Kuh-e Sorkh, which comprises the eastern highlands of the Rig Valley. The mountain derives its name from the numerous red chert

cobbles embedded within its conglomeratic deposits, which give it a reddish appearance. The mountainous Bakhtiari region, which forms the northern and north-eastern boundary of Khuzestan, is crucial to understanding cultural developments across Iran's alluvial plains. It has traditionally played an important role in the economic and political life of the plateau's lowland regions and, to a lesser extent, the Central Iranian Plateau. The Bakhtiari region encompasses a substantial part of what Flannery termed "Greater Mesopotamia". It provides an ideal setting for a mixed economy centered on livestock herding. Its fertile intermontane valleys are generally well watered and highly suitable for a mixed subsistence economy combining extensive agriculture with pastoral nomadism (Ibid: 24). Agricultural potential nevertheless varies considerably between valleys. Several provide excellent conditions for cultivation, while some areas and valleys are intensively farmed and produce substantial quantities of rice. Even so, mixed farming and livestock herding remain widespread because some valleys possess only limited agricultural potential. Elsewhere in Bakhtiari area, the terrain is suitable only for herding, as the land is too rocky or arid for cultivation.

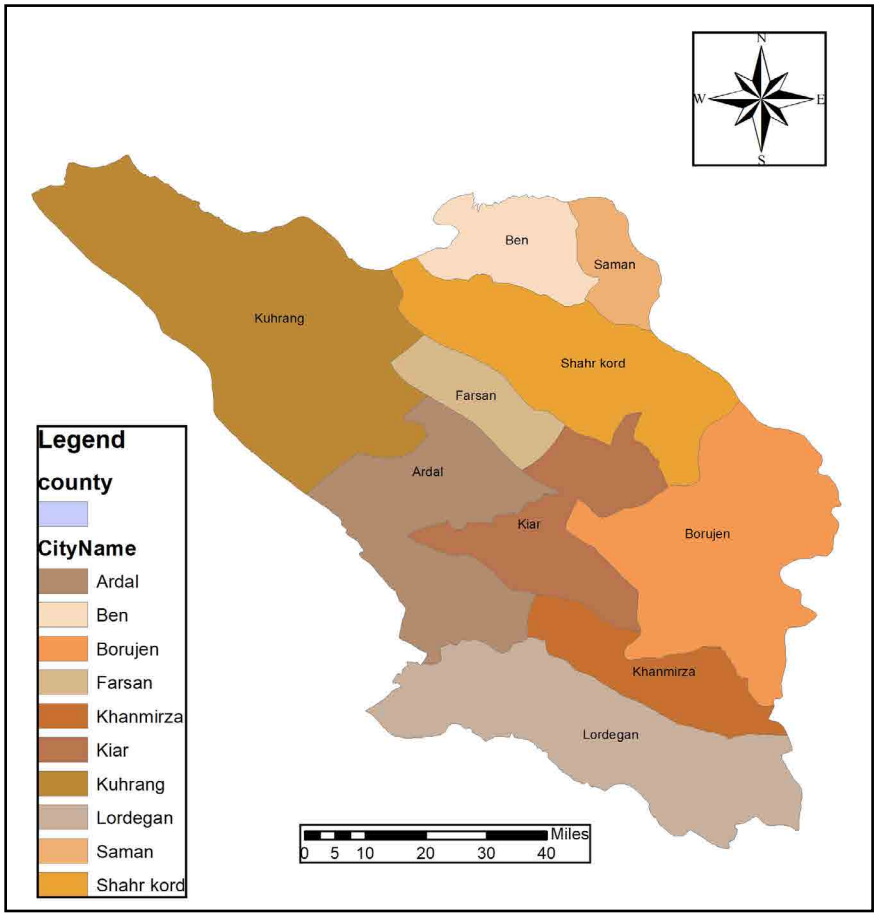
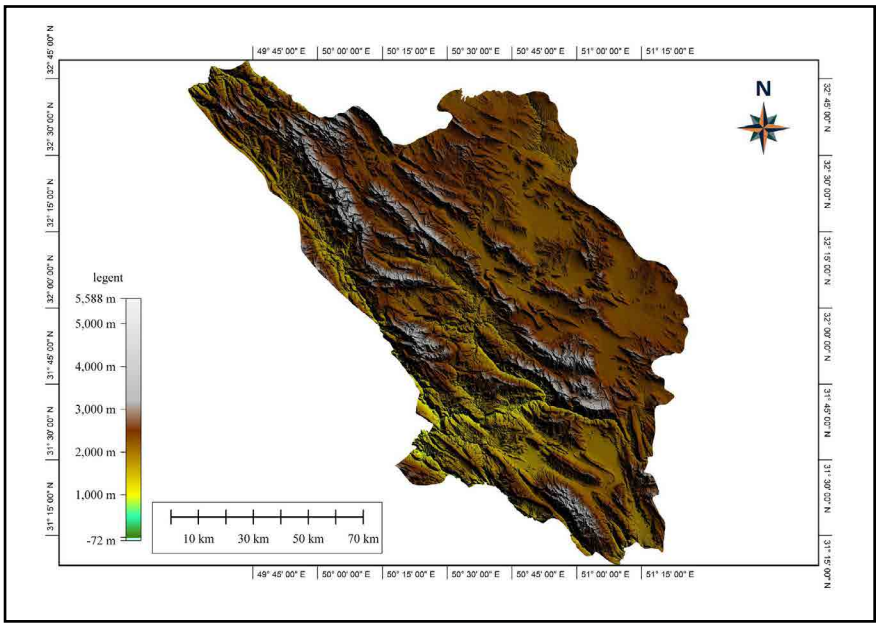


Fig. 1: Location of Khanmirza County within Chaharmahal and Bakhtiari Province (Authors, 2024). ▶



◄ **Fig. 2: Topographic map of Chaharmahal and Bakhtiari Province, showing Khanmirza County (Authors, 2024).**

Sphere of Influence and Expansion of the Lapui Culture in Chaharmahal and Bakhtiari Province

This section first briefly introduces the areas that previous archaeological studies have identified as forming part of the sphere of Lapui cultural influence. It then describes the ceramic evidence recovered during the field survey and reassesses the geographical extent of this cultural tradition. During the fourth and third millennia BCE, the economic, political, and cultural relations between Fars and neighbouring regions, including Kohgiluyeh and Boyer-Ahmad and Chaharmahal and Bakhtiari, facilitated the transmission of Lapui cultural traits and ceramic traditions into these areas. Ceramics constitute the most important category of material evidence for examining regional and interregional cultural interactions. Shared technological attributes and ceramic correspondences documented at other sites, including close and occasionally direct parallels, provide the basis for the present investigation of cultural affinities and the geographical reach of the Lapui period beyond present-day Fars into the adjacent region of Chaharmahal and Bakhtiari.

Archaeological interpretations of the emergence and development of the Lapui culture in Fars have focused primarily on changes in subsistence practices. Based on settlement data from the Kur River basin, Sumner identified evidence of a continuous decline in settlement from the fourth millennium BCE, at the end of the Bakun period, to the late third millennium BCE, corresponding to the beginning of the Kaftari period. He argued that this pattern reflected a sustained decline in the productivity of the regional

agricultural system, which he attributed principally to the area's saline lands. Although Sumner maintained that the observed decline in settlement could not be explained by a continuous decrease in the regional population, he proposed that it might reflect a gradual transition from an economy based on irrigated agriculture during the Bakun period to one centred on nomadic pastoralism during the Banesh period. He further argued that the expansion of nomadic groups and their subsequent attainment of political and economic influence during the Proto-Elamite period arose from a new and distinctive form of organisation in the highlands. Tribal political systems incorporated both sedentary and mobile elements, which were sometimes organised separately and at other times united into cohesive confederations under the authority of tribal khans (Sumner, 1986: 209). Although detailed, systematically organised information concerning the duration of the Lapui period, its interactions with preceding and subsequent phases, and its regional and interregional connections remains unavailable, resolving these questions requires a comprehensive study of its material culture and more detailed comparisons with other sites and regions. Further investigation of other plains and valleys in Fars, combined with comparisons with surveys conducted in the Kur River basin, would be particularly valuable. Comprehensive surveys are also required in the northern highlands, the intermontane plains of the Zagros, the southern plains, and adjacent environmental zones that served as routes for nomadic and semi-nomadic groups during this period. Comparing evidence from these areas with the defining characteristics of the Lapui culture may help resolve some of these questions.

If the prevailing hypothesis concerning the emergence and transmission of the Lapui culture is accepted, the Bakhtiari region has historically been, and remains, environmentally well suited to mobile pastoral occupation. Its proximity to the principal homeland of the Lapui culture in Fars, together with its diverse natural resources, including abundant perennial and seasonal watercourses, high precipitation, fertile soils, varied vegetation and wild plants, suitable pastures, and intermontane plains, would have attracted Lapui pastoralists and mobile communities seeking fodder for their livestock. The southern plains of the region, including Rig and Khanmirza, contain several Lapui sites and scatters of ceramics dating to this period. The southernmost areas of Chaharmahal, owing to their proximity to the Lapui heartland, consequently, preserve more numerous and sustained traces of occupation associated with this culture (Alirezazadeh Nodehi *et al.,* 2019). The northern part of the Bakhtiari region likewise contains rich

intermontane plains suitable for herd movement. These plains lay along the northern margins of the Lapui cultural sphere and appear to have been extensively used by communities associated with this tradition. As noted above, evidence from the Lapui period has been recovered throughout this geographical area. The sites are predominantly situated on intermontane plains and near mountain slopes, a distribution that may support the proposed settlement model for the Lapui period. They are located beside perennial and seasonal water sources, particularly the waterways of the Farsan Plain and Lordegan County. The plains lie between mountain ranges, while the adjacent slopes provided suitable conditions for both seasonal and sustained pastoral mobility. Nevertheless, given the quantity and quality of the ceramics and the volume of visible archaeological deposits at some sites, not all Lapui settlements in this region can be attributed to mobile communities; further extensive research is therefore required. Archaeological investigations in the Bakhtiari region have largely demonstrated the connections between this period and the regions and mountains farther north. However, the precise relationship between Lapui ceramics and the painted wares of Bakhtiari remains unclear and requires further research and systematic comparison between sites in the two regions. Significantly, recent fieldwork has shown that many newly-identified sites represent permanent settlements with multiperiod occupational sequences. This evidence casts doubt on the proposition that communities associated with the Lapui culture were exclusively nomadic or mobile. It should also be noted that only a limited number of sites have been identified on the Rig Plain, although previous studies cited in the literature review described it as particularly favourable for communities associated with the Lapui culture.

In his surveys of the Lordegan and Khanmirza plains, Zagarell identified Late Chalcolithic ceramics whose characteristics corresponded closely to those of red Lapui ware. He also noted similarities between Aspas ware and ceramics recovered from the Bakhtiari region (Zagarell, 1982: 29–30). During surveys of the Farsan Plain and the districts of Miyankuh and Ardal in Chaharmahal and Bakhtiari, Khosrowzadeh identified Lapui-period ceramics at several sites, including Ar185, Ar143, Fs85, Fs123, Fs139, Fs156, Fs178, Mk84, Mk118, Mk65, and Mk12 (Khosrowzadeh, 2009: 8). Other surveyed sites in Chaharmahal and Bakhtiari include Shahrak S10 and Qaleh Afghan, where large quantities of Lapui-period ceramics were recovered (Zagarell, 1982: 38).

Research Findings

Zagarell's field investigations identified nine sites as Late Chalcolithic settlements. Rezvani's archaeological survey similarly attributed fifteen sites to the Late Chalcolithic period, although some yielded no evidence of Lapui ceramics and were assigned to this period solely on the basis of their lithic assemblages. During the present field survey, ceramic evidence enabled twenty-seven sites to be associated with the Late Chalcolithic, or Lapui, period. These settlements occupied a combination of foothill, intermontane, and open-plain settings. Some preserve occupational sequences extending from the Neolithic to the Islamic period, whereas others were inhabited exclusively during the Late Chalcolithic period (Table 1).

Table 1: Sites identified during the 2024 field survey (Authors, 2024). ▼

Razgah Valley	Sites with multiperiod occupation	Sites with two-period occupation	Single-period occupation sites (Lapui)
Darreh-ye Bid-e Bagh-e Behzad	Tol-e Kochir-e Aluni	Kuh-e Dalan	Tol-e Barmi
Imamzadeh Shah Abd al-Azim, Bagh-e Behzad	Tol-e Boland-e Sini	Borjuyi	Gushki Site
Tol-e Afghan	Mazargah-e Sini	Tol-e Aqa Ayaz	Muradan
Chel-e Gushki	Mazargah-e Deh Sahra	Sefilan	East of Borjuyi
Eshkaft Gushki 3	Tol-e Bandar	Kort-e Gol Cemetery	Deh Sahra Site
Gushki Cemetery	Sartang-e Dinar-Ali	Ahmadabad-e Bardbor	Bard-e Jilan
Tol-e Ka Khodadad	Tol-e Bardbor	Tol-e Khargushi	

Table 2: Sites identified during Rezvani's field survey (Rezvani, 2010).▶

Aluni 1	Musa Khani	Tol-e Malu
Aluni 2	Tang-e Mirzavand	Mazari-ye Sini
Chel-e Gushki	Kamrad Ali	Tol-e Bandar
Ka Khodadad	Deh Sahra	Ka Khodadad
Abd al-Azim	Sefilan	Sartang

Table 3: Sites identified during Zagarell's field survey (Zagarell, 1982). ▼

Borjuyi	K60	K96
Tol-e Boland	K74	Kuh-e Dulab
Shahruyi	K75	Qaleh Afghan

Description and Analysis of Lapui Ceramic Characteristics in Chaharmahal and Bakhtiari

No typological or classificatory study has yet been undertaken of the Lapui-type ceramics recovered in Chaharmahal and Bakhtiari Province. It is therefore currently necessary to employ Sumner's classification of Lapui ceramics from Fars. The Bakhtiari assemblage has provisionally been divided into fine and common wares. The ceramics recovered at Shahrak



◄Fig. 3: General view of the Tappeh Raisi site (Authors, 2024).



◄Fig. 4: General view of the Ka Khodadad site (Authors, 2024).



◄Fig. 5: General view of the Qaleh Afghan site (Authors, 2024).



Fig. 6: General view of the Mazargah-e Sini site (Authors, 2024). ▶

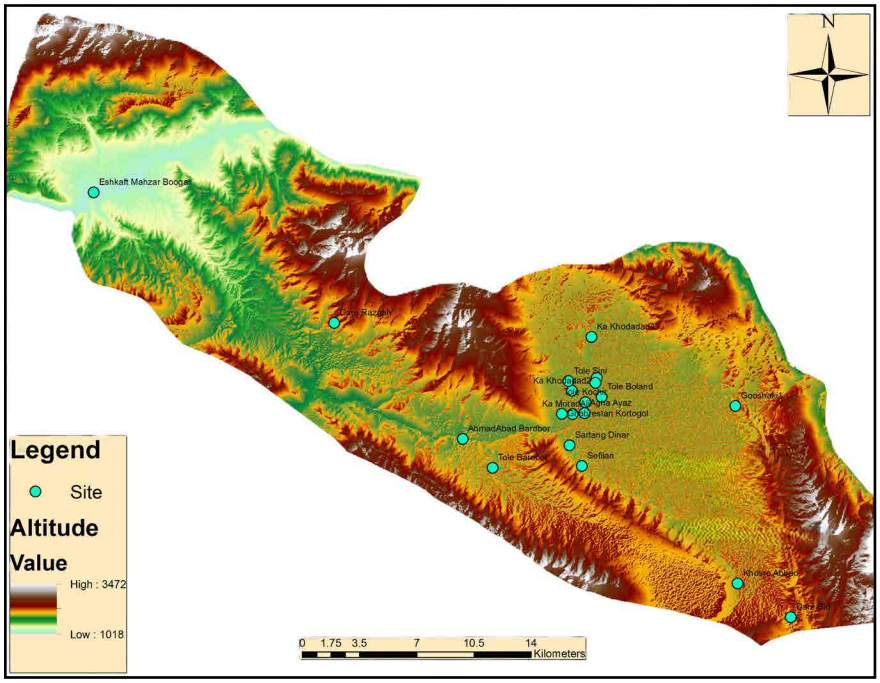


Fig. 7: Map showing the settlement pattern of Lapui-period sites in Khanmirza (Authors, 2024). ▶

clearly date to the Late Chalcolithic Period. The mound lies immediately north of Shahrak village, amid agricultural fields. Based on the ceramic evidence, the Shahrak assemblage may be divided into three principal categories: painted buff ware, red-slipped red ware, and plain buff ware. All three groups contain abundant vegetal temper, and their exterior surfaces bear a red clay slip. It remains unclear whether these vessels were hand-made or wheel-made. The assemblage includes several bowls with globular bodies and incurving rims (Zagarell, 1982: 41). The ceramic assemblages from the Khanmirza, Rig, and Lordegan plains bear no direct relationship to the Late Chalcolithic assemblage of the Shahr-e Kord region. In general, the Late Chalcolithic phase in these plains is characterised by a distinct ceramic assemblage, although several close parallels occur at Shahr-e Kord. Interpreting the archaeological evidence from these plains is more difficult because red wares predominate. Both red ware and red-slipped

ware occur and, unfortunately, cannot readily be distinguished. Broadly, the ceramics of this region may be classified into Borjuyi ware and buff ware. At Borjuyi, red and red-slipped wares constitute the overwhelming majority of the assemblage. A fragment of a small, handled jug recovered from the upper part of the site may be dated to the Late Chalcolithic period. Fragments of bowls with distinct rims were also recovered from this area of the site. Like several other sherds from Borjuyi, they contain mineral temper, and their fabrics include abundant fine white particles. This diagnostic ware can be used to date most of the red ceramics from Borjuyi and, consequently, those from other sites in the region (Zagarell, 1982: 46). Caldwell identified several ceramic innovations in Levels 36 and 38 at Tall-i Ghazir. Some ceramics recovered during surveys of the Khanmirza and Lordegan plains appear comparable to Borjuyi ware. At Qaleh Geli on the Lordegan Plain, for example, two pedestal bases were recovered, one of which bears an incised decoration comprising two lines on its unslipped interior surface. According to Zagarell, these examples have parallels at Tall-i Ghazir (Caldwell, 1961: fig. 34) and Susa 14–16b. Comparable rims recovered during the Kur River basin survey have likewise been dated to the Lapui period (Sumner, 1972).

A study entitled "A Comparative Petrographic Study of Lapui Ceramics from Chaharmahal and Bakhtiari and Northern Fars" examined material from several sites. Because one of the sampled sites, Qaleh Afghan, lies within Khanmirza County, the relevant laboratory findings are presented here. Rock fragments were not commonly added to the examined Lapui ceramics as either fillers or temper. Limestone and calcite inclusions occur much more frequently in ceramics from Chaharmahal and Bakhtiari than in those from Fars. Several samples display a fluidal fabric attributable to the vessel-forming process. Variations in color within individual vessels, as well as differences in colour between vessels, are unrelated to their composition. Instead, they reflect oxidising and reducing conditions and the availability of oxygen during firing. The analytical results demonstrate that the manufacturing techniques, ceramic fabrics, and even firing temperatures employed in producing Lapui ceramics were highly similar in Fars and Chaharmahal and Bakhtiari. Such close correspondence is unlikely to be coincidental, although the proportional composition of the samples differs. Given that the Lapui ceramic tradition originated in the Kur River basin of northern Fars, and that laboratory analyses reveal strong similarities between samples from Fars and Chaharmahal and Bakhtiari, particularly those from Gerchgah 5 and Mian Talan, the authors argue



▲ **Fig. 8: Ceramic finds from the Tappeh Raisi site (Authors, 2024).**



▲ **Fig. 9: Ceramic finds from the Ka Khodadad site (Authors, 2024).**



▲ Fig. 10: Ceramic finds from the Qaleh Afghan site (Authors, 2024).



▲ Fig. 11: Ceramic finds from the Mazargah-e Sini site (Authors, 2024).

that Lapui ceramic technology was transmitted from the Kur River basin in Fars to Chaharmahal and Bakhtiari. Potters from the Kur River basin subsequently produced Lapui ceramics within the territory of present-day Chaharmahal and Bakhtiari. They could carry their technical knowledge with them, but not the clay itself. This explains why the composition of Lapui ceramics from Chaharmahal and Bakhtiari differs slightly from that of the Fars samples. Some Lapui vessels from Chaharmahal and Bakhtiari were even fired at approximately 800°C (Alirezazadeh Nowdehi, 2019).

Based on preliminary examination, cataloguing, and classification, the Lapui ceramics recovered during the survey of Khanmirza County were divided into two categories. 1) Fine wares generally have red, light brown, occasionally dark-brown, or orange fabrics containing limestone and calcite particles. Firing usually produced uniformly red, orange, or brown cores, although some vessels have dark cores. Vessel surfaces are generally burnished or fire clouded. 2) Common wares have red fabrics containing black sand temper and are somewhat coarser than the fine wares. Their cores are generally brownish orange, orange, or dark brown. Preliminary examination of manufacturing techniques indicates that most ceramics of this type in the Bakhtiari region were wheel-made, although a smaller quantity of handmade pottery was also recovered.

Archaeological investigations and surveys conducted across Chaharmahal and Bakhtiari indicate that, with the exception of Ben, Saman, and Kuhrang counties, the province preserves material and cultural evidence attributable to the Lapui period. The Shahr-e Kord and Farsan plains may therefore be regarded as the northernmost extent of the Lapui cultural sphere in Chaharmahal and Bakhtiari (Alirezazadeh Nowdehi *et al.*, 2019). It should also be noted that the 2024 field survey conducted by the present authors in the southern part of the province extended the known distribution of the Lapui culture to the province's southernmost area, along the border with Khuzestan. In light of recent research within the administrative boundaries of Khuzestan Province, this geographical range may extend farther south into northern Khuzestan.

Conclusion

Zagarell distinguished three phases in the prehistoric development of the Bakhtiari region. During the first phase, associated with the Neolithic Period, an early mixed economy and a particular form of social organisation prevailed, characterised by a high degree of mobility. This was followed by a more sedentary phase characteristic of the Late Neolithic and Early

Chalcolithic periods. By the end of the Middle Chalcolithic Period, however, a new phase of mobile lifeways appears to have emerged. This increased mobility developed across a broad geographical setting and involved a degree of economic specialisation, as highland lifeways became increasingly differentiated from those of the lowlands. It was also accompanied by a growing tendency towards political centralisation. This phase differed fundamentally from the Neolithic pattern and represented a distinct form of nomadism. According to Zagarell, during the Middle and Late Chalcolithic periods, a distinctive highland way of life emerged, with its own social rules and subsistence mechanisms, bearing greater similarity to lifeways practised in the region today. During the Late Chalcolithic Period, both the total number and average size of sites declined. This decrease coincided with the appearance of a new site types, probably associated with pastoral activities. As noted above, however, recent archaeological evidence contradicts Zagarell's interpretation. The ceramics recovered during the survey constitute the principal evidence for the presence of the Lapui culture in the High Zagros, particularly in the southern part of the province. Their detailed description and publication are therefore essential for defining the cultural characteristics of the Lapui tradition.

Although substantial differences occur among ceramic assemblages from different parts of the High Zagros, or Bakhtiari region, the local Lapui-type pottery displays close affinities with corresponding ceramics from other highland areas. Based on preliminary examination, cataloguing, and classification, the Lapui ceramics recovered during the survey of Khanmirza County were divided into two categories. 1) Fine wares generally have red, light brown, occasionally dark-brown, or orange fabrics containing limestone and calcite particles. Firing usually produced uniformly red, orange, or brown cores, although some vessels have dark cores. Vessel surfaces are generally burnished or fire clouded. 2) Common wares have red fabrics containing black sand temper and are somewhat coarser than the fine wares. Their cores are generally brownish orange, orange, or dark brown. Preliminary examination of manufacturing techniques indicates that most ceramics of this type in the Bakhtiari region were wheel-made, although a smaller quantity of handmade pottery was also recovered. Rock fragments were not commonly added to the examined Lapui ceramics as either fillers or temper. Limestone and calcite inclusions occur much more frequently in ceramics from Chaharmahal and Bakhtiari than in those from Fars. Several samples display a fluidal fabric attributable to the vessel-forming process. Variations in colour within individual vessels, as well as

differences in colour between vessels, are unrelated to their composition. Instead, they reflect oxidising and reducing conditions and the availability of oxygen during firing. Laboratory results indicate that the manufacturing techniques, ceramic fabrics, and even firing temperatures employed in producing Lapui ceramics were highly similar in Fars and Chaharmahal and Bakhtiari. Such close correspondence is unlikely to be coincidental, although the proportional composition of the samples differs. The Lapui ceramic tradition originated in the Kur River basin of northern Fars, and laboratory analyses demonstrate close similarities between samples from Fars and Chaharmahal and Bakhtiari.

The geographical extent conventionally attributed to the Lapui culture in the southern High Zagros has largely been defined on the basis of Zagarell's and Rezvani's surveys, the limitations of which have been discussed in the preceding sections. Although Zagarell's work constituted one of the earliest archaeological investigations of the Bakhtiari highlands, some of its conclusions require substantial and fundamental reassessment. Many prominent sites escaped detection, and it may reasonably be inferred that Zagarell's survey strategy favoured elevated and readily visible sites. As Zagarell himself acknowledged, the survey was conducted rapidly and under considerable time constraints; consequently, only nine sites were identified as Late Chalcolithic settlements. Rezvani's 2010 survey identified fifteen Late Chalcolithic sites. However, many yielded no diagnostic Lapui ceramics and were assigned to this phase solely based on their lithic assemblages. The two-season reassessment of the southern part of Chaharmahal and Bakhtiari Province, conducted by the present author in 2024, identified twenty-seven sites containing Lapui-type ceramics. The discovery of these additional sites necessitates a reassessment of the geographical extent of the Lapui cultural sphere. Archaeological evidence indicates that, except for Ben, Saman, and Kuhrang counties, other parts of Chaharmahal and Bakhtiari preserve material and cultural remains attributable to the Lapui period. The Shahr-e Kord and Farsan plains may therefore be identified as its northernmost extent, while Lapui remains also occur in Lordegan, the province's southernmost region bordering Khuzestan. Recent investigations within Khuzestan further suggest that the distribution of the Lapui culture may extend into the northern part of that province.

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Author Contribution

This research is derived from the first author's doctoral dissertation. The primary data collection, encompassing all observational and analytical components, was conducted by the first author under the direct supervision and mentorship of the second and third authors.

Conflict of Interest

In adherence to ethical publication standards, the authors affirm that there are no conflicts of interest, either personal or financial, that could have influenced the content or conclusions presented in this research.

Endnote

1 The Bakun period takes its name from the site of Bakun, which is incorrectly rendered as Bākun in the archaeological literature.

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بازشناسی پراکندگی سفال لپویی در حوزهٔ جغرافیایی زاگرس مرتفع، براساس یافته‌های باستان‌شناختی خانمیرزا

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چکیده

قابلیت‌های محیط طبیعی شهرستان خانمیرزا، نظیر در دسترس بودن منابع آب (رودهای دائمی و فصلی)، خاک حاصلخیزو توپوگرافی منطقه از عوامل اثرگذار در شکل‌گیری استقرارهای مهم و شاخص از دوران پیش‌ازتاریخ تا عصر حاضر است.با شروع دورهٔ نوسنگی و شکل‌گیری تعاملات منطقه‌ای و فرامنطقه‌ای و شدت گرفتن آن در دوره‌های بعد به‌خصوص در هزاره‌های پنجم و چهارم، جنوب استان و به‌ویژه منطقهٔ خانمیرزا مکان مستعدی برای بررسی و مطالعهٔ این ارتباطات و برهمکنش‌های فرهنگی و اقتصادی است. هزارهٔ سوم و چهارم، در زاگرس جنوبی (استان فارس کنونی) با اصطلاحی تخصصی‌تر، با نام فرهنگ لپویی معرفی‌شده و به‌عنوان یکی از مهم‌ترین مراحل گاهنگاری پیش‌ازتاریخ این مناطق شناخته می‌شود. نتایج منتشر شده از فعالیت‌های میدانی باستان‌شناسانه درخصوص چگونگی زندگی اجتماعی، اقتصادی و سیاسی و مذهبی این دوره در نواحی زاگرس‌مرکزی (جنوب استان چهارمحال‌وبختیاری) بسیار محدود و در بسیاری از موارد ناقص است. حجم زیادی از اطلاعات موجود درخصوص ویژگی‌های فرهنگ لپویی منطقهٔ بختیاری مربوط به گزارشات قدیمی زاگارل است، که از این گزارشات به‌عنوان منبع اطلاعاتی مقالات متعددی استفاده شد. نتایج برخی مقالات منتشرشده با یافته‌های جدید ناهمگونی محسوسی دارد. در این پژوهش قصد داریم با اتکا بر یافته‌های باستان‌شناختی جدید، ضمن معرفی مشخصه‌های سفال لپویی جنوب زاگرس مرتفع، پراکنش و حوزهٔ نفوذ و گسترش این فرهنگ را در این محدوده مورد بازنگری قرار دهیم. طبق نتایج بررسی‌های میدانی و مطالعات گونه‌شناسی و طبقه‌بندی یافته‌های فرهنگی (سفال) که یکی از نگارندگان در بخش جنوبی چهارمحال‌وبختیاری انجام‌داده است، سفال لپویی در منطقهٔ موردمطالعه در دو گروه ظریف و خشن قابل طبقه‌بندی است که طبق مقایسات صورت‌گرفته مشابهت بسیار زیادی با سفال لپویی فارس دارد. باتوجه به یافته‌های سطحی بررسی میدانی از تعداد ۲۷ محوطهٔ باستانی، که برخی از آن‌ها دربردارندهٔ شواهد استقراری از دورهٔ نوسنگی تا دوران اسلامی هستند، سفال شاخص دورهٔ لپویی به‌دست آمده است. بنابر نقشهٔ موجود درخصوص الگوی پراکنش محوطه‌های لپویی حوزهٔ نفوذ فرهنگ لپویی علاوه‌بر منطقهٔ فارس (زاگرس جنوبی) تا بخش‌هایی از زاگرس‌مرکزی (مرتفع) و جنوبی‌ترین بخش آن، که هم‌مرز با خوزستان می‌باشد، گسترش یافته است.

کلیدواژگان: لپویی، خانمیرزا، مس‌وسنگ جدید، سفال، زاگرس مرتفع.

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Prehistoric Floats of Cham Qule, Evidence of Human Responses to Natural Occurrences in the Seimarreh Valley, Central Zagros

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Abstract

The narrow valleys of Seimarreh, with their high ecological potential and strategic location between the lowlands and the Zagros highlands, hold particular significance for archaeological research. Nevertheless, despite the earlier efforts of foreign researchers, the region has rarely been subjected to systematic and focused investigation, with the exception of the Huleilan Valley. The salvage project in the reservoir area of the Seimarreh Dam, initiated in 2009, provided a valuable opportunity to expand our knowledge of the prehistoric and even historic societies of the region. The identification and investigation of important areas such as East Chia Sabz demonstrates the potential for the earliest settlers to have occupied these valleys. Cham Qule is another prehistoric settlement in this area that has yielded evidence dating to the sixth and fifth millennia BCE and was excavated over two seasons. Archaeological evidence points to a notable pattern linking the abandonment of Chia Sabz with the formation of Cham Qule, a transition that extended for about a thousand years. This discontinuity in settlement may have been caused by the massive landslides of Kabir Kouh and Pusht e Bil, which occurred around the end of the eighth or the beginning of the seventh millennium BCE. Given that the lake formed by the damming of the Seimarreh and Kashkan Rivers persisted for about a thousand years, it appears that even after this period, the lake waters had not fully drained. For a further two or three thousand years, river depths and water levels remained higher than at present. Accordingly, the inhabitants of a settlement such as Cham Qule, which is enclosed by canyons with only two narrow gorges providing access to surrounding areas, probably travelled by boat. Evidence recovered from the excavations at Cham Qule should help clarify this hypothesis.

Keywords: Central Zagros, Human Ecology, Village Period, Cham Qule, Boat.

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Introduction

The archaeological salvage project in the catchment basin of the Seimarreh Dam, covering parts of Luristan and Ilam provinces in western Iran, was conducted from the mid 2000s to the early 2010s. This project led to the identification of over 100 archaeological sites (Boroujeni, 2008) and provided the basis for the subsequent reconstruction of chronological sequences (Moghaddam *et al.,* 2008), thereby establishing the groundwork for long term, targeted research in these ecologically favourable habitats. However, these research efforts were ended by the formation of the dam's reservoir.

The significance of the Seimarreh Dam salvage project lies in its potential to provide a coherent cultural sequence for the Central Zagros, particularly given that our current understanding largely derives from excavations undertaken by foreign archaeologists in the northern and western plains, such as Kangavar and Mahidasht. Except for Danish archaeological investigations in the Huleilan Valley, there has been a conspicuous absence of systematically researched settlement sites in Luristan proper. The findings from the early Neolithic settlement of East Chia Sabz (Darabi *et al.,* 2011; Riehl *et al.,* 2012; Darabi, 2015), which formed part of the Seimarreh Dam salvage project, demonstrate the environmental capacity of these prehistoric communities. Furthermore, several settlements dating from the Initial through Late Village periods were excavated within the framework of this project, revealing remarkable environmental features and providing clear evidence of regional and trans regional connections. Among them, the small site of Cham Qule was particularly significant, being located near East Chia Sabz.

Excavations at Cham Qule were carried out over two seasons in 2009 and 2010. The investigations produced cultural evidence spanning the Initial to Late Village periods (corresponding to the late Neolithic and Chalcolithic of the Central Zagros). A rich assemblage of findings was uncovered, including pottery, lithic tools, animal bones, human burials, and plant remain. Additionally, the site yielded a unique and internally consistent architectural complex from Area A, dating to the Late Village period. In this paper, we present clear and tangible evidence of the ecosystem's impact on the lives of prehistoric communities in the Central Zagros highlands, drawing on the discoveries from Cham Qule.

Physiography of the Central Zagros during the Early Holocene

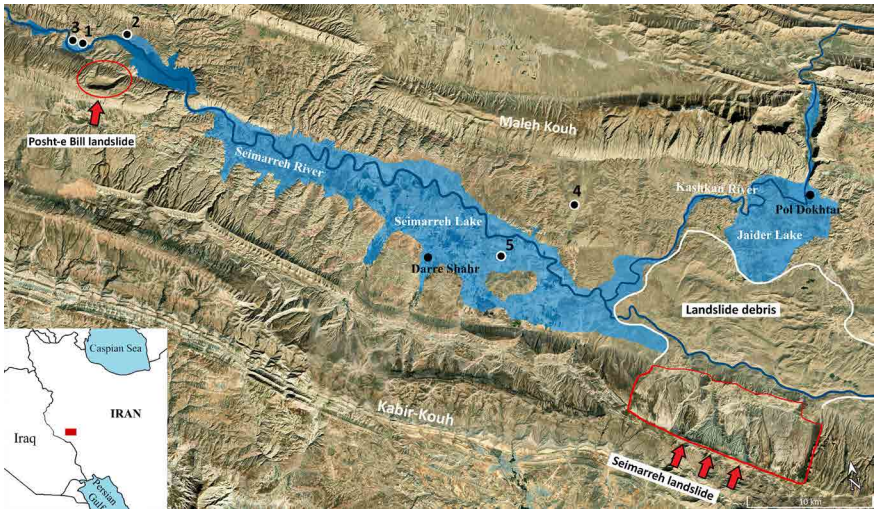
The Central Zagros region, characterised by rugged but orderly highlands interspersed with narrow, water rich valleys that open onto small fertile

plains, represents a key structural feature of the central Zagros. The mountainous area under study, encompassing parts of present day Luristan and Ilam provinces in western Iran, is dominated by the Seimarreh and Kashkan rivers. The Kabirkouh mountain ridge, which historically marked the border between Pishkouh and Poshtkouh, stands as the region's most prominent mountain. This area is a significant reserve of oak, wild pistachio, and hawthorn species within the Zagros mountain range.

Palynological studies conducted at Lake Mirabad indicate that during the early Holocene (8000 to 4500 BCE), there was a high abundance of pistachio pollen. In contrast, the amount of oak pollen was about 30% lower than at present. Additionally, the prevalence of salt tolerant vegetation suggests a drier climate than that of today (Stevens *et al.,* 2006; Van Zeist & Bottema, 1977). However, toward the end of this period there was a sudden increase in oak pollen, signalling a shift to a more humid climate and an improvement over the previously drier conditions.

The climate of the Seimarreh Valley during the Early Holocene was profoundly influenced by the colossal Seimarreh landslide. This landslide, situated on the northern flank of the Kabirkouh ridge overlooking the Seimarreh Valley, is regarded as one of the largest landslides in the world (Harrison, 1946: 62; Oberlander, 1965; Roberts, 2008: 6). It was first identified and described by Harrison and Falcon during their oil exploration project (Harrison *et al.,* 1935; Harrison & Falcon, 1937; Harrison & Falcon, 1938). This complex geological phenomenon involved the slippage of limestone masses from the Asmari formation, resulting in a massive failure extending 16 km in length, 6 km in width, with an average thickness of 400 m from the edge of Kabirkouh at an elevation of about 2,640 m (Shoaei, 2014).

The debris from this natural event, covering an area of approximately 200 square kilometres, led to the obstruction of the confluence of the Seimarreh and Kashkan rivers. This blockage subsequently facilitated the formation of three lakes, namely Seimarreh, Jaider, and Mirabad/Balmak, behind the natural dam (Sharafi, 2015; Delchiaro *et al.,* 2020; Shoaei, 2014; Watson & Wright, 1969), (Fig. 1). The resulting lacustrine deposits, now visible as clay and silty mounds up to 40 m thick (Fig. 2), lie above the deep riverbed of the Seimarreh River. These deposits, situated at an approximate elevation of 630 to 640 m, correspond to the upper terrace of the Seimarreh River (Zeynivand *et al.,* 2018). Taking into account the height of the natural dam, the lake's water level likely exceeded 700 m at its peak, which suggests that the lake may have reached a depth of over 100 m at full capacity.



◄ **Fig. 1: Location of the Seimarreh and Posht-e Bil landslides and distribution of sites mentioned in the text: 1. Cham Qule; 2. East Chia Sabz; 3. Kapargah; 4. Kelek Asad Morad; 5. Kozehgaran (base image from: Google Earth; edit by M. Zeynivand).**



◄ **Fig. 2: Overview of the Kabirkouh rock avalanche (Seimarreh landslide), showing the source area and the landslide debris within the former lake basin (photograph by: Mohsen Zeynivand photograph by: Mohsen Zeynivand).**

The timing of this event has been the subject of investigation by numerous researchers. The most reliable 14C dates for the deposits associated with this event have been obtained by Watson & Wright (1969) and Roberts (2008), who estimate that the landslide occurred approximately 10,000 years ago. Berberian (1994) has reported an earthquake of this age on the Kabirkouh anticline, which could have been the primary cause of the Seimarreh landslide (Shoaei, 2014). This date appears to be consistent with the archaeological evidence, since there is a gap of nearly a thousand years between the early Neolithic and late Neolithic settlements in this area, which may have been influenced by this event. Shoaei (2014) estimated that it took 935 years to breach the dam wall and drain the lake, based on the size and volume of the lake and the hardness of the natural bedrock. As will be discussed later, it is possible that the lake water was not completely drained even after a millennium, and that the water level and depth of

the Seimarreh River remained much higher than at present during the late Holocene/early Middle Holocene.

While researchers have concentrated on the Seimarreh landslide, a similar phenomenon, albeit on a smaller scale, occurred 40 km to the northwest on a distinct fault line north of Kabirkouh and parallel to it. Known locally as Posht e Bil, this landslide overlooks the Seimarreh River and is situated in the vicinity of the contemporary Seimarreh Dam, where its movement altered the course of the river (Fig. 3). The deposits extended to the opposite bank and partially covered the Pre Pottery Neolithic site of East Chia Sabz. The dimensions of this landslide are observable, with a length of 2,500 m, width of 2,100 m, and an approximate thickness of 500 m. Because no laboratory analysis has been undertaken, the exact date of the event is unknown. However, it may coincide with the Seimarreh landslide or may have occurred before 9000 BCE. Archaeological evidence indicates that the East Chia Sabz settlement (Darabi *et al.*, 2011) was established around the ninth millennium BCE, or possibly somewhat earlier, after which the Kapargah settlement (Akbari, 2018) came into existence, with habitation persisting for another thousand years. After a period of abandonment caused by the Seimarreh landslide and the subsequent formation of the lake, human groups returned and resettled in the region by the late seventh millennium. Examples of such reoccupation include the Cham Qule and Cheshme Rajab settlements. Further evidence is provided by the burial of both older settlements (East Chia Sabz and Kapargah) beneath lacustrine sediments, with no subsequent settlements reported in these areas during the later Neolithic period and beyond.



Fig. 3: View of the Posht-e Bil landslide and the reservoir of the Seimarreh Dam (photograph by: Ali Azizi). ▶

Cham Qule

Cham Qule is situated within the catchment area of the Seimarreh Dam, straddling the border between Luristan and Ilam provinces (Central Zagros), and became submerged approximately a decade ago following the filling of the reservoir. The site lies roughly 8 km from the dam's construction site and is located 2,100 m west of the Neolithic site of East Chia Sabz. The extent of the settlement slightly exceeds half a hectare, at an elevation of 667 m asl. Cham Qule developed on a small alluvial fan within an isolated plain. The Seimarreh River flows in a horseshoe shape around the southern extremity of the plain, passing through two gorges on the western and eastern sides, approximately 750 m from Cham Qule (Fig. 4).



◄ **Fig. 4: General view of Cham Qule and its surrounding landscape (photograph by: Abbas Moghaddam).**

Cham Qule was first identified in 2006 by Rasoul Seyedin Boroujeni as part of a salvage archaeological survey project and was designated "Tappeh Dol Keikha" in his report (Boroujeni, 2007). Subsequently, a dedicated and long term salvage project was developed for Cham Qule by one of the authors (A. Moghaddam). However, excavations were conducted in only two seasons, in 2009 and 2010, owing to a lack of funding and the filling of the dam's reservoir, which permanently halted further research at this valuable archaeological site. The excavations focused on three trenches (A, B, and C), (see: Fig. 5). Trench A (initially 4×4 m, later expanded to 14×27 m) was extensively dug in the northern part of the site. Trench B (2×2 m), also located in the north of the site and initially dug by looters, was incorporated into Trench A during the second season. Finally, Trench C (2×2 m), positioned in the southern part of the site, was established for stratigraphic purposes. The surface elevation between Trench A and Trench C was approximately 4 m. The excavations revealed deposits associated with the Initial Village period (Late Neolithic) in Trench C and deposits

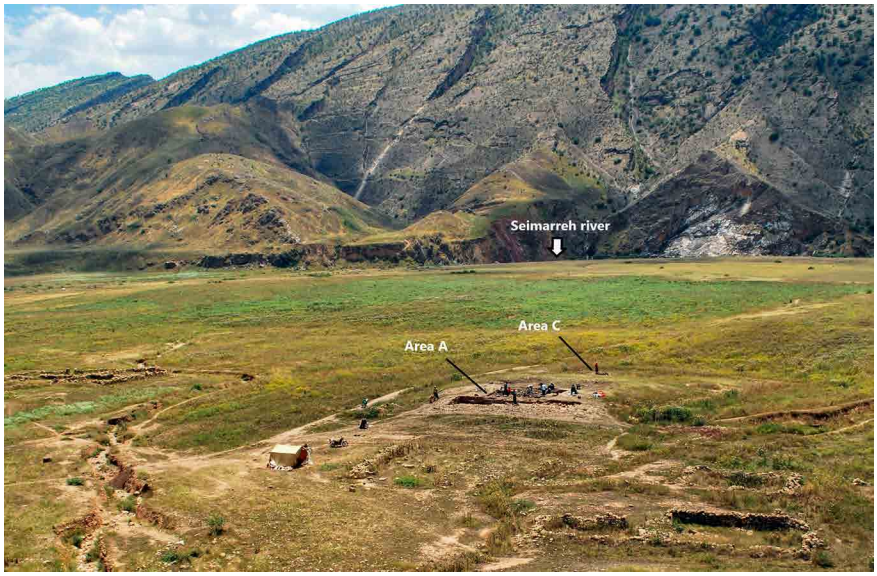


Fig. 5: View of the site showing the locations of Trenches A and C (photograph by: Abbas Moghaddam). ▶

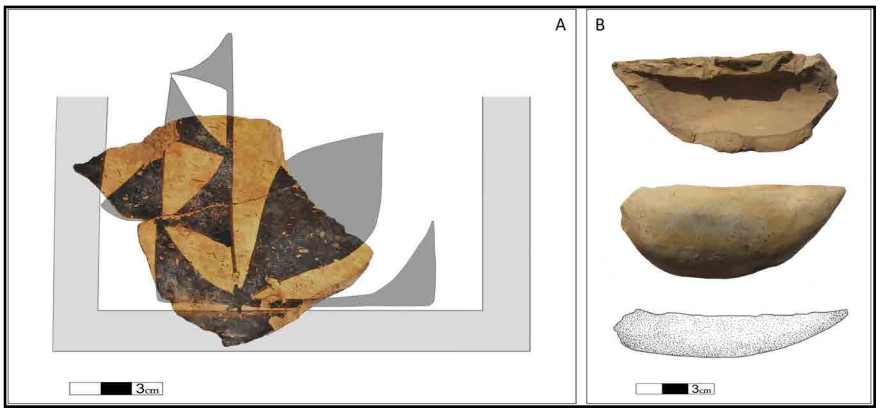
dating to the Middle to Late Village periods (Central Zagros Chalcolithic) in Trench A, including the settlement's upper layers. Comprehensive excavations in Trench A, conducted across five areas and extending into what appears to be an extension of Area 5, uncovered 12 archaeological strata. The five uppermost layers, revealed through extensive excavation, included evidence of two settlement phases. The architecture of the second phase exposed an exceptional stone construction (Fig. 6), remarkably similar to that found at Bahra 1 in Kuwait (Rutkowski, 2011: 33), dating to approximately the 5th millennium BCE. Chronologically, this phase aligns with that same timeframe.



Fig. 6: The second architectural phase identified at Cham Qule (photograph by: Abbas Moghaddam). ▶

Artifacts Associated with Boats from Cham Qule

During two excavation seasons in Trench A at Cham Qule, among other finds, two specific artifacts were unearthed: a pottery fragment with a distinctive motif and a ceramic object, both seemingly related to boats or rafts. The first artifact is a painted pottery sherd bearing black motifs on a buff to brownish background, identified as part of a vessel (Fig. 7a). The depicted motifs are geometric, suggesting the image of a sailing boat. Despite the partial preservation of these motifs, the symmetry in the geometric patterns allows for a speculative reconstruction of their complete forms. The principal motif appears within a frame, delimited by a broad black band visible at the motif's lower section. Above this band is a narrow strip terminating in a filled triangle, forming the primary subject from which the other motifs derive; mirroring this arrangement suggests a form akin to a cockleshell. Completing the vertical motifs on the background, one of which is diagonal and converging at the base, is straightforward using mirroring logic (as demonstrated in: Fig. 7a). Remarkably, this composition evokes the image of a sailboat. The diagonal motif resembles a unified leaf shape, and the vertical motifs include several triangles resembling flags, connected near the scene's base to two poles. The junction of the poles, extending through the boat's body to the base where they are entwined, is clearly observable.



◀ **Fig. 7: Boat-related finds from Cham Qule: (a) painted pottery sherd of Black-on-Buff type; (b) ceramic boat model (?), slightly damaged (Drawing by: Mohsen Zeynivand; photograph by: Abbas Moghaddam).**

This piece was recovered from the third layer of Trench A at Cham Qule. This layer yielded three main types of pottery: Black on Buff, incised and pressure flaked styles associated with the Dalma tradition, and a plain type with a thick red slip (Fig. 8). Dalma style artifacts are rare at Cham Qule, suggesting they were imported from northern regions via the Seimarreh Valley. Apart from a few specimens found at Farrukhabad (Wright 1981: Fig. 10), Cham Qule is the southernmost site in the Seimarreh Valley where this style has been identified. A modest collection of this style was



Fig. 8: Selected ceramics from Phase 3, Trench A (photograph by: Abbas Moghaddam).▶

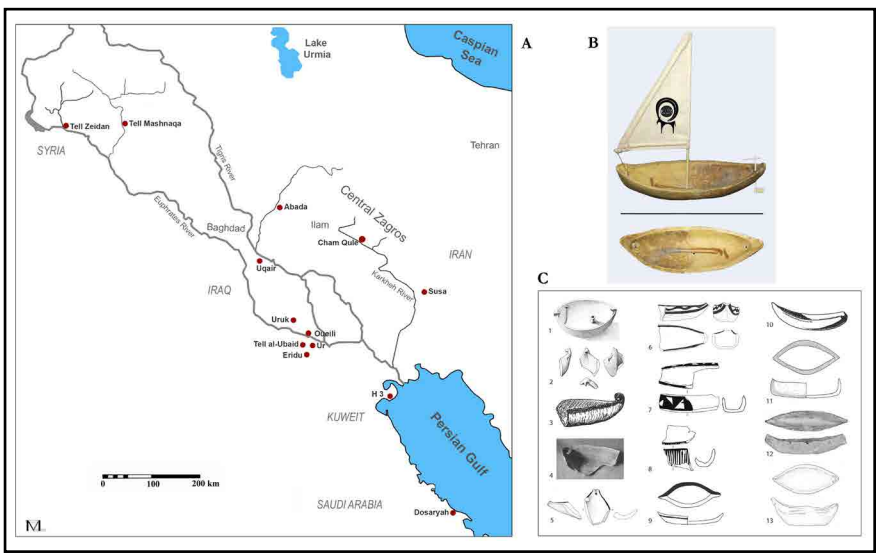
also discovered at the Cheshmeh Rajab settlement to the east of Cham Qule. This style, albeit infrequently, has been found in the Hamrin region and northern Mesopotamia, alongside Ubaid style pottery (for details on the pressure flaked and incised Dalma style, see: Renette 2022). Notably, it appears at Tall e Abada, where this style coexists with Ubaid 3 pottery (Jasim, 2021). The prevalent Black on Buff style is recognizable across the Central Zagros and was popular during the Middle Chalcolithic period of the region. The most significant and nearest comparable examples come from the cemeteries of Hakalan and Parchineh, located respectively 23 km and 38.7 km southwest of Cham Qule. A few instances of the plain Red Slip style, similar to the Plain Red style of Bayat, were also unearthed in this and even some earlier layers, albeit with some stylistic variations. The pottery assemblage from this layer dates to the first half of the 5th millennium BCE.

The second artifact is a ceramic model that was damaged and possibly deformed by physical pressure either before or during firing, as evidenced by one of its altered sides (Fig. 7b). This object is made of a light buff coloured clay and has a somewhat polished exterior. It measures 9 cm in length and 3 cm in height and is devoid of any detailed embellishments. What leads us to consider it a model of a boat is the precisely crafted curve on its underside and the sharp point at the prow. Additionally, the discovery of a pottery sherd with a similar motif supports this interpretation. Compared with similar artifacts found in Mesopotamia, along the southern shores of the Persian Gulf, and a recently discovered object from earlier excavations at Susa, this piece is markedly simpler and more rudimentary.

This simplicity may be attributable either to the potter's unsuccessful attempts at crafting this model or to damage it sustained after manufacture. This ceramic model was retrieved from Layer V of Trench A and is chronologically older than the pottery sherd bearing the "boat" motif. The ceramic assemblage from this layer includes regional and local styles such as black on buff, local plain red, and painted red on buff.

Similar Samples

Given that the boat model and the pottery sherd were recovered from layers dating to the late 6th millennium BCE and the first half of the 5th millennium BCE, and that the pottery sherd corresponds to the black on buff (BOB) style similar to Ubaid pottery, it is appropriate to review comparable examples from this period. Our understanding of the oldest known clay boat models derives from their contexts within significant Ubaid period settlements (see: Carter, 2018). These settlements were typically situated along rivers with abundant flow and at lower elevations throughout Mesopotamia (from modern day southern Iraq to Syria) and along the southern coast of the Persian Gulf (Fig. 9a). Additionally, a previously unreported boat model (Fig. 9b) was identified in the pottery collections stored at the French Castle in Susa by Abbas Alizadeh (Alizadeh, 2020). He compared it with the as Sabiyah (H3) sample and dated it to approximately 4200 BCE, coinciding with the formation of the Acropole settlement at Susa. However, the as Sabiyah sample is notably older.



◄ **Fig. 9: Prehistoric ceramic boat models from southwestern Asia: (a) location of sites from which boat models have been recovered; (b) ceramic boat model from Susa (Alizadeh 2020: fig. 8); (c) boat models from various sites: 1. Eridu; 2. Tell el-Oueili; 3. Al-Ubaid; 4. Tell Zeidan; 5. Dosariyah; 6. Mashnaqa; 7. Tell el-Oueili; 8. Tell el-Oueili; 9. Tell Abada; 10. Uqair; 11. Tell Abada; 12. Uruk; 13. H3/ As-Sabiyah (Carter 2018: fig. 2.7).**

The earliest examples of boat models date to the Ubaid I period, having been discovered at Tell Oueili (Breniquet, 1996: Pl. XXVIII 2 & 3) and Eridu (Safar *et al.,* 1981: 230). Most of the remaining models are attributed

to the Ubaid III and IV periods (see: Fig. 9c). Only three models from Northern Mesopotamia, namely those found at Tell Abada (Jasim, 1985: fig. 63a), Tell Zeidan (Stein, 2010: fig. 5), and Mashanqa (Thuesen, 2000: fig. 5), all date to the Ubaid III period. These sites are located at elevations of 100 m, 300 m, and 300 m above sea level, respectively, making them the highest locations where boat models dating to the Ubaid Period have been found. The boat model from Cham Qule closely resembles the one from Tell Abada in form, except that the Abada model features a horizontal black band painted just under the rim. The Mashanqa model also bears a strong resemblance to the Abada model, being distinguished by the addition of a wavy line. This decorative feature became popular during the Ubaid I period, as both models from Tell Oueili are adorned with paint.



Fig. 10: Bitumen spring near Cham Qule and the use of bitumen to repair a ceramic vessel from the site (photograph by: Abbas Moghaddam). ▶

Aside from the boat motifs on seals that became prevalent during the 4th millennium BCE in Mesopotamia and southwestern Iran, the only older related motif found painted on pottery was identified on a clay disc from the H3 settlement at as Sabiyah on the Persian Gulf coast (Carter 2006: fig. 4). This motif is rendered in a simple and abstract style, depicting a boat with two sails. It appears that the H3 settlement at as Sabiyah is the only prehistoric site where a comprehensive set of archaeological evidence related to boats has been found. Thus, Cham Qule represents the second known site where similar artifacts have been identified, dating to the first half of the 5th millennium BCE.

Conclusion

The discoveries at Cham Qule provide concrete evidence concerning

the lives of inhabitants during the Initial to Late Village periods in the Central Zagros and their interactions with the river. For the first time, boat related artifacts have been identified in the highlands, raising questions about why boats were used in the Zagros highlands in a manner like that of the neighbouring lowlands. Was the turbulent Seimarreh River navigable, or were these items purely symbolic or related to ritual offerings? Furthermore, we must consider whether this technology was adopted from Ubaid settlements.

As discussed previously, a significant landslide occurred in the Seimarreh Valley and had a considerable impact on archaeological interpretations. This event likely influenced both settled societies and communication routes between the lowlands and highlands. The earliest villages in the Seimarreh Valley, East Chia Sabz (Darabi *et al.,* 2011) and Kelek Asad Morad (Moradi *et al.,* 2016), emerged in the 9th millennium BCE but were abruptly abandoned by the 8th millennium BCE, with no further evidence of settlement until the resurgence of activity at Cham Qule and Cheshme Rajab in the late 7th millennium BCE during the Late Neolithic Period. This sequence suggests a gap of nearly a thousand years, which may be attributed to the Seimarreh landslide. Acceptance of Shoaei's (2014) hypothesis of a millennium long lake formed by natural dams on the Seimarreh and Kashkan rivers is consistent with the archaeological evidence. We might further speculate that it took a further one to two thousand years for this lake to fully drain following the dam's rupture. The establishment of several terraces (Sharafi & Bahrololoomi, 2017) overlooking the Seimarreh River supports this view.

Our aim in raising these points is to develop a clearer understanding of the natural environment in which Cham Qule developed. This natural setting likely sustained elevated water levels in the Seimarreh River well into the fifth millennium BCE, before the river eventually incised through the landslide deposits and established its present course. The strategic location of Cham Qule on a natural embankment beside a dynamic river, along with the availability of natural resources such as bitumen, wood, and reeds, would have facilitated technological advancements that improved connectivity and ease of access to surrounding habitats. Even if these innovations were not indigenous and were instead adopted through interactions with western Zagros regions such as Hamrin (Tell Abada) and Greater Susiana (Susa), the environmental capacity and the presence of elites within the communities of the Seimarreh Valley should not be overlooked.

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Observation Contribution

This research presents part of the findings from the first author's doctoral dissertation, titled "The Village period settlements of the Seimarreh River Basin on the basis of Cham Quleh", which was defended at the University of Tehran in 2024. The second and third authors supervised this thesis. Mohsen Zeynivand: Writingoriginal draft; Methodology. Abbas Moghaddam: Investigation-Lead; Project administration; Writing - review & editing; Supervision. Kamal-Aldin Niknami: Writing - review & editing; Supervision.

Conflict of Interest

The Authors, while observing publication ethics in referencing, declare the absence of conflict of interest.

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چکیده

دره‌های کم‌عرض سیمره با ظرفیت بالای زیست‌محیطی و موقعیت راهبردی بین سرزمین‌های پست و بلندی‌های زاگرس اهمیت بسیاری در پژوهش‌های باستان‌شناختی دارند. با این حال، به‌رغم فعالیت‌های جسته‌وگریختهٔ برخی از پژوهشگران خارجی، جز در درهٔ هلیلان، هیچگاه مورد پژوهش جدی و هدفمند قرار نگرفته‌اند. پروژهٔ نجات‌بخشی حوضهٔ آبگیر سد سیمره که از نیمهٔ دوم دههٔ ۸۰هـ.ش. آغاز شد، فرصت مناسبی بود تا آگاهی ما نسبت به جوامع پیش‌ازتاریخ و حتی تاریخی منطقه فزونی یابد. شناسایی و کاوش در محوطه‌های ارزشمندی همچون چیاسبز شرقی نشان از قابلیت شکل‌گیری روستاهای نخستین در این دره‌ها دارد. چم‌قوله یکی دیگر از زیستگاه‌های پیش‌ازتاریخ این محدوده به‌واسطهٔ وجود نهشته‌های هزاره‌های ششم و پنجم پیش‌ازمیلاد است که طی دو فصل مورد کاوش قرار گرفت. شواهد باستان‌شناختی نشان می‌دهد بین متروک شدن چیاسبز تا شکل‌گیری چم‌قوله که حدود یک‌هزار سال به‌طول انجامیده، الگوی معناداری وجود دارد. این وقفهٔ استقراری می‌تواند ناشی از زمین‌لغزش‌های بزرگ سیمره و پشته‌بیل بوده باشد که تقریباً در اواخر هزارهٔ هشتم/اوایل هزارهٔ هفتم پیش‌ازمیلاد رخ‌داده بودند. یافته‌های مرتبط با قایق (ماکت قایق) از چم‌قوله برای نخستین‌بار از مناطق مرتفع شناسایی شده‌اند و این پرسش مطرح می‌شود؛ چرا در ارتفاعات زاگرس هم‌سو با سرزمین‌های پست از قایق استفاده شده است؟ و اساساً رودخانهٔ خروشان سیمره قابل قایق‌رانی بوده است یا اشیائ فوق، نمادین یا در رابطه با نذری هستند؟ وجود حجم عظیمی از رسوبات مارنی برروی محوطه‌های نوسنگیِ بدونِ سفال چیاسبز شرقی و کپرگاه، شکل‌گیری زیستگاه چم‌قوله بر روی رسوبات دریاچه‌ای نشان می‌دهد که در هزارهٔ هفتم پیش‌ازمیلاد درهٔ سیمره و حوضهٔ آبگیر امروزین سد سیمره در سیطرهٔ دریاچه‌ای کهن بوده است. براساس شواهدی که از رخ‌داد زمین‌لغزش دوگانهٔ سیمره ارائه می‌شود، استفاده از قایق توسط جوامع ساکن در چم‌قوله واکنشی است روشن به شرایطی که طبیعت بر زندگی انسانِ پیش‌ازتاریخ تحمیل کرده است.

کلیدواژگان: زاگرس‌مرکزی، زیست‌بوم، دورهٔ روستانشینی، چم‌قوله، قایق.

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Stylistics of Pottery in the Ardabil Style: A Case Study of Ardabil-Style Pottery from the Archaeological Museum of the Sheikh Safi al-Din Ardabili Mausoleum

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Abstract

Among archaeological materials, pottery provides valuable evidence for reconstructing cultural, technological, and artistic developments. Changes in vessel forms, manufacturing techniques, fabrics, tempers, colors, and decorative motifs can contribute significantly to the identification of cultural and chronological patterns and provide insights into the technological skills and artistic practices of pottery producers. This study examines the stylistic characteristics and chronological development of Ardabil-style pottery preserved in the Archaeological Museum of the Sheikh Safi al-Din Ardabili Mausoleum. The research employs a field- and museum-based method, descriptive–analytical and library-based research. The pottery assemblage examined consists primarily of confiscated archaeological objects transferred to the museum. Since the provenance and precise archaeological contexts of many of these objects were not documented, comparative analysis was undertaken using comparable specimens preserved in the National Museum of Iran, as well as materials recovered from archaeological sites in Iran and neighbouring regions. The study of Ardabil-style pottery represents an important aspect of the archaeology of northwestern Iran. Most known examples have entered museum collections through illicit excavations, whereas specimensrecovered through controlled archaeological excavations remain relativelylimited. The assemblage includes a variety of vessel forms, including jugs, cups and drinking vessels, vessels with trefoil-shaped rims, handled vessels, spouted vessels, drainage elements, and bases. The predominant colors are red, orange, and pale green, while the decorative repertoire consists mainly of geometric motifs, including triangular patterns, hatching, and buttonlikeornaments. Based on stylistic and comparative evidence, the pottery examined in this study can be broadly dated from the prehistoric period to the Late Parthian period, with the principal chronological range extending from the Late First Millennium BCE (Iron Age III) to the Late Parthian period. The results contribute to a better understanding of the formal,decorative, and chronological characteristics of Ardabil-style pottery and its place within the archaeological traditions of northwestern Iran.

Keywords: Northwest Iran, Ardabil-Style Pottery, Archaeological Museum of the Sheikh Safi Al-Din Ardabili Mausoleum, Parthian-Period Archaeology.

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Introduction

Pottery is one of the most important forms of material culture and reflects various aspects of human life, including subsistence, technology, economy, social practices, and cultural interaction. Its production began during the Neolithic period and continued, with considerable technological and stylistic developments, into the present day. As one of the earliest forms of craft production, pottery was initially developed to meet fundamental human needs and subsequently underwent significant changes in manufacturing techniques, vessel forms, fabrics, and decorative traditions. Archaeologists have therefore employed pottery as an important source of evidence for identifying cultural diversity, reconstructing patterns of use, and establishing chronological frameworks across different regions and periods (Fagan, 2011: 467).

Iran is regarded as one of the earliest and most significant centers of pottery production, where a wide range of ceramic traditions developed over long periods. Throughout the history of pottery production, changes and innovations in vessel form and decoration have occurred in response to both internal cultural developments and interactions with neighbouring and more distant communities. Such transformations may reflect processes of cultural continuity and change, as well as economic and social interactions between communities. Furthermore, pottery is particularly valuable for archaeological research because of its production, distribution, exchange, transportation, and consumption. Consequently, ceramic assemblages provide important evidence for investigating relationships among different cultural groups within a region, as well as interactions between distinct regional cultural traditions. For this reason, pottery should be examined from multiple perspectives and through different analytical approaches (Majidzadeh, 1991: 9).

Geographically, northwestern Iran encompasses the present-day provinces of East Azerbaijan, West Azerbaijan, and Ardabil. Owing to its strategic geographical position, this region has maintained continuous cultural contacts with neighbouring areas, including Anatolia, Armenia, and the Caucasus. Archaeological and historical evidence indicates that during the Iron Age, northwestern Iran was involved in interactions with several political and cultural entities. These included the Urartians and Mannaeans during the ninth century BCE, the Scythians during the eighth century BCE, and Assyria, whose influence and military activities extended into the region from the early first millennium BCE. By the seventh century BCE, the region had also become closely associated with the emergence and expansion of the Median polity (Talaei, 2008: 149).

The Sheikh Safi al-Din Ardabili Museum in Ardabil houses a valuable collection of archaeological and historical objects, including artefacts displayed in its galleries and stored in its repositories. A portion of the museum's collection consists of objects confiscated by law-enforcement authorities from individuals involved in unauthorized excavations. Consequently, many of these artefacts lack secure archaeological provenience and contextual information, and in some cases their authenticity has also been questioned. Despite these limitations, many of the objects are relatively well preserved and possess distinctive aesthetic and technological characteristics.

Among the archaeological materials preserved in the museum is a group of elaborately decorated ceramic vessels commonly referred to as "Ardabil-style pottery", which constitutes the principal subject of the present study. Until recent decades, numerous examples of this ceramic tradition had reportedly been recovered through unauthorized excavations and subsequently entered international art and antiquities markets, including foreign auction houses. The lack of reliable archaeological contexts for many of these vessels has considerably complicated their chronological and cultural interpretation.

In terms of morphology, Ardabil-style pottery encompasses a variety of vessel forms, including single- and double-bodied jars and decorated cups. Previous studies have identified and discussed examples of this ceramic tradition in northwestern Iran, particularly in the regions of Ardabil, East Azerbaijan, and West Azerbaijan. Among the scholars who have reported and studied related pottery assemblages are Charles Allen Burney (Burney, 1979), Robert H. Dyson (Dyson, 1965), Roman Ghirshman (Ghirshman, 1954), and Ernie Haerinck (Haerinck, 1997). Their studies provide an important comparative basis for examining the morphological, stylistic, and chronological characteristics of Ardabil-style pottery.

Research Questions and Hypotheses: Because the Ardabil-style pottery examined in this study was not recovered through controlled archaeological excavations, its precise archaeological contexts and absolute chronological framework remain unknown. Establishing a relative chronology is therefore essential for determining the cultural and chronological position of this pottery within the archaeological sequence of northwestern Iran, particularly in the Ardabil region. Accordingly, the present study addresses the following questions:

1) Can Ardabil-style pottery be regarded as a distinctive ceramic tradition of northwestern Iran, particularly Azerbaijan, during the historical period, especially the Parthian period?

2) To what extent does Ardabil-style pottery represent a continuation or transformation of earlier ceramic traditions, particularly regarding vessel form, morphology, and decorative motifs, from the prehistoric periods into the historical period?

3) What is the chronological position of Ardabil-style pottery within the ceramic sequence of northwestern Iran, and what evidence can be used to establish its relative chronology?

The principal hypothesis of the study is that Ardabil-style pottery is broadly contemporary with pottery characterized by triangular decorative motifs and represents a distinctive ceramic tradition of northwestern Iran extending from the Achaemenid period into the early Parthian period, potentially as late as the second century BCE. It is further hypothesized that the distribution of this ceramic tradition was not restricted to the Ardabil region but extended into neighbouring areas, including the present-day Republic of Azerbaijan, the Nakhchivan Autonomous Republic, eastern Anatolia, and Armenia.

Another hypothesis is that the decorative repertoire of Ardabil-style pottery is predominantly geometric and reflects a long-standing tradition rooted in the ceramic traditions of the Bronze and Iron Ages of the first millennium BCE. From this perspective, certain decorative elements may have continued, with stylistic modifications, into the Parthian period. Similarly, the morphological characteristics of these vessels may demonstrate a degree of continuity with ceramic forms dating from the first millennium BCE through the historical periods.

Particular attention is given to the relationship between Ardabil-style pottery and the tradition of triangular-decorated pottery, which is widely represented in the ceramic assemblages of the first millennium BCE. The present study hypothesizes that Ardabil-style pottery may represent a continuation and transformation of this decorative tradition. Although the two groups differ in vessel morphology and formal characteristics, similarities in the use of geometric and triangular motifs may indicate a degree of cultural and stylistic continuity between them.

Research Methods: The present study employs a descriptive–analytical approach, combining documentary research with field- and museum-based investigations, to establish a relative chronological framework for 16 pottery vessels preserved in the Sheikh Safi al-Din Ardabili Museum. Of these, six vessels were displayed in the museum galleries, while the remaining specimens were preserved in the museum repository.

The research process consisted of several stages. First, the selected vessels were systematically documented through photography, technical

drawings, and the preparation of detailed descriptive and technical records, including information on vessel morphology, dimensions, fabric, surface treatment, and decorative characteristics. Subsequently, the documented specimens were subjected to comparative analysis with comparable pottery assemblages preserved in other museums and with ceramic materials recovered from archaeological sites in northwestern Iran and neighboring regions. This comparative approach was used to identify similarities and differences in vessel forms, decorative motifs, technological characteristics, and stylistic attributes and, consequently, to establish a relative chronological framework for the Ardabil-style pottery examined in this study.

Research Background

The earliest scholarly attribution of Ardabil-style pottery to a specific chronological period was proposed by Charles Allen Burney following his field investigations at Yaniq Tepe in the 1960s. Burney attributed this ceramic tradition to the Late Iron Age III (Burney, 1960). Subsequently, in 1964, Robert H. Dyson examined a substantial assemblage of Ardabil-style pottery recovered by unauthorized excavators from cemeteries in the Ardabil region. Based on its formal and decorative characteristics, Dyson associated this pottery broadly with the Hasanlu I ceramic tradition and, particularly in terms of its decorative repertoire, with Hasanlu IIIA, a phase in which triangular-patterned pottery became prominent. He consequently proposed a chronological range extending from the Achaemenid to the Parthian periods (Dyson, 1964).

Roman Ghirshman also referred to related ceramic materials in his discussions of Iranian archaeological remains and emphasized their significance within the broader development of Iranian pottery traditions (Ghirshman, 1989). Haerinck subsequently undertook a comparative study of Ardabil-style pottery and related ceramic materials from Mingachevir in the Republic of Azerbaijan, Armenia, Anatolia, northwestern Iran, and Germi in Ardabil Province. Based on these comparisons, he assigned the pottery to a chronological range extending from the Achaemenid period to the Late Parthian period (Haerinck, 1997: 145).

As noted above, the majority of known Ardabil-style pottery derives from unauthorized excavations and lacks secure archaeological contexts. Consequently, many of the chronological attributions proposed for this ceramic tradition are based primarily on stylistic and comparative evidence rather than on firmly stratified archaeological contexts. More reliable chronological evidence is provided by the scientific excavations conducted

at the cemeteries of Germi by Kambakhsh Fard. Based on coins recovered from the graves, Kambakhsh Fard attributed the associated Ardabil-style pottery to the Parthian period (Kambakhsh Fard, 1998). This chronological interpretation is also broadly consistent with the research conducted by S. Piran on Ardabil-style pottery preserved in the National Museum of Iran. Piran proposed a relative and absolute chronological range extending from the end of Iron Age III to the end of the Parthian period (Piran, 2003: 17).

Ardabil-style and triangular-decorated pottery have also been documented during archaeological surveys and investigations at several sites in northwestern Iran. Examples have been identified at the Qonaq Qeyran fortress, where they have been associated with the Achaemenid period (Valdebigi *et al.*, 2014: 5). Related ceramic materials have also been reported from sites such as Buyini Yoghun Fortress in Nir County (Pourfaraj, 2017), the Bonab Plain (Kazem Nezhad Asl, 2016), and Yaniq Tepe (Burney, 1960), among other archaeological sites in the region.

Taken together, the available evidence suggests that the chronology of Ardabil-style pottery remains a matter of scholarly discussion, largely because of the absence of secure archaeological contexts for a substantial proportion of the known assemblage. Nevertheless, the combination of stratified archaeological evidence, associated finds such as coins, and comparative stylistic analysis provides a basis for proposing a relative chronological framework extending broadly from the Late Iron Age III through the Parthian period. The present study seeks to reassess this chronological framework through a systematic examination of the Ardabil-style pottery preserved in the Sheikh Safi al-Din Ardabili Museum and comparison with securely dated archaeological materials from northwestern Iran and adjacent regions.

Azerbaijan Region

The historical region of Azerbaijan, corresponding broadly to the present-day provinces of East Azerbaijan, West Azerbaijan, and Ardabil in northwestern Iran, is characterized by a predominantly mountainous landscape and a strategic geographical position. Situated at the intersection of the Iranian Plateau, Anatolia, Mesopotamia, the South Caucasus, and the Caspian basin, the region has historically functioned as an important corridor for human mobility, trade, and cultural interaction (Faizkhah *et al.*, 2009: 26). Its geographical position contributed significantly to the development of diverse settlement patterns and to sustained cultural contacts between communities in the Iranian Plateau, Anatolia, Mesopotamia, and the Caucasus.

The present-day geographical configuration of Azerbaijan is largely the result of complex geological processes, including orogenic movements, tectonic activity, and volcanism. During the Tertiary period, major geological transformations contributed to the formation of the region's present mountainous topography and geological structure (Darvishzadeh, 1991: 659). The resulting combination of mountain ranges, intermontane valleys, plains, and river systems has played an important role in shaping patterns of human settlement and communication throughout different historical periods (Pirnia, 1991: 87).

During the first millennium BCE, the region formed part of the political and cultural landscape of western and northwestern Iran and was associated with the territory of Media. In classical and later historical sources, parts of the region were also referred to as Atropatene, a designation traditionally associated with Atropates, the local ruler who established an autonomous political entity in the region following the fragmentation of the Achaemenid Empire and the subsequent Macedonian and Seleucid periods (Dyakonov, 2007: 859). The political and geographical position of the region facilitated interactions with neighbouring areas while also allowing earlier cultural traditions to persist. In some cases, these traditions interacted with contemporary cultural developments, resulting in new forms of material culture and artistic expression that were characteristic of northwestern Iran and its neighbouring regions (Haerinck, 1997: 110).

Throughout the pre-Islamic period, the region experienced successive phases of political incorporation and relative autonomy under different ruling powers. The emergence of the Median polity and, subsequently, the formation of the Atropatene political entity represent important stages in the historical development of northwestern Iran (Christensen, 1998: 114). These political transformations did not necessarily result in the complete replacement of earlier cultural traditions; rather, archaeological evidence indicates varying degrees of continuity, transformation, and interaction among local and external cultural traditions.

During the Islamic period, Azerbaijan continued to occupy an important geopolitical position. From the early centuries of the Islamic era, the region underwent substantial political, economic, and cultural transformations. The arrival and expansion of Turkic-speaking groups, particularly from the Seljuk period onward, contributed to significant changes in the political and cultural landscape of Azerbaijan and neighbouring regions of the Caucasus. Maragheh and Tabriz subsequently emerged as major political, economic, and cultural centers, particularly during the medieval period.

In later centuries, Azerbaijan remained an important center of political and cultural developments. The Safavid period was of particular significance because of the close association of the region, especially Ardabil, with the origins and early development of the Safavid dynasty. Subsequent periods, including the Zand and Qajar eras, also played important roles in the political and historical development of Azerbaijan (Shaabani, 1998: 27). The region's long history of interaction among local traditions and external influences provides an important context for understanding the development and transformation of its material culture, including its ceramic traditions.

Ardabil-Style Pottery

Ardabil-style pottery is a distinctive ceramic tradition characterized by bold painted decoration and was first defined and named by Ernie Haerinck. These vessels generally have a cream or beige-colored slip and are decorated with large, prominently executed motifs. The decorative repertoire is predominantly geometric and includes simple triangles filled with hatching, rhombuses, and groups of parallel lines. In addition to geometric motifs, some vessels bear representations of animals, particularly birds and antelopes. The painted motifs are generally executed in relatively matt colors, most commonly bright red, orange-red, and dark brown (Haerinck, 1997: 142, 146).

The chronology of Ardabil-style pottery has been the subject of different interpretations. Based on ceramic evidence from Yaniq Tepe, Charles Burney initially assigned this pottery tradition to the Late Iron Age III (Burney, 1960). Haerinck subsequently revised this chronology and proposed a date extending from the sixth–fifth centuries BCE to the second century BCE (Haerinck, 1997: 110; Piran, 2003: 20). Piran later attempted to establish a more precise chronology through thermoluminescence (TL) analysis of Ardabil-style pottery. The samples analysed included four pottery vessels from confiscated collections and two pottery fragments from the archaeological site of Zahhak Castle and Yaniq Tepe. According to Piran, the TL results indicated a date corresponding to the Late Parthian period (Piran, 2003: 128). In addition, comparison with Ardabil-style pottery from Sarein, which was considered broadly contemporary with Bichorom pottery and dated to the Late Parthian period, together with comparative evidence from Zahhak Castle, was used to support the proposed chronological attribution (Ibid).

It should be noted, however, that the chronological interpretation of Ardabil-style pottery remains problematic because a considerable

proportion of the known examples lack secure archaeological contexts. Consequently, chronological assessments based on stylistic comparison, laboratory analyses of samples from poorly documented collections, and comparisons with materials from excavated sites should be evaluated separately in terms of their evidential reliability. Securely excavated and well-dated contexts therefore remain particularly important for establishing a more reliable chronological framework.

Regarding vessel morphology, Haerinck classified Ardabil-style pottery into two principal groups: cups and jars. This remains the most general morphological classification proposed for the tradition to date (Haerinck, 1997: 115). The known geographical distribution of Ardabil-style pottery has largely been reconstructed from materials recovered through commercial and illicit excavations, particularly from graves in Ardabil Province, as well as from the comparative studies of Dyson (Dyson, 1965) and Roman Ghirshman (Ghirshman, 1966: 94). The absence of reliable archaeological provenience for many of these vessels has consequently limited the possibility of establishing a precise spatial and chronological distribution.

Given that a substantial proportion of the Ardabil-style pottery available for study has entered collections through unauthorized excavations and illicit trafficking, the assemblage preserved in the Archaeological Museum of the Sheikh Safi al-Din Ardabili Mausoleum provides an important, although contextually problematic, body of material for comparative study. According to the museum records, this collection was confiscated from individuals involved in the illicit trade of antiquities in Ardabil Province in the 1990s and has subsequently been preserved in the museum repository. Of the 16 vessels examined in the present study, six are currently displayed in the museum showcases, while the remaining specimens are kept in storage.

Because the original archaeological contexts and precise findspots of these vessels are unknown, the present study does not attempt to establish an absolute chronology for the assemblage. Instead, it employs a relative chronological approach based on comparison with securely or more reliably dated ceramic materials from the National Museum of Iran, archaeological sites in northwestern Iran and neighbouring regions, and comparable materials from the broader Azerbaijan region. Particular emphasis is placed on similarities and differences in vessel morphology, decorative motifs, fabric characteristics, and stylistic attributes to clarify the chronological and cultural position of the Ardabil-style pottery preserved in the Sheikh Safi al-Din Ardabili Museum.

Classification of Vessel Forms

Based on morphological characteristics, the Ardabil-style pottery examined in this study can be divided into three principal vessel categories: 1) jars, 2) cups or bowls, and 3) drinking vessels.

1. Jars

The assemblage contains 12 small- and medium-sized jars. Based on their morphological characteristics, these vessels can be divided into four main types:

- Jars with a handle and a vertical spout terminating in a trefoil-shaped mouth;
- Jars with two lateral handles, some of which are modelled in the form of animal figures, particularly goats;
- Jars with a narrow neck and globular body; and
- Handleless jars with rounded or globular bodies.

Haerinck compared some of these jar forms with examples recovered from the Republic of Azerbaijan and proposed a second-millennium BCE date for the comparative material. Similar morphological characteristics have also been reported from Takht-e Soleyman and Level IV at Hasanlu (Haerinck, 1997: 146). The jars in the present assemblage are frequently decorated with button-like motifs, and most have clearly defined bases. One distinctive form is a jar with a spout projecting from the lower part of the vessel, referred to as a "double-spouted" or "double-tube jar" in the relevant literature. The unusual morphology of some of these vessels has led to suggestions concerning their possible ritual or ceremonial functions.

One particularly distinctive vessel has two lateral handles modelled in the form of goats. The legs of the animals are attached to the shoulder and neck of the vessel, while their horns curve towards the rim and are connected to it, creating a symmetrical arrangement on either side of the opening. The spout is incorporated into the raised lower portion of the globular body. Similar zoomorphic elements have been interpreted as representations of animals such as goats or horses (Haerinck, 1997: 147). Comparable examples are also represented in the Ardabil-style pottery collection of the National Museum of Iran.

The chronological and cultural origins of this vessel type have been discussed by several researchers. According to Speiser (1933), one of the earliest examples was recovered from Level III at Tell Pila. This vessel has been compared with Khabur-type ceramics and dated to the Late Bronze Age (1600–1300 BCE). Haerinck, however, discussed comparable examples within a later chronological framework and associated them

with the post-Achaemenid and Parthian periods, based partly on their morphological similarities to vessels reported from Pasargadae and Bagram and attributed to the Achaemenid–Parthian transition or later periods. He also cited examples from Tell Maghuz and Tell Shamlu as comparative material (Haerinck, 1980).

These chronological differences demonstrate the importance of distinguishing between the earliest known examples of a vessel form and the chronological attribution of the Ardabil-style specimens under study. Morphological similarity alone cannot establish contemporaneity, particularly when the archaeological contexts of the specimens are unknown. Accordingly, comparative evidence is used in the present study primarily to establish a relative chronological framework rather than to assign an absolute date to individual vessels.

2. Cups and Bowls

Two vessels in the assemblage can be classified as cups or bowls. They are characterized by relatively wide openings, angular bodies, and considerable depth. Both vessels are decorated with geometric motifs, including cross-hatched patterns, applied to both the interior and exterior surfaces. Their morphology and decorative treatment provide useful comparative evidence for identifying relationships between the Ardabil-style assemblage and other ceramic traditions of northwestern Iran.

3. Drinking Vessels

Two handleless drinking vessels have been identified. They are approximately 17 cm high, with mouth diameters of approximately 12 cm. Both have flat bases and relatively cylindrical bodies. Their distinctive morphology and proportions suggest that they may represent a less frequently documented form within the Ardabil-style ceramic repertoire and therefore constitute a potentially significant addition to the known range of vessel forms.

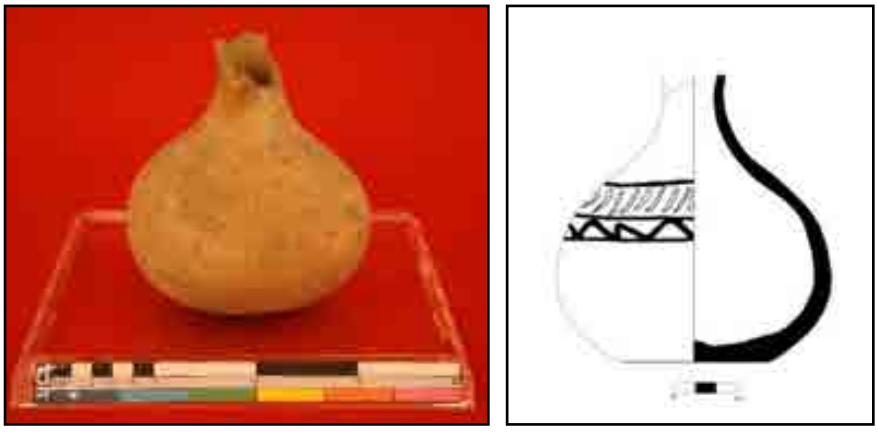
Technical and Decorative Characteristics: The pottery assemblage exhibits a color range dominated by red brick, light brick, and pale green tones. Most vessels are decorated with geometric motifs, although several examples also bear zoomorphic representations. Considerable variation can be observed in the execution of the painted decoration. On some vessels, the motifs are carefully and precisely executed, whereas on others the designs appear to have been applied more freely, with less emphasis on geometric regularity.

The ceramic fabric is predominantly brick-red in color and generally contains mineral and ceramic inclusions, including grog (chamotte), relatively coarse sand, and fine windblown sand. Most vessels appear to have been wheel-made, although some specimens show characteristics consistent with production on a slow-rotating wheel. The painted decoration is primarily executed in red ochre.

The decorative repertoire is predominantly geometric and includes simple triangular motifs, both hatched and solid, fan-shaped designs, chevrons, filled lozenges or diamonds, and star motifs. In addition to these geometric elements, several vessels display animal representations. The combination of geometric and zoomorphic motifs, together with variation in the execution of the designs, constitutes one of the principal stylistic characteristics of the Ardabil-style pottery examined in this study.

Examples

1) A handleless jar with a narrow neck, spherical body, flat base, and a broken, incomplete rim. The vessel body is decorated with geometric motifs, consisting of zigzag and hashuri patterns arranged in two horizontal registers encircling the lower part of the body. The ceramic fabric is brick-red in color and covered with a pale buff slip. The decorative motifs are painted in ochre. The temper is sand inclusions, and the vessel was manufactured using slow wheel rotation. The object is heavily covered with sediment deposits, which obscure the surface and hinder clear observation of the decorative scheme (Fig. 1).



◄ **Fig. 1: Narrow-necked jar, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).**

2) A vertically handled jar with a narrow neck, an elongated, almost oval body, and a convex base. The vessel is undecorated. It is wheel-made from brick-red clay fabric and covered with a light brick-red slip. The object is complete and well preserved (Fig. 2).

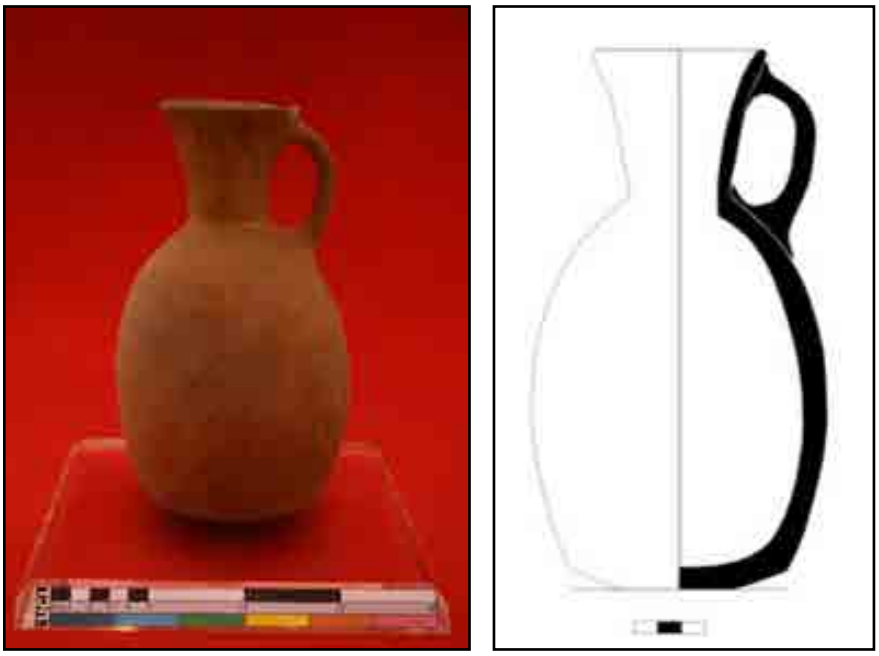


Fig. 2: Narrow-necked jar with handle, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018). ▶

3) A handleless jar with a spherical body and a broken, incomplete rim. The interior surface is decorated with triangular geometric motifs, while the exterior bears triangular motifs on the body and a row of enclosed triangles within a rectangular frame encircling the vessel. The vessel is wheel-made from brick-red ceramic fabric containing sand as temper. The surface is covered with a buff-colored slip, with ochre-painted floral motifs. The object is poorly preserved and incomplete; sediment deposits, surface abrasion, and weathering obscure parts of the decorative scheme and prevent full observation of the original motifs (Fig. 3).

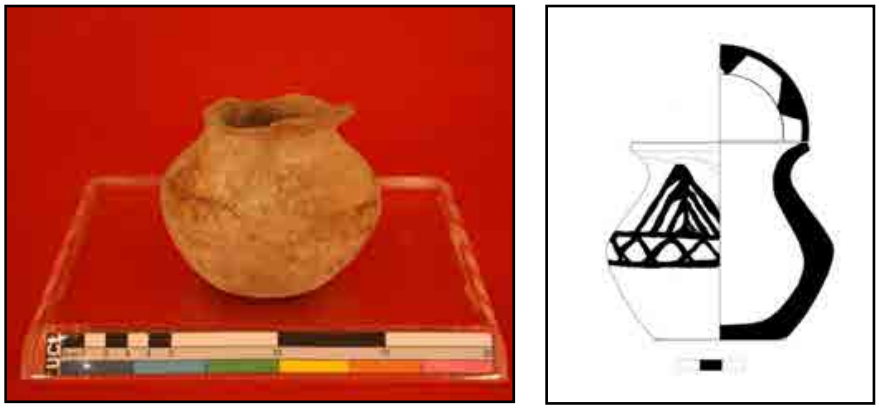


Fig. 3: Handleless jar – spherical body, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018). ▶

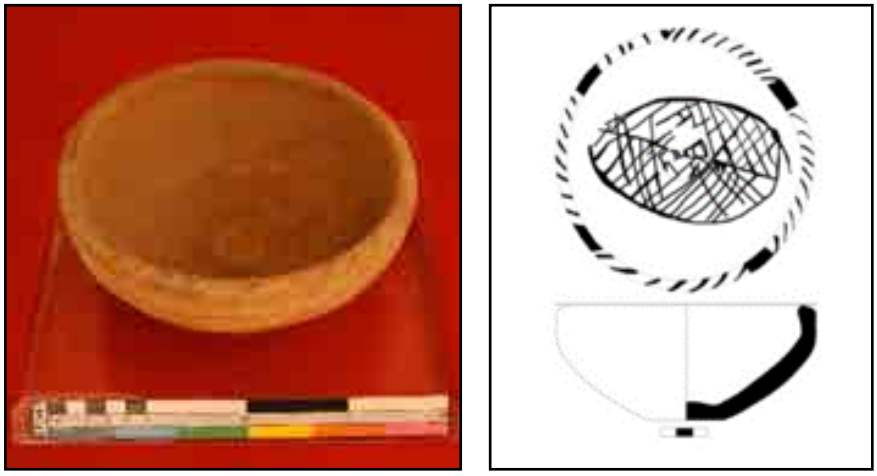
4) A small shallow bowl with a handle, flat base, and a small spout. The rim extends into a small lug handle with perforation, while a small projection on the rim serves as a spout. The exterior surface of the rim is decorated with geometric motifs consisting of ochre-painted hatched

designs. The vessel is wheel-made from brick-red ceramic fabric containing sand inclusions and is covered with a light brick-red slip. The object is complete and well preserved (Fig. 4).



◀ **Fig. 4: Handled shallow bowl, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).**

5) A deep bowl with a wide mouth. The interior surface is decorated with geometric motifs arranged around the rim, while the interior base features an oval medallion containing geometric designs. The decoration is executed in ochre and applied in an irregular and coarse manner. The vessel is wheel-made and has a rounded profile. The ceramic fabric is tempered with sand inclusions and is covered with a brick-red slip. The object is complete and well preserved, although affected by sediment deposits (Fig. 5).



◀ **Fig. 5: Deep cup (bowl) with a wide mouth, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).**

6) A handleless jar with a narrow neck, spherical body, and flat base. The exterior surface of the vessel, extending from the neck to the shoulder and body, is decorated with three horizontal bands of solid lines encircling the vessel. Below these bands, a decorative register contains hollow triangular motifs arranged in a zigzag pattern around the body, painted in ochre. The vessel is wheel-made with a rounded profile. The ceramic fabric

is brick-red and tempered with sand, and covered with a light brick-red slip. The object is well preserved, although some areas of the rim show faded surface coloration (Fig. 6).



Fig. 6: A jar with a narrow neck and no handle, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018). ▶

7) A handled jar with a clover-shaped mouth, an almost spherical body, and a handle connecting the rim to the shoulder of the vessel. The vessel is undecorated. It is wheel-made from brick-red ceramic fabric tempered with sand inclusions and covered with a buff-colored slip. The object is partially preserved, with a broken and missing section of the rim, while parts of the surface are covered with sediment deposits (Fig. 7).



Fig. 7: Handled jar with clover-shaped spout, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018). ▶

8) A handled jar with an applied handle. The vessel has a pear-shaped mouth, an almost spherical body, and a flat base. The exterior surface of the rim is decorated with applied button motifs, while the exterior body, extending from below the rim to the upper part of the body, bears ochre-painted geometric motifs consisting of triangles and hatched designs. Similar hatched geometric motifs are also present on the handle. These

motifs were executed using an incision technique. The interior surface of the rim is decorated with geometric hatched motifs extending around the entire rim. The vessel is wheel-made, with a rounded profile, and is produced from brick-red ceramic fabric tempered with chamotte and sand inclusions. It is covered with a buff-colored slip. The vessel is complete and well preserved. This vessel form is comparable to examples documented in the pottery assemblage from the Germi excavation (Fig. 8).



◄Fig. 8: Handled jar with pear-shaped mouth, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).

9) A handled jar with a clover-shaped mouth; the handle is applied and extends from the rim to the body of the vessel. The vessel has a spherical body and a flat base. The exterior surface of the rim and body is decorated with geometric motifs, including two solid ochre-painted horizontal lines encircling the vessel. The vessel is wheel-made with a rounded profile, produced from brick-red ceramic fabric tempered with sand inclusions, and covered with a buff-colored slip. The object is complete and well preserved (Fig. 9).



◄ Fig. 9: Handled jar with clover-shaped spout, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).

10) A handled jar with two handles attached on opposite sides of the rim, one of which incorporates an attached animal-shaped spout. Two additional tubular spouts are positioned on either side of the base and function as supports, providing stability for the vessel. The exterior surface of the body is decorated with ochre-painted geometric motifs consisting of hatched triangles and hollow triangular designs arranged around the vessel. The vessel is made of brick-red ceramic fabric tempered with chamotte and sand inclusions and covered with a buff-colored slip. The object is poorly preserved, with one handle partially broken and the rim and vessel edges damaged and incomplete (Fig. 10).

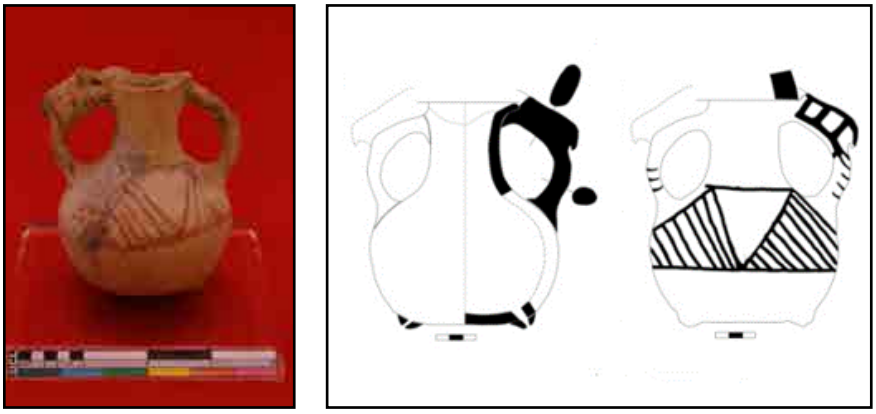


Fig. 10: Handled jug, with a spout, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018). ▶

11) A small handled jar with a narrow neck and two tubular spouts positioned on either side of the base, serving as supports for the stability of the vessel. Geometric decoration begins below the neck and extends across the body. The neck is decorated with solid triangular motifs, while the body bears an ochre-painted decorative frame composed of intersecting and non-intersecting hollow triangles. Hatched geometric motifs are also present on both handles. The vessel is made of brick-red ceramic fabric tempered with sand inclusions and covered with a brick-red slip. The object is complete and well preserved, although sediment deposits cover parts of the surface (Fig. 11).

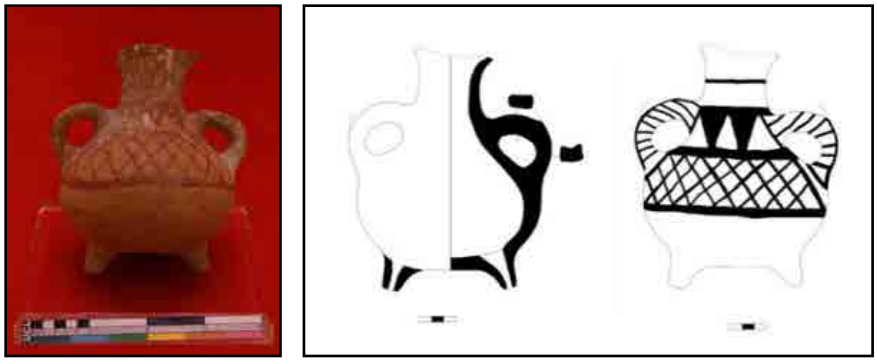
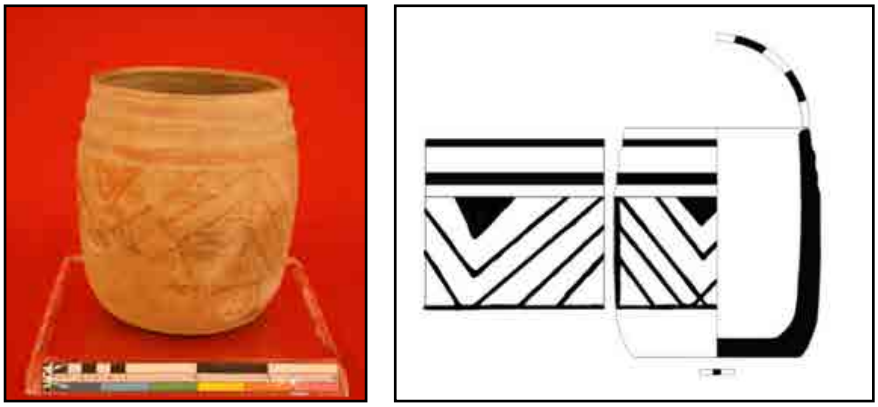


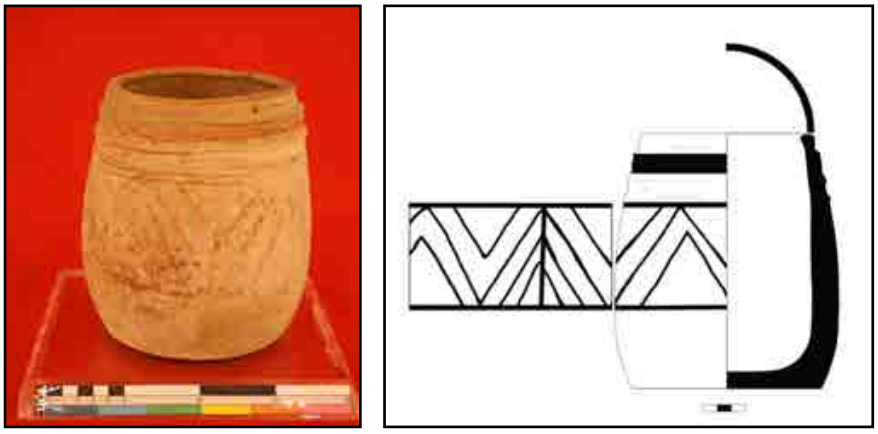
Fig. 11: Small handled jar with narrow neck, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018). ▶

12) A handleless drinking bowl with a cylindrical body and flat base. The exterior surface is decorated with geometric motifs. The rim bears encircling linear decoration, while the body is decorated with ochre-painted geometric motifs consisting of solid and hollow chevrons. The vessel is wheel-made from brick-red ceramic fabric tempered with rounded coarse sand and covered with a buff-colored slip. The object is complete and well preserved, although the surfaces are covered with sediment deposits (Fig. 12).



◄ **Fig. 12: Handleless drinking bowl with cylindrical body, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).**

13) A handleless drinking bowl with a cylindrical body and flat base. The exterior surface bears geometric decoration, with encircling linear motifs around the rim. The body is decorated with solid and hollow geometric motifs painted in ochre. The vessel is made of brick-red ceramic fabric tempered with rounded chamotte and coarse sand inclusions and covered with a buff-colored slip. The object is complete and well preserved; however, sediment deposits and surface abrasion in some areas obscure parts of the decorative scheme (Fig. 13).



◄ **Fig. 13: Handleless drinking bowl with cylindrical body, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).**

14) A handled jar with a vertical spout connected to the rim by a small bridge. The vessel has a spherical body and flat base. Applied button motifs decorate the spout and handle. The interior surface of the rim is decorated

with incised hatched geometric motifs extending around the rim, while the exterior body bears a row of solid ochre-painted triangular motifs. The vessel is wheel-made from brick-red ceramic fabric tempered with sand and covered with a brick-red slip. The object is poorly preserved, with a broken and incomplete rim (Fig. 14).

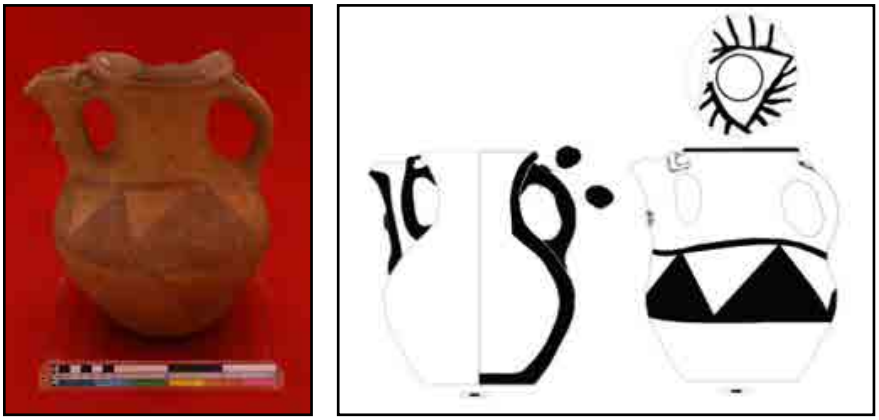


Fig. 14: Handled jug with vertical spout (Archaeology Museum, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018). ▶

15) A jar with two tubular spouts positioned on either side of the base and two zoomorphic handles in the form of goats attached to the rim and shoulder. The forelegs of the handles are attached to the rim, while the hind legs are attached to the shoulder. The heads of the animal-shaped handles are turned backward toward the rim and arranged symmetrically. The exterior surface of the vessel is decorated with ochre-painted geometric motifs consisting of hollow chevron-shaped triangles. The vessel is made of brick-red ceramic fabric tempered with sand and covered with a brick-red slip. The object is complete and well preserved (Fig. 15).

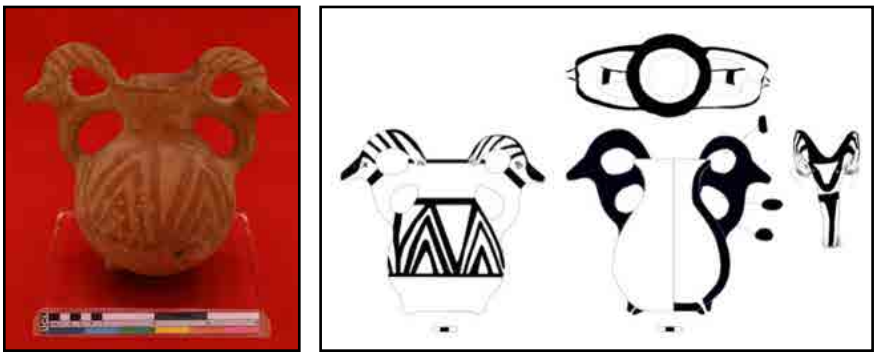
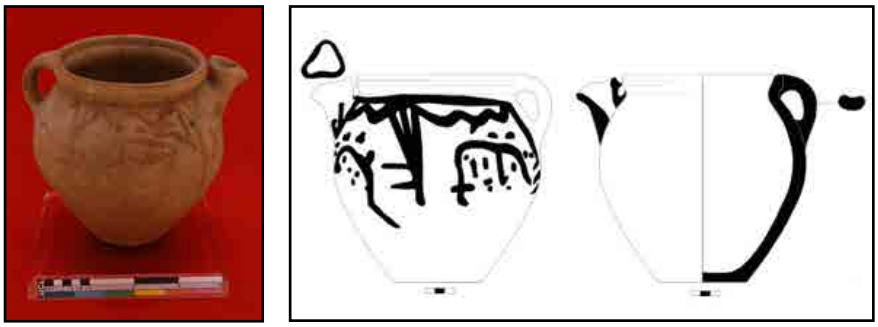


Fig. 15: Jar with two pipe drains, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018). ▶

16) A large, handled jar with a small spout featuring a clover-shaped mouth, a spherical body, and a flat base. The exterior surface of the body is decorated with indistinct ochre-painted geometric motifs. The vessel is wheel-made from brick-red ceramic fabric tempered with sand inclusions and covered with a buff-colored slip. The object is complete and well preserved, although parts of the surface are covered with sediment deposits (Fig. 16).



◄ Fig. 16: A jar with a handle and a clover spout, Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).

Study of Northwestern Iranian Pottery in Terms of Decoration and Form

Northwestern Iran has played an important role in the cultural, economic, and political developments of the Iranian Plateau and its neighbouring regions since the first millennium BCE. The region's strategic geographical position, together with its extensive cultural contacts with Anatolia, the South Caucasus, Mesopotamia, and other parts of the Iranian Plateau, contributed to the emergence and transformation of diverse ceramic traditions. Nevertheless, the sequence of ceramic developments in northwestern Iran from the Late Iron Age through the emergence of Parthian political authority remains incompletely understood. This is particularly evident in the transition from Iron Age III to the subsequent historical periods, when significant changes occurred in local political structures, settlement patterns, and material culture.

The ceramic tradition of Iron Age III in northwestern Iran, conventionally dated to approximately 750–600 BCE, comprises a diverse range of vessel forms and decorative traditions. These ceramic assemblages provide valuable evidence for understanding local cultural practices and the development of regional identities. Among the most distinctive painted ceramic traditions attributed to this period and its subsequent phases are the Triangular Style and what has subsequently been termed the Ardabil Style. The emergence and distribution of these painted ceramics provide an important basis for examining cultural continuity and transformation from the Late Iron Age into the Achaemenid and Parthian periods.

In discussing the chronological and cultural changes that occurred in northwestern Iran, Levin proposed the addition of an Iron Age IV phase to the conventional sequence of the Iron Age, particularly to account for the poorly understood period between the Late Iron Age and the emergence of the Parthian period (Levin, 2007: 476). The appearance of painted pottery during this transitional phase represents a significant development when compared with the ceramic traditions of the Early and Middle Iron Ages

and with the characteristic triangular-decorated pottery associated with Iron Age III.

Dyson initially employed the designation Hasanlu IIIB in his discussion of painted pottery from northwestern Iran (Dyson, 1958). Subsequent investigations at sites such as Ziwiye (Dyson, 1963; 1965) and Yaniq Tepe (Burney, 1962) contributed substantially to the identification and interpretation of these ceramic traditions. Although painted pottery has been recovered from a relatively limited number of archaeological sites, its occurrence within the ceramic sequences of northwestern Iran is characterized by recurring technological and stylistic attributes, including particular color combinations, fabric characteristics, tempering practices, vessel forms, and decorative motifs (Henrickson, 1994: 115).

Triangular-Decorated Pottery

Triangular-decorated pottery constitutes one of the most recognizable ceramic traditions of northwestern Iran during the Late Iron Age and subsequent periods. Its decorative repertoire includes a variety of geometric and figurative motifs, such as triangular patterns, incised or painted geometric designs, suspended or pendant motifs, circular elements, drop-shaped motifs, and representations of birds. The associated vessels generally have angular or shallow profiles, sometimes with concave bodies and relatively thin rims. Some examples exhibit tulip-shaped or related morphological characteristics. The geographical distribution of this tradition extends principally across southern, western, and northwestern Azerbaijan, Armenia, northern Kurdistan, and eastern Anatolia (Fayzkhah, 2009: 287).

Some decorated vessels are characterized by handles modelled in the form of animals standing on their hind legs. Their surfaces may be covered with a pale green or buff-green slip and decorated with cream and reddish-brown motifs. The decorative repertoire includes simple triangles, solid geometric motifs incorporating crosses, groups of parallel lines, and both solid and hatched designs. In some cases, the decoration includes a frieze of animals, particularly running or galloping deer and goats. These motifs are generally concentrated on the shoulder and upper body of the vessels.

Because many of these vessels have not been recovered from controlled archaeological excavations, their precise chronology remains uncertain. Nevertheless, comparative evidence from excavated sites in the Republic of Azerbaijan and the occurrence of similar specimens at several archaeological sites in Iran suggest that at least some forms may be associated with the Achaemenid or Early Parthian periods (Haerinck, 1978:

35–36). Such comparisons should, however, be regarded as evidence for relative chronology rather than as definitive chronological determinations for vessels lacking secure archaeological contexts.

Relationship between Triangular and Ardabil Styles

Dyson, in his study of the Hasanlu III ceramic sequence and his comparison of triangular-decorated pottery from northwestern Iran with ceramic traditions from the eastern regions of the Achaemenid Empire, distinguished different regional expressions of painted pottery, including what he termed the Western Triangular Style (Dyson, 1999). Haerinck subsequently examined painted jars and vessels preserved in various museum collections and associated with the Ardabil region and proposed the term Ardabil Style for this group of ceramics (Haerinck, 1978).

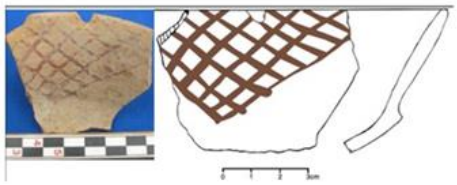
In his classification of ceramics of the pre-Parthian period, Haerinck identified Yaniq Tepe as an important site because both Western Triangular pottery and Ardabil-style pottery occur there. He consequently regarded the site as a potential zone of interaction or overlap between the distribution areas of these ceramic traditions (Haerinck, 1997). However, the contextual evidence from Yaniq Tepe requires careful consideration. The Ardabil-style pottery reported from the site was recovered from a refuse deposit rather than from a clearly defined stratigraphic sequence. Therefore, the available evidence does not by itself demonstrate a chronological development, direct convergence, or evolutionary relationship between the Western Triangular and Ardabil styles (Burney, 1962; Summers & Burney, 2012).

More recent archaeological investigations in northwestern Iran have provided additional evidence for reconstructing ceramic developments between the Iron Age and the Parthian period. Continued excavations at Hasanlu (Khatib Shahidi, 2004; Kroll, 2012), excavations at Kul Tepe Hadi Shahr in Jolfa (Khatib Shahidi & Abedi, 2011), investigations at Zahhak Castle in Hashtrud (Qandgar *et al.,* 2004), excavations at Buini Yoghun Castle in Nir (Pourfaraj, 2017), archaeological surveys of the Bonab Plain (2000; 2004), investigations at Qonagh Qeyran Castle (Valdbeigi *et al.,* 2014), and archaeological surveys along the eastern shores of Lake Urmia (Omrani, 1993; Ajurloo, 2007; Ebrahimi, 2012) have all contributed to a better understanding of the ceramic sequence and cultural developments of the region.

Taken together, these studies demonstrate that the transition from the Late Iron Age to the Achaemenid and Parthian periods in northwestern Iran was characterized by considerable ceramic diversity and by the

persistence, transformation, and regional differentiation of earlier decorative traditions. The relationship between Triangular Style pottery and Ardabil-style pottery is therefore best approached through comparative analysis of morphology, decoration, fabric, technology, and archaeological context rather than through assumptions of direct stylistic continuity. The pottery preserved in the Sheikh Safi al-Din Ardabili Museum, despite its uncertain archaeological provenience, provides an important comparative assemblage for investigating these relationships and for evaluating the proposed chronological position of Ardabil-style pottery within the broader ceramic sequence of northwestern Iran.

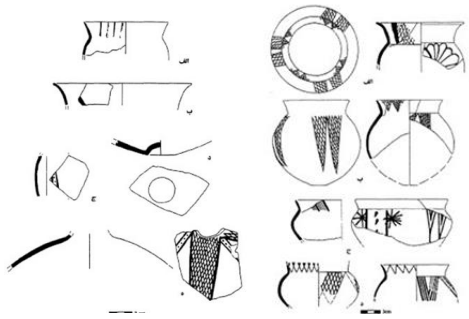
Table 1: Samples of pottery from north-west Iran (Authors, 2018). ▶



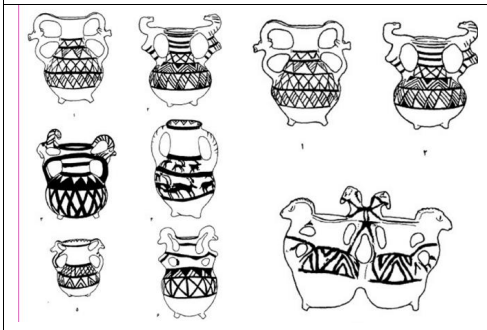
Painted pottery fragment from Boini Castle in Yoghun (Pourfaraj, 2017: 45).



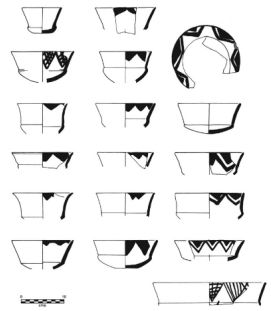
Pottery with a triangular pattern from Aqrab Tepe (Muscarella, 1973).



Classical "imported" triangular vessels from Hasanlu Tepe (Faizkhah & Aliyun, 2009: 382)



Double-rolled vessels discovered in Azerbaijan (Faizkhah, 2009)



Woven vessels from Yaniq-Tepe (Summers, 2013)

The Ardabil-style pottery collection preserved in the National Museum of Iran includes a number of vessels originating from the Foroughi Seized Collection, which was confiscated at the Bazargan border in 1988. In 1996, these objects were catalogued and examined by specialists under the

supervision of the Cultural Heritage Department of Tehran Province and the National Museum of Iran. In addition to this collection, the comparative corpus includes pottery fragments recovered through archaeological excavations at Zahhak Castle in East Azerbaijan and from Charles Burney's excavations at Yaniq Tepe in 1960 (Burney, 1960).

Based on morphological characteristics, Sedigheh Piran classified the vessels represented in these collections into three principal categories: 1) jars, 2) cups, and 3) drinking vessels (Piran, 2003: 62). These vessels generally feature cream-colored to buff-colored slips and are characterized by relatively large painted motifs. In many cases, the decorative designs were executed with limited concern for geometric regularity or precision. On some specimens, traces of surface finishing and smoothing tools remain visible beneath or on the slipped surfaces.

The painted decoration is generally matte and was executed primarily in ochre, dark and light brown, and reddish-orange pigments. The ceramic fabric is predominantly brick-red, orange, or buff in color and contains fine sand and grog (chamotte) temper, with occasional fine white mineral inclusions. Based on macroscopic examination, the fabrics may generally be classified as semi-coarse to semi-fine. However, accurate characterization of their mineralogical composition, provenance, and firing conditions requires petrographic and archaeometric analyses.

The decorative repertoire is predominantly geometric and includes simple triangular motifs, both hatched and solid, fan-shaped motifs, solid lozenges or diamond-shaped elements, and linear designs. In addition to geometric decoration, some vessels feature zoomorphic and anthropomorphic representations, including birds, goats, deer, dogs, human figures, cross-shaped trees, and circular motifs interpreted as possible solar symbols. Piran has noted similarities between some of these zoomorphic and anthropomorphic representations and motifs documented in the rock art and petroglyph traditions of northwestern Iran. Comparable imagery has been reported from several locations in Ardabil Province, including Aq Morad, Moshiran, Shakili Dash, Qaleh Qahqeh, and Ganakh Qeyran (Piran, 2003: 63–65). These parallels may contribute to discussions concerning the symbolic repertoire of the region; however, such comparisons should be approached cautiously, as formal similarities alone do not necessarily demonstrate direct cultural or chronological relationships.

Comparative analysis of Ardabil-style pottery from the National Museum of Iran, the Archaeological Museum of the Sheikh Safi al-Din Ardabili Mausoleum, and comparable assemblages from neighboring regions reveals several recurring morphological and decorative

characteristics. These include large jars with handles and relatively vertical spouts, frequently terminating in trefoil-shaped or zoomorphic mouths. Their bodies are commonly decorated with large-scale geometric motifs (Tab 2: Figs. 1–4).

Another distinctive vessel form is the handleless drinking vessel, characterized by a cylindrical body and flat base. Its exterior surface is decorated with geometric motifs. The rim is encircled by a band of linear decoration, while the body bears solid and hollow geometric motifs executed in ochre (Tab 2: Figs. 5–6).

A further distinctive form is the double-spouted jar, characterized by two tubular spouts projecting from the lower part of the vessel and two zoomorphic handles modeled in the form of goats positioned near the rim. The forelegs of the animal figures are attached to the rim, while the hind legs are attached to the shoulder of the vessel. Their heads are turned backward toward the rim, creating a symmetrical composition on either side of the vessel. The exterior surface is decorated with geometric motifs, particularly hollow or outlined triangular patterns executed in ochre (Tab 2: Figs. 7–9).

The recurrence of these vessel forms and decorative elements in collections from Ardabil, the National Museum of Iran, and archaeological sites in northwestern Iran provides an important foundation for comparative studies. In particular, the combination of trefoil or zoomorphic spouts, animal-shaped handles, painted geometric motifs, and distinctive fabric and surface treatments may be considered among the principal stylistic attributes associated with Ardabil-style pottery.

Table 2: Samples of Comparable pottery (Authors, 2018). ▼

 Fig. 1: Jars With trefoil-shaped rims. Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).	 Fig. 2: Jars Spouted Jar in the Bird shape (National Museum of Iran Archives, 2018).	 Fig. 3: Jar from the Yaniq Tepe site (Summers & Bunery, 2012)



Fig. 4: Mingechaur jar, Azerbaijan IA3 (Bijeb, 1960: xita6JIO).



Fig. 5: Drinking vessel -bowl, with cylindrical body, Sheikh Safi-al- Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).



Fig. 6: Drinking vessel-bowl, with cylindrical body, in Juno, Azerbaijan. (de Morgan, 1896)



Fig. 7: Two-spouted Jar; Sheikh Safi-al-Din Ardabili Mausoleum Archaeological Museum (Authors, 2018).



Fig. 8: Two-spouted Jar (National Museum of Iran Archives, 2018).

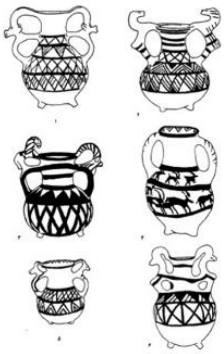


Fig. 9: Two-Spouted Jar (Fayzkhah & Aliyoun, 2009)

Conclusion

Northwestern Iran occupied a strategically important position during the first millennium BCE and was continuously involved in cultural, economic, and political interactions with neighbouring regions, including Anatolia, Armenia, the South Caucasus, and Mesopotamia. Its diverse geographical and environmental conditions supported the development of successive settlements and contributed to the persistence and transformation of local cultural traditions. During the first half of the first millennium BCE, the region was influenced by, and interacted with, several political and cultural entities, including Urartu, Manna, Assyria, the Scythians, and, subsequently, the Medes. These interactions contributed to the formation of a complex cultural landscape in which local traditions were maintained while simultaneously being transformed through contact with neighbouring communities.

The present study examined 16 Ardabil-style pottery vessels preserved in the Archaeological Museum of the Sheikh Safi al-Din Ardabili Mausoleum. Because these vessels lack secure archaeological

contexts and were not recovered through controlled excavations, their absolute chronology cannot be established directly. Accordingly, the study employed comparative and stylistic analysis to establish a relative chronological framework based on vessel morphology, manufacturing characteristics, decorative motifs, and comparison with pottery from archaeological sites and museum collections in northwestern Iran and neighbouring regions.

The analysis demonstrates that the Ardabil-style assemblage is characterized by a distinctive combination of morphological, technological, and decorative features. The principal vessel forms include narrow-necked jars, handled vessels, vessels with tubular spouts, trefoil-mouthed vessels, cups, and cylindrical drinking vessels. Most specimens appear to have been produced on a potter's wheel, including the slow wheel in some cases. The fabrics are generally brick-red to pale greenish or related tones and contain grog (chamotte), sand, and, in some specimens, fine windblown sand. Surface treatments and painted decoration vary, but the dominant decorative repertoire consists of geometric motifs, including solid and outlined triangles, hatching, fan-shaped designs, chevrons, filled lozenges, stars, and parallel lines. A smaller number of vessels also bear zoomorphic motifs, particularly representations of goats, deer, birds, and other animals.

From a functional perspective, the vessels may provisionally be divided into two broad groups. The first comprises ordinary jars, cups, and drinking vessels that could have served domestic or subsistence-related functions. The second includes distinctive vessels, particularly jars with one or two tubular spouts and zoomorphic handles, whose unusual morphology and elaborate decoration may indicate ceremonial or ritual functions. However, because the archaeological contexts of the museum specimens are unknown, functional interpretations must remain tentative.

Comparative analysis indicates that Ardabil-style pottery shares several morphological and decorative characteristics with ceramic assemblages documented in northwestern Iran, the Republic of Azerbaijan, Nakhchivan, Armenia, and eastern Anatolia. Nevertheless, the available evidence does not support treating Ardabil-style pottery and Triangular Style pottery as identical ceramic traditions. Rather, they appear to represent distinct but partially overlapping traditions that developed within the broader cultural sphere of northwestern Iran. Their similarities in the use of geometric motifs, particularly triangular decoration, suggest

the possibility of stylistic interaction or shared regional conventions, whereas differences in vessel morphology, decorative organization, and geographical distribution indicate that each tradition maintained its own distinctive characteristics.

The chronological evidence suggests that the origins and development of Ardabil-style pottery should be sought within the ceramic transformations of the Late Iron Age and the Achaemenid period. Comparative evidence indicates that the tradition continued into the Early Parthian period and possibly later phases of the Parthian period. The relationship between Ardabil-style and Triangular Style pottery therefore appears to reflect a process of continuity, transformation, and regional interaction rather than a simple linear development from one style into the other.

The hypothesis that Ardabil-style pottery represents a characteristic ceramic tradition of northwestern Iran during the Achaemenid and Early Parthian periods is broadly supported by the comparative evidence. Likewise, similarities between its decorative repertoire and earlier geometric traditions suggest that certain elements of the first-millennium BCE ceramic tradition continued into later periods, although these similarities should not automatically be interpreted as evidence of direct cultural continuity. More securely excavated assemblages and archaeometric studies are required to establish the chronological sequence and technological characteristics of the tradition with greater precision.

Overall, Ardabil-style pottery represents an important component of the ceramic traditions of northwestern Iran. Its distinctive combination of vessel forms, geometric and zoomorphic decoration, and technological characteristics provides valuable evidence for understanding cultural interaction and ceramic development in the region from the Late Iron Age through the Achaemenid and Parthian periods. The study of well-documented archaeological contexts in future excavations, together with petrographic, compositional, and other archaeometric analyses, will be essential for refining the chronology, provenance, technology, and cultural significance of Ardabil-style pottery.

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Conflict of Interest

In adherence to ethical publication standards, the authors affirm that there are no conflicts of interest, either personal or financial, that could have influenced the content or conclusions presented in this research.

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چکیده

منطقهٔ شمال‌غرب ایران به‌دلیل موقعیت استراتژیک و اهمیت خاص خود، وجود فرهنگ‌های مختلف بشری در ادوار گذشته از پیش‌ازتاریخ تا دوران معاصر، نقش مهمی در ارتباطات فرهنگی خاور نزدیک ایفا کرده است. سفال به‌عنوان یکی از عوامل انتقال مفاهیم، که نتیجهٔ تغییر و تحولات دوران گذشته ظاهر شده و به‌وسیلهٔ اشکال و تزئینات غنی خود، گویاتر از همهٔ ساخته‌های بشری، مفاهیم هنری هر دوره را بیان می‌کند. تحولات علاوه‌بر موارد تکنیکی ساخت، نقوش، جنس و رنگ ایجاد شده و میزان خلاقیت هنری صنعتگران بر آثار سفالین مشاهده نمود. هدف از پژوهش حاضر سبک‌شناسی سفال‌های سبک اردبیل موزهٔ باستان‌شناسی بقعهٔ شیخ صفی‌الدین اردبیلی بوده است؛ از این‌رو، نوشتار حاضر به روش مطالعات میدانی-موزه‌ای (مستندنگاری، عکاسی، طراحی) و توصیفی-تحلیلی (کتابخانه‌ای) است. سفال‌های مورد پژوهش جزو اشیاء توقیف شده‌ای است که به موزهٔ باستان‌شناسی بقعهٔ شیخ صفی‌الدین اردبیلی انتقال‌یافته است. به‌دلیل بی‌شمار بودن این نوع اشیاء در سایر موزه‌ها و مجموعه‌ها قابل تفکیک بودند، اما ازلحاظ تاریخی و یا موقعیت مکانی مشخص رعایت نشده است؛ درنتیجه به مطالعات تطبیقی، با سایر نمونه‌های مشابه موجود در موزهٔ ملی، محوطه‌های باستانی ایران و مناطق همجوار پرداخته شده است. مباحث سفال سبک اردبیل، یکی از اساسی‌ترین موضوعات سفال شمال‌غرب ایران است. اغلب این نوع سفال‌ها از طریق حفاری‌های غیرمجاز و قاچاق به‌دست آمده و نمونه‌های یافت‌شده از کاوش علمی اندک هستند. سفال‌ها ازلحاظ شکل، شامل: کوزه، پیاله و آبخوری‌ها، به‌صورت دهانهٔ شبدری، دسته‌دار، لوله‌دار، آبریز، و پایه‌دارمی‌باشند. رنگ اکثرا سفال‌ها قرمز متمایل به نارنجی و رنگ نخودی و تزئینات هندسی شامل: نقوش مثلثی، هاشور، تزئینات برجستهٔ دکمه‌ای و ... است. محدودهٔ زمانی سفال‌های موردمطالعه از لحاظ نقش از دوران پیش‌ازتاریخ تا اواخر اشکانی و ازلحاظ فرم از اواخر هزارهٔ اول پیش‌ازمیلاد (عصر آهن III) تا دوران تاریخی (اواخر اشکانی) درنظر گرفته شده است.

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Ideological Representations and Ritual Behaviors in Bronze Age Southeastern Iran

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Abstract

The expansion of complex societies in southeastern Iran during the Bronze Age (3rd millennium B.C.) was driven not only by material and commercial networks with Mesopotamia but also by the transmission of ideological beliefs and ritual behaviors. Despite extensive research on trade and cultural relations between this region and its neighbors, the ritual and ideological aspects reflected in material culture have received less attention. This study aims to identify manifestations of ideology through iconographic analysis of reverence gestures and architectural motifs on figurines, seals, and chlorite vessels from Shahdad, KonarSandal (Jiroft), and Tepe Yahya. The central question is whether these material representations reflect direct Mesopotamian influence or demonstrate localized ritual practices. The hypothesis posits that if these motifs directly reflect Mesopotamian influence, a uniform pattern in typology and context should be observable across all sites; however, if they resulted from localization, significant differences in typology, context of use (funerary at Shahdad versus temple-related at Konar Sandal), and chronological range should be observed. This research employs a descriptive-analytical method based on published data from these sites, with comparative evidence from Mesopotamia and Central Asia. The findings reveal that while the prototypes of reverence gestures have origins in ancient Mesopotamia, they were reproduced in different contexts in southeastern Iran, indicating active adoption and localization. Furthermore, rather than a monolithic state ideology, the sites shared a flexible repertoire of ritual behaviors. Chronologically, the closed-hand gesture appears earlier and more widely, while the raised-fist gesture becomes more frequent in the second half of the third millennium B.C. It is concluded that although complete ritual homogeneity is not evident, shared symbols played a key role in connecting producers, local elites, and exchange networks toward Elam and Mesopotamia, though the mechanism of this link cannot be established from iconography alone.

Keywords: Ritual Gesture, Ideology, Bronze Age, Southeastern Iran, Iconography.

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Introduction

The major settlements of southeastern Iran experienced significant economic expansion and artistic development during the Bronze Age. Several of these sites reached a scale and level of social complexity that have led scholars to describe them as proto-urban or urban centers, although the extent to which they represent fully developed urban societies remains a matter of ongoing debate. Despite their geographical separation, these communities maintained both intra-regional and long-distance connections, including interactions with Mesopotamia, through which they influenced and were influenced by neighboring cultural spheres. These interactions are reflected in a wide range of material expressions, including seals, beveled-rim bowl pottery, writing systems, plaques, anthropomorphic sculptures, and figurines. While the first three categories have received considerable scholarly attention, the ritual significance and iconographic dimensions of statues, seals, and plaques have been comparatively less explored.

The reconstruction of ritual practices in the ancient Near East is inherently constrained by the uneven distribution of archaeological and textual evidence across both time and space (Westenholz, 2013: 247). Written sources from the third millennium BCE are preserved primarily from Mesopotamia, whereas contemporary communities in southeastern Iran and neighboring regions did not leave comparable textual records (Karlovsky, 2013: 569). Consequently, evidence for religious concepts, ritual performance, and ceremonial representation in southeastern Iran remains limited and is derived mainly from specific categories of material culture, including the anthropomorphic statues of Shahdad, cylinder seals from Tepe Yahya and Shahdad, the monumental figure from Konar Sandal South (KSS), and the flat seals from the Jiroft region.

Earlier scholarship tended to emphasize direct Mesopotamian influence in explaining the emergence of ideological and artistic traditions in southeastern Iran. However, recent archaeological and epigraphic discoveries have encouraged a broader consideration of the region's interactions with Elam. In particular, the identification of early Linear Elamite inscriptions at Shahdad, recently dated through radiocarbon analysis to the early third millennium BCE (approximately 2900–2600 BCE), demonstrates the existence of an indigenous writing and visual tradition closely connected with the Elamite cultural sphere rather than representing merely a passive adoption of Mesopotamian models (Eskandari et al., 2025).

Although sculpture began depicting royal and divine figures as early as the fourth millennium BCE, relief remained one of the dominant artistic media throughout much of the ancient Near East (Benzel, 2010: 11). In

southeastern Iran, however, the available evidence for religious ideology and ceremonial expression remains relatively restricted, represented primarily through statues, seals, and specialized objects such as chlorite vessels. The recurrence of these visual forms, together with shared human representations and architectural motifs on intercultural chlorite objects, suggests the existence of broader symbolic traditions extending beyond simple imitation. Nevertheless, the interpretation of specific examples, including the Shahdad statues and the Jiroft figure, remains subject to ongoing scholarly discussion.

Research Questions: How can ritual gestures and symbolic motifs within the material culture of southeastern Iran be interpreted in the context of Bronze Age ideological expressions? 1. To what extent do similarities among archaeological sites in southeastern Iran reflect shared ritual practices, cultural interaction, or processes of local adaptation during the third millennium BCE?

Research Hypothesis: Regarding Research Question 1, it is hypothesized that these gestures and motifs functioned as expressions of ritual reverence and authority. In the absence of written sources from southeastern Iran, their probable ideological significance can be reconstructed through contextual and comparative iconographic analysis rather than through formal similarity alone. Regarding Research Question 2, it is hypothesized that the available evidence is more consistent with selective adoption and local reinterpretation than with the direct transmission of a uniform Mesopotamian or Elamite ideological system. Hypothesis 2 predicts that variations in typology, archaeological context, and chronological distribution among Shahdad, Konar Sandal, and Tepe Yahya should accompany shared formal conventions. Therefore, Hypothesis 1 focuses on the interpretation of the motifs, whereas Hypothesis 2 addresses the nature of cultural interaction and processes of local adaptation.

Research Method: This research employs a descriptive-analytical method based on published archaeological evidence from key Bronze Age sites in southeastern Iran, including Shahdad (Hakemi, 1997: 97), KSS (Madjidzadeh & Pittman, 2008: 82; Madjidzadeh, 2003: 45; 2019, Vol. 2: 171), Tepe Yahya (Potts *et al.,* 2001: 223; Lamberg-Karlovsky, 1970: 56), and Shahr-i Sokhta (Tosi, 1992: 191). Comparative evidence from Elam, particularly Susa and Anshan (Malyan), as well as Mesopotamia (Diyala, Mari, and Ur) and Central Asia (BMAC/Gonur Depe), is also examined. The primary categories of material evidence include: 1) figurines and statues depicting reverential postures; 2) seals and seal impressions

representing ritual scenes; and 3) chlorite vessels bearing architectural or temple-related motifs.

Rather than equating ideology with trade, this study focuses on a specific line of evidence: recurring gestures of reverence and architectural motifs on chlorite vessels. These elements are examined through their formal characteristics, archaeological contexts, and chronological distribution at Shahdad, KSS, and Tepe Yahya, and are compared with parallels from Elam, Mesopotamia, and Bactria-Margiana. The symbolic materials discussed here should not be understood merely as artistic objects in the modern sense; for the communities that produced them, such objects may have carried ideological and ritual significance. Accordingly, this article seeks to develop an interpretation of ideology in Bronze Age southeastern Iran by examining how ideological concepts were expressed through material culture, how they transformed over time, and how their distribution reflects both local practices and broader networks of interaction.

Research Literature

The iconographic investigation of ritual gesture motifs within the material culture of Bronze Age southeastern Iran has not yet received a comprehensive and independent study. Although several scholars have addressed aspects of this subject, most notably Hakemi's pioneering analysis of the Shahdad statues (Hakemi, 1993), the interpretation of ritual gestures as indicators of ideological practice remains insufficiently developed. Existing comparative studies are distributed across three interconnected cultural spheres: Mesopotamia, Elam, and southeastern Iran itself.

Within the Mesopotamian context, Frankfort examined the Sumerian statues from Tell Asmar and Khafajah in the Diyala region and proposed a developmental sequence spanning approximately four centuries (Frankfort, 1939). Evans analyzed Sumerian sculptures within their temple contexts (Evans, 2012), Parrot investigated stylistic developments in Sumerian statuary (Parrot, 1961), and Winter explored royal images as recipients of ritual action within Mesopotamian ideological systems (Winter, 1992). These studies provide an essential comparative framework for understanding the relationship between bodily representation, ritual behavior, and expressions of authority.

For Elam, Álvarez-Mon examined Elamite sculpture and the Susa corpus, addressing questions concerning Mesopotamian influence, imported artistic traditions, and locally produced sculpture (Álvarez-Mon, 2018, 2020). In addition, Roach's comprehensive study of Elamite

cylinder seals provides an important comparative dataset for evaluating the distribution and development of ritual gestures at Susa and Anshan (Roach, 2009). Recent chronological reassessments of Shahdad further indicate that the administrative and visual traditions of the Iranian Plateau developed alongside Elamite cultural systems, maintaining significant connections with both Highland Elam at Anshan and Lowland Susiana (Eskandari *et al.*, 2025). The present study, however, does not attempt to reconstruct Elamite religious beliefs or theological systems; rather, it focuses specifically on the material and iconographic manifestations of shared visual conventions (Ascalone, 2013).

The study of intercultural chlorite vessels and their architectural motifs by Miroschedji (1973) provides another important comparative perspective, particularly regarding the circulation of symbolic imagery across regional networks. For southeastern Iran, Ascalone classified glyptic evidence into broad stylistic phases and emphasized the connections among Shahdad, Konar Sandal, and Tepe Yahya (Ascalone, 2013). Similarly, Hakemi and Pittman documented the statues, seals, and associated archaeological materials from Shahdad and Konar Sandal (Hakemi, 1997; Madjidzadeh & Pittman, 2008). Together, these studies provide substantial evidence for cultural interaction and shared visual traditions across the Iranian Plateau.

Despite this significant body of research, a systematic examination of ritual gestures themselves, including their formal characteristics, archaeological contexts, and chronological distribution across southeastern Iran, Elam, and Mesopotamia, remains limited. The existing research gap therefore does not simply concern the study of cultural interaction; rather, it involves the absence of an integrated analysis of ritual gestures as material expressions of ideological practice.

A further challenge derives from the uneven archaeological record. Unlike Mesopotamia, southeastern Iran lacks a comparable corpus of contemporary written sources documenting deities, ritual institutions, temple hierarchies, or ceremonial practices. Moreover, despite the exceptional concentration of ritual statues at Shahdad, no securely identified shrine or temple context has yet been established for these objects. Elam represents an important intermediate comparative field because sites such as Susa and Anshan preserve both glyptic and sculptural evidence that can be examined alongside southeastern Iranian material, while simultaneously reflecting sustained interaction with Mesopotamia.

Considering these limitations, the present study examines evidence from the Bronze Age (3000–2000 BCE) in order to distinguish recurring visual conventions from assumptions of direct ideological transmission. It

further seeks to evaluate the extent to which shared motifs were adopted, modified, and locally reinterpreted within different regional contexts.

The First Representations in Southeastern Iran

Three principal ritual evidence can be identified in the material culture of southeastern Iran: 1) A human figure with hands clasped in a gesture of reverence. 2) A human figure with one hand positioned symmetrically along the body and the other bent upward from the elbow, parallel to the face. 3) Architectural or temple motifs represented on chlorite vessels and miniature objects in the form of temple structures.

1) A Human Figure with Hands Clasped in a Gesture of Reverence

In 1972, excavations in virgin soil in the Lut Desert revealed three male statues deposited as funerary offerings. Despite their relatively modest material quality, one small standing figure, with arms extended along the sides of the body, demonstrates considerable artistic sensitivity, while a second, better-proportioned bust follows the same representational convention (Kleiss *et al.,* 1973: 203). Continued excavations at Shahdad in 1973 uncovered 68 additional graves, expanding Cemetery A, which now includes more than three hundred documented burials (Hakemi, 2007: 97; Kaboli, 1986: 55). Recent radiocarbon dating of lead-based cosmetic remains from two graves provides chronological anchors for this cemetery: Grave 30 dates to 2923–2667 BCE, while Grave 338 dates approximately to 2500–2300 BCE, demonstrating that Cemetery A remained in use throughout much of the third millennium BCE (Eskandari *et al.,* 2025: 125–128).

Fifteen clay statues of a relatively standardized type, representing both male and female figures, were recovered from these graves alongside ceramics, metal objects, beads, and clay models of cubic buildings with crescent-shaped roofs (Kaboli, 1974: 4, 46; Hakemi, 2006: 98). Approximately forty statues representing the deceased individuals, ranging between 40 and 97 cm in height, were placed beside burials. Nearly all display a reverential posture, with the hands positioned over the chest, while the head and torso received more detailed modelling than the lower body (Kaboli, 1974: 46).

At KSS South in Jiroft, a large but incomplete statue discovered at the entrance of the citadel presents another example of this gesture. Its fists are positioned symmetrically below the chest on a belt, recalling the statues from Tell Asmar, and the figure may originally have held an object in its

hands (Madjidzadeh & Pittman, 2008: 82; cf. Frankfort, 1966: 46). A related bronze statuette preserved in the Jiroft Museum, although lacking a precise archaeological provenance within the Halil Rud basin, demonstrates the same symmetrical hand position above a serpent-shaped belt (author).

At Tepe Hissar, thirteen nude male copper figurines and one female figure were discovered together in a non-funerary context dating to the late third millennium BCE. This assemblage has been interpreted as a possible ceremonial deposit, and at least five examples display the same hand position observed at Shahdad, recalling bronze figurines from the Shara Temple at Tell Aqrab (Gürsan-Salzmann, 2016: 256; Evans, 2012: 168). Another more fragmentary parallel derives from a burial context at Turang Tepe in Gorgan (Wulsin, 1932).

Beyond Iran, statues displaying clasped hands are attested at Susa IV, including an example from the Susa II period carved from a single piece of marble (Álvarez-Mon, 2020: 81; 2018: 604), as well as examples associated with the area near the Manishtushu temple, dated to approximately 2700–2400 BCE. The preserved arms from these contexts can be divided into two groups: figures with hands closed above the waist, and figures with arms crossed across the chest while wearing the Mesopotamian-style long kaunakes garment (Álvarez-Mon, 2020: 89).

Within the Bactria-Margiana Archaeological Complex (BMAC), composite stone, clay, and gypsum statues from both looted and excavated tombs display the same gesture, including a seated figure from Grave 2900 (Sarianidi, 2007: 71–74, 153). At the Gelot cemetery, a marble anthropomorphic statue from a wealthy female burial has been considered stylistically closer to Old Dynastic Mesopotamian traditions than to the broader BMAC corpus (Виноградова & Кутимов, 2018: 56; Natal'ja, 2020: 647). Similar representations of clasped hands occur at Gonur Depe in both gender-neutral figurines and a burial of a young girl with crossed hands. Chlorite figurines from the same cultural sphere also appear to follow this representational convention (Sarianidi, 2007: 71–74, 153).

A limestone statue from Tarut, located in the southern Persian Gulf and dated to Old Dynastic Period II (approximately 2700 BCE), displays the same clasped-hand gesture, as does a copper hand mirror from the Barbar II temple in Bahrain (Rice, 2002: 220; Potts, 2008: 168). In contrast, the second reverential gesture, characterized by one raised or bent hand, is not represented in southeastern Iranian statuary. Outside this region, its closest parallel is a damaged bronze female statue from Tell Asmar (Frankfort, 1943: 337).

2) The Role of Ritual Reverence on Seals and Seal Impressions

Seals constitute the second major category of material culture in which these gestures are represented. Cylinder seal engraving was the dominant form of glyptic production during this period (van Dijk, 2016: 19), and the two reverential gestures identified in statuary also appear in glyptic imagery: the symmetrical clasping of hands above the belt or chest (Table 2), and, particularly in the Jiroft corpus, seated figures with one clenched fist raised toward the face (Table 3).

A Shahdad seal presents a related composition, possibly depicting an act of gift exchange, in which a seated figure extends one bent arm alongside the head (Pittman, 2016: 79). The clasped-hand gesture also appears in Ascalone's classification of southeastern Iranian metal seals, with the earliest group attributed to production centers at Shahdad and KSS. At least one copper or bronze seal depicts a standing male figure with hands symmetrically positioned on the abdomen (Hakemi, 1997: 188). Another example represents a seated plant deity facing a horned deity, both associated with the same posture, while a Tepe Yahya IVB seal depicts a winged deity with hands clasped over the abdomen (Ascalone, 2013: 4), (Fig. 1).

At least three late third-millennium BCE Bactrian seals depict serpent-necked deities in the same posture, including two examples without objects and one apparently holding an object (Winckelmann, 2000: 50).



◄ **Fig. 1: Respect with clasped hands. a. Cylinder seal from Goňur (Lamberg-Karlovsky, 2013: 26). b. Cylinder seal from Tepe Yahya (Ascalone, 2013: 8). c. Cylinder seal from Shahdad (Ascalone, 2013: 4).**

A standing female figure, interpreted as a goddess, with both hands positioned on the abdomen is represented on a Shahdad seal (Ascalone, 2013: 4). At Tepe Yahya, seals from Periods IVA and IVB[1], dated to the late third millennium BCE, depict a winged female figure with clasped hands below the abdomen among seated attendants. Each attendant is represented with one hand placed at the waist and the other extended forward (Pittman, 2001: 262, 237). Potts interprets one of these compositions, featuring two seated deities, as an Iranian parallel to the Mesopotamian mythological pairing of Inanna and Dumuzi (Potts, 1981: 139). Both reverential gestures are also attested in the published corpus of Susa cylinder seals (Roach, 2009), (Table 2).

This gesture also appears on plaques, most notably on a limestone plaque of Ur-Nanshe, king of Lagash, who is depicted with children and

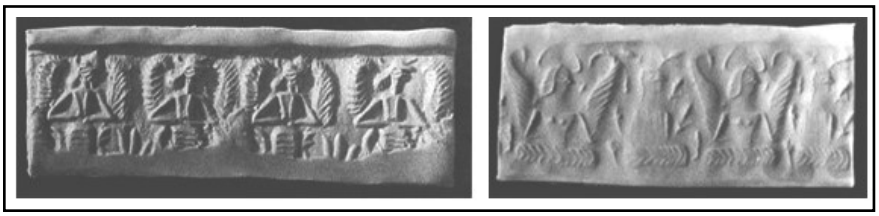
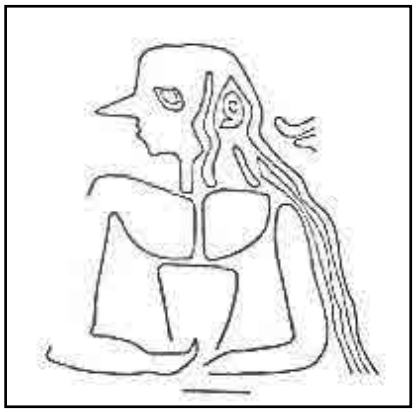


Fig. 2: Tepe Yahya seals depicting figures with hands clasped on the belly (Pittman, 2001: 261, 262). ▶



▲ Fig. 3: A type of ritual respect with both hands clasped (Majidzadeh, 2019: 298).

courtiers whose hands are folded obliquely over their abdomens, while in the lower register the king himself extends one hand to hold an object (Kramer, 1963: 64c). A small fragment of a cylinder seal from Jiroft likewise depicts a bare-chested male figure with hands respectfully closed above the abdomen (Majidzadeh, 2019: 297), (Fig. 3). Comparable to the KSS statue, this Jiroft seal is the only local glyptic example of this gesture. A related, apparently hybrid composition is attested on a cylinder seal from Goňur Depe in Bactria-Margiana (Lamberg-Karlovsky, 2013: 26; Winckelmann, 2020: 238).

The second reverential gesture, consisting of a seated figure with one hand placed at the waist and the other bent at approximately sixty degrees, perhaps in the act of offering something, is attested on several KSS seals (Majidzadeh & Pittman, 2008: 97; Majidzadeh, 2019, vol. 2: 294), on a Shahdad seal (Ascalone, 2013: 4), on a bronze pin from Shahdad (Amiet, 1974: 104), and on the Shahdad standard (Ascalone, 2013: 18), (Table 3 One rare seal combines both gestures within a single composition (Table 3 This gesture is rendered with particular clarity on the flat bronze seals of Jiroft, where seated figures on both faces hold a clenched fist before the face (Majidzadeh, 2003, vol. 2: 170–171), (Fig. 5). It also appears on another Jiroft cylinder seal from the northern mound, which shows two facing figures, one with an arm at rest and the other extended (Majidzadeh, 2019, vol. 2: 292), (Fig. 4).

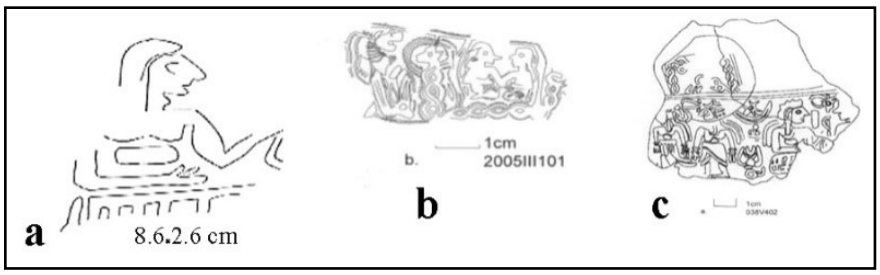


Fig. 4: Seal impression with a sign of ritual respect from KSS and KSN (Majidzadeh and Pittman, 2008: 97, 98). ▶

Comparable compositions are also attested in Mesopotamia: a disk from Lagash attributed to Eannatum I or II and dated to ca. 2450 BCE (Porada, 1993: 52); a seal that Porada associates with Kerman or Fars, showing a figure inside a circle with one hand raised to the face and flanked by two figures with raised hands (Porada, 1993: 93); and a damaged bronze

statuette catalogued by Frankfort, likely venerated in a similar manner (Frankfort, 1943: 337).



◀ **Fig. 5: A type of ritual respect with one hand on the waist and the other hand clenched into a fist and facing forward, c. 7-8 cm (Majidzadeh, 2003: 170, 171).**

3) Chlorite Motifs

Clay house models, considered ritual objects, were found in 33 graves at Shahdad, cubic in form and 20–30 cm long. Hakemi interpreted them as three-dimensional versions of the house motif on chlorite vessels and termed them shrines, and argued that they were made only at Shahdad (Hakemi, 1997: 62). Comparable models, however, are also known from Susa (Álvarez, 2020: 120), Damb Sadaat III in Balochistan (Fairservis, 1956: 228), and the Oxus culture of Central Asia (Namazga VI), (Amiet, 1977: 96). The chlorite vessels depicting a temple space likely encode a similar ideological role shared across the sites of southeastern Iran, as evident at Shahdad on a chlorite model (Hakemi, 1997: 615), on several vessels with a base showing a place of worship (Hakemi, 1997: 28–29), and occasionally on handbags (Vidale, 2017: 5), though most examples occur on vessels proper.

Chlorite vessels bearing the temple or palace motif include fragments from Susa, now in the Louvre (Miroschedji, 1973: 15), and examples from Saar in Bahrain (Potts, 2005: 70; Rice, 2002: 192). Further examples come from Tarut Island, Saudi Arabia (Porada *et al.,* 1971: 306); the Jiroft Museum, showing a standing man with one hand on his waist and the other bent toward his face (author); and a Bactrian vessel in the Louvre depicting a winged goddess with hands folded over her belly (Francfort, 2019: 259). A partial exception comes from Bampur, where carved pottery sherds each depict a doorway, recalling the chlorite vessels' architectural motif (De Cardi, 1970: 321–324), (Fig. 8); a comparable design occurs on gray pottery from Hili in the UAE, itself linked to imported third-millennium Iranian wares (Thornton, 2013: 613), (Fig. 8).

Discussion

The gesture of reverence has roots in Ubaid-period figurines, some shown with arms and elbows perpendicular to the waist and holding an object above the abdomen (Parrot, 1961: 56, 58); a comparable fifth-millennium BCE chlorite statuette in the Louvre has been attributed to southeastern

Iran (Jastrow, 2006). The closed-hand gesture may originally have involved holding a cup or jug, later simplified to empty clasped hands (Frankfort, 1943); twelve such ritual statues derive from the Abu Temple at Tell Asmar (Frankfort & Jacobsen, 1935: 55). Mesopotamian examples from the Early Dynastic through Akkadian periods show greater variety than those from southeastern Iran, differing mainly in elbow angle and the arrangement of the fingers. Hands were held at ninety degrees around an object, as at Tell Asmar; palms were pressed together with locked thumbs, as in the statue of Gudea (c. 2144–2124 BCE) from Lagash (Parrot, 1961: XXXI; Feldman, 2020: 292) and the seated Ebih-Il from the temple of Ninni-zaza at Mari (Evans, 2012: 185; Evans *et al.*, 2019: 52), (Fig. 6). This tradition continued after the fall of Akkad, as in the statue of Ishtup-ilum from Mari (Frankfort, 1966: 116). These Mesopotamian examples provide important comparative evidence, but formal similarity alone does not establish direct transmission to southeastern Iran; chronology, archaeological context, and the distribution of the motif must also be considered.



Fig. 6: Statues of respect: Ebih Il, Gudea and Ishtup Ilum. A. Statue of Ishtup Ilum from Mari (Frankfort, 1966: 116). B. Statue of Godea from Lagash (Parrot, 1961: XXXI). C. Statue of Ebih Il from Mari (Evans, 2012: 185). ▶

A third position is defined by the elbow resting upon the abdomen and inclined slightly upward, with two fingers interlocked over the hand; this configuration appears on the statues of Lugal-dalu and Nin-kisalsi (Banks, 1912: 191) from Adab, and on a statue from the Temple of Nintu V at Khafajah, although at the latter the hand and elbow are held straight (Frankfort, 1943: 214). Khafajah has likewise produced four further minor variants: one open hand laid across the other; an elbow angled toward the chest with fingers intertwined; both hands raised and crossed; and hands crossed at right angles (Frankfort, 1943: 209). Virtually all eight positions recur among the Shahdad statues (Table 1).

A related yet distinct posture is attested on Jiroft seals, where one hand is absent and the other is held at a right angle to the body, clenched into

a fist and sometimes grasping an object such as a beaker—a convention equally common among the Tell Asmar ritual statues (Frankfort & Jacobsen, 1935: 56). Royal images in this idiom favour idealized over individualized features, conveying either piety (the ruler as servant of the gods and temple builder) or power (the ruler as protector and expander of territory). Static, closed-handed, wide-eyed statues were installed in temples to embody the ruler's eternal presence, whereas more dynamic acts of piety or construction, as depicted on the Ur-Nanshe plaque (Kramer, 1963: 64c), were rendered in narrative relief. Sumerian ritual practice displays both continuity and variation among its participants (Westenholz, 2013: 247); Frankfort interpreted the Khafajah statues as connected to a fertility deity (Frankfort & Jacobsen, 1935: 54, 59). The surviving material suggests that both gestures underwent change during the third millennium: an object held in the hand (a beaker or similar) was gradually replaced by empty clasped hands, while the gesture itself shifted in status, originally reserved for deities, it was extended to kings and rulers by the mid-third millennium and, by its close, to courtiers standing before the king. The second gesture, although it became common later, appears to have followed the same trajectory. Woolley's 1930–31 excavations at the public chapels of Ur recovered a statue of Pabilsag dating to the Ur III period in the same clasped-hands posture (Woolley, 1931: 270). Unlike Mesopotamia, statues and figurines from southeastern Iran exhibit no consistency in type, size, material, or findspot: the Shahdad examples derive from graves, whereas Shahr-i Sokhta, despite its scale and its regional and transregional connections, has produced figurines but no comparable statues, an absence equally true of Mundigak in the Helmand region.

At Tepe Hissar, by contrast, the figurines differ in material and originate from a ritual rather than funerary context; such funerary and ceremonial practice more broadly serves to enact and reinforce elite ideological authority (Laneri, 2007: 6). No comparable figurine has been identified in Bronze Age Tepe Yahya, apart from a tentative candidate: a schematic fifth-millennium chlorite figurine from Period VII, possibly female (Beale *et al.,* 1986: 200). At the KSS citadel, the large statue recovered there has no parallel at any Bronze Age site in the region and likely signals the importance of ideology at that centre (Madjidzadeh and Pittman, 2008: 80). The Shahdad statues most closely resemble those of Khafajah and Tell Asmar (Eshnunna), mostly of Early Dynastic II date, though of markedly inferior quality: attention focused on the upper body, hands, and facial detail, with hair carefully rendered in only one instance. Kaboli considers the seated, hunched posture of one Shahdad statue closest to examples from

the Inanna temple at Nippur (Kaboli, 1986: 56–57); the earliest Shahdad statues were too idiosyncratic to date by comparison, whereas the 1974 finds permit more secure comparison (Amiet, 1976: 3). Because no temple has yet been identified at Shahdad and all statues come from graves, direct comparison with the temple-based ritual use documented in Mesopotamia is not straightforward. Most published Tell Asmar/Eshnunna statues, apart from four from a residential area, came from a temple built in the late Jemdet Nasr period and used into Akkadian (Sargonic) times (Frankfort, 1939: 2), and Early Dynastic sculpture more generally derives mainly from temple contexts (Al-Gailani, 2013: 379). Nearly thirty comparable statues, 15–30 cm high, come from Mari in Syria, some with hands on the belly in the same reverent posture (Parrot, 1938: 22); Parrot saw statuary developing regionally over three or four centuries, a trend most visible in the Diyala region rather than at Mari or in the Sumerian south (Parrot, 1961: 65). The most notable Shahdad statue shares the arm position and hairstyle of a Pre-Sargonid II statue and, like the earliest finds, lacks legs; its modelling likely drew on models widespread in central Mesopotamia. This differs from the 1973 find, whose posture instead follows an old Elamite tradition traceable on Susa I seals and later in the marble statues of the so-called Ancient Mines (Amiet, 1976: 3). Karlovsky's comparison of the Shahdad material with Hiebert's Central Asian finds established clear links to Turkmenistan, especially the Namazga VI horizon; he noted painted round architectural fragments built around the body in Shahdad graves, accompanying burial gifts, and in one case a statue that had fallen face down (Karlovsky & Hiebert, 1992: 135). Statues from Goňur resemble those from Shahdad in some respects and differ in others but share the same style and hand placement (Sarianidi, 2007: 71), supporting Karlovsky's connection. This round architectural burial feature points to a local Shahdad ritual; despite superficial similarities to Mesopotamian and Indus Valley sculpture, differences in size, material, and context indicate a distinct local tradition, with some effort to localize production (Eskandari *et al.,* 2021: 42). Following Hodder, such decoration can function as a symbolic and ritual response to ambiguity and anxiety in daily life (Hodder, 1992: 87); the harsh desert environment of Shahdad may be one such context, and the ideological significance of figures depicted in the act of venerating a ruler should not be underestimated (Westhead, 2015: 64).

In the Indus Valley and at Harappan sites, as well as in southern Afghanistan, this mode of reverence is absent from statues and figurines. In particular, the highly detailed statues from the Zhob and Loralai regions (Fairservis, 1959) and the Quetta Valley display no engagement with this

style (see: Fairservis, 1952: 14; 1956: 224, 225). It remains uncertain whether the statue from southern KSS represents a king, a priest-king, or a deity, because the identity of the structure, whether palace or temple, has not been established. The excavator, however, considered this structure a citadel (Madjidzadeh and Pittman, 2008: 82). Owing to the loss of the statue's head, the only basis for identifying it as a deity is the position of the hands, which are arranged in the manner of Sumerian gods at Tell Asmar and elsewhere. In the Sumerian period, such a gesture of reverence occurs in both kings (e.g., Gudea) and priests. Consequently, it is possible that, given eastern adaptations from Mesopotamia and unlike Mesopotamia, the architectural spaces of governance and worship were in the same place. Confirmation of this point, however, requires further data. This statue also appears in the Tell Asmar glyptic list (Nos. 616, 580, 617, 618, 713, 940), where, of course, not the god himself but one of his two attendants displays such a sign of reverence (see: Frankfort & Jacobsen, 1955). It appears that in Early Dynastic I and II, unlike statues found in palaces, such gestures of reverence on seals were rare, and emphasis fell on naturalistic and mythological motifs (Ibid: 1955). This gradually increased from the Early Dynastic III period, and in the Akkadian period both styles can be seen in greater numbers. In southeastern Iran, the same pattern was observed, with the Shahdad statues from Cemetery A overlapping with much of the chronology of the Takab IV1 and III1 cemeteries (Hakemi, 1997: 75). It must be said, however, with high probability that these statues relate to Takab IV1, where such statues were more common during Early Dynastic I and II. The second type of ritual posture, by contrast, may relate to the Early Dynastic III and Akkadian periods. In the case of Jiroft, the second type of reverence described above seems to have been more widespread; at least the seals and seal impressions suggest this. Given that the seals of KSS production (Trench III) are dated to ca. 2500/2400–2300 BCE (Ascalone, 2013: 4), their prevalence is much earlier than that of the type A seals, which date to the Akkadian period (Ibid: 4). According to the classification of the Susa seals (Roach, 2009) and given that both seal styles mentioned at Susa relate to the pre-Akkadian (Susa IV) and Akkadian periods, Ascalone's chronology can be confirmed. The situation in southern Turkmenistan during this period differs: the motifs on the seals found there have many similarities to those of the Iranian Plateau. Winckelmann relates several of these seals to the Shahdad site and the late third-millennium Bactrian cultural horizon (Winckelmann, 2020: 272; Winckelmann, 2000: 70). It remains unclear to what extent these motifs reflect cultural influences, the adoption of an ideology, or their use in a ritual role. There is, however, an

exceptional example of a chlorite vial (Francfort, 2019: 259) on which a winged goddess is depicted with her hands clasped on her belly (Vidale, 2020: 319), (Table 2), a motif that has no counterpart in southeastern Iran. Jiroft's connections with chlorite exports to southern Mesopotamia have been established for this period (Perrot and Madjidzadeh, 2005: 147). The strong emphasis on this type of reverence at Jiroft, which was prevalent in Mesopotamia in the mid-third millennium, indicates the importance of ideological influences through cultural connections. This gesture became more common on seals during the Early Dynastic III and Akkadian periods, while the number of statues in temples decreased. All these factors seem to indicate a changing pattern of ideology in Mesopotamia and subsequently in southeastern Iran. Especially at Shahdad, these changes are also visible on bronze objects. Madjidzadeh and Pittman attributed the Jiroft seals to Early Dynastic IIIa, around 2400 BCE (Madjidzadeh and Pittman, 2008: 101), which is approximately the same time as the prevalence of this ideology. Perhaps, considering the chronology of the Tepe Yahya seals, which, according to Pittman (Potts *et al.,* 2001: 232), relate to the Old Akkadian period and are dated around 2400–2200 BCE, it would be more accurate to include part of Early Dynastic III in the dating of these seals. As emphasized above, according to Karlovsky, although there is a 200–300-year difference between the end of the Tepe Yahya IVC chronology and the beginning of the IVB period (see: Potts *et al.,* 2001: 276; Mutin & Karlovsky, 2013: 291), the pre-Sargonic period, or even the latter part of Early Dynastic III, seems a more reasonable starting point for this period. In particular, the chlorite fragment like the Tepe Yahya style (Fig. 7), which Frankfort and Jacobsen attribute to the temple of Sin at Khafajah (Frankfort & Jacobsen, 1935: 49), relates to Early Dynastic III. With this argument, the settlement gap at Tepe Yahya between the IVC and IVB periods can be considered narrower, according to Kohl, an estimated 200–300 years. Although the seals and statues found in Central Asia and in the Oxus, culture are very similar to the Shahdad complex (Table 3), according to Karlovsky (Karlovsky, 2013: 59), the radiocarbon chronology of Gonur Depe is reduced to about 2100–1800 BCE. This, of course, somewhat aligns with Potts' chronology of an Elamite cup depicting a woman, found near Persepolis, which was compared to a cup from Gonur. This site was attributed, with high probability, to the Elamite Shimashki dynasty and the time of Puzur-Šušinak (c. 2240–2220 BCE), (Potts, 2008: 191), overlapping with Karlovsky's chronology of Gonur Depe by about 100 years. Sarianidi also dates the seals found in the BMAC to the late third millennium and Namazga Depe VI (Sarianidi, 2003: 77), and estimates

the Bactrian objects as contemporary with Ur III, dating them to 2140–2000 BCE. Hiebert dated Namazga VI to 1750 BCE (Hiebert, 1994: 374), and Philip Kohl dated Namazga VI to the late third millennium and the first half of the second millennium BCE (Kohl, 2007: 180). Lyonnet and Dubova also date Namazga VI between 1900 and 1700 BCE. Dubova's chronology (Lyonnet & Dubova, 2020: 8) of Gonur is closer to reality and dates the beginning of Gonur to 2300 BCE (Dubova, 2019: 30; Lyonnet & Dubova, 2020: 8), which also overlaps with the Shahdad and Tepe Yahya seal inscriptions. Instead of relying on Mesopotamian diffusionist models, the Iranian Plateau's ritual repertoire can be better understood through its deep connections to Elam. The presence of the earliest datable Linear Elamite text in Grave 30 at Shahdad (Eskandari *et al.,* 2025), found alongside chlorite cosmetic vials with architectural motifs, establishes that Shahdad was an active participant in the Elamite cultural and visual network from the early third millennium BCE. This suggests that shared reverential gestures, such as clasped hands or raised fists, were part of a long-standing highland Iranian and Elamite visual continuum rather than secondary adaptations of Mesopotamian royal imagery.

The first gesture of reverence prevalent at Susa is absent, at least from seals and statues, during the early Elamite period (ca. 3100–2900 BCE), becoming common only in Susa IVA (ca. 2600–2400 BCE). Even in the Akkadian Susa IVB period, it remains very rare, at least on seals and statues. Álvarez attributed the statues found at Susa during Akkadian domination to Mesopotamian workshops (Álvarez, 2020: 90), making it difficult to regard them as indigenous or to gauge their influence on the southeastern Iranian sphere. These statues display decoration and carving comparable to Mesopotamian examples, being mostly of stone and similar in form and construction. Elite-sponsored monumental sculpture from Susa broadly follows Mesopotamian stylistic conventions, although recent reassessments favor a range of overlapping styles over the older two-phase "geometric" versus "realistic" model, drawing on comparanda from Eshnunna and Mari (Álvarez-Mon, 2020: 89). Unlike in southeastern Iran, however, these figurines cannot be considered indigenous to Susa. This situation is better explained by the assumption that temple objects were periodically renewed, with old or worn pieces buried or discarded in temple grounds. Thus, broken and damaged statues lie scattered in a layer beneath a certain floor level in Court K of the Temple of Sin and the Temple of Single at Tell Asmar (Frankfort, 1939: 16). The context in which the Susa statues were found lies near a shrine (Álvarez, 2020: 89), evidence for the prevalence of ritual worship and ideological use at Susa. Owing to

Akkadian dominance during this period, the possibility of Elamite interest in this style remains unclear.

According to Roach's epigraphic index, neither category of theme appears at Susa IV, but seals bearing the second type of reverential gesture were common in Akkadian-period Susa (see: Roach, 2009, vol. II: part II), although a mixed role is also attested (Roach's Glyptic Catalogue, nos. 2125, 2138, 2141). During Akkadian rule, Elam itself had been conquered by the Akkadians, making it difficult to separate Elamite from Akkadian art in this material. In the Akkadian-period seal catalogue from Susa, the first style of reverential gesture (both hands clasped) is more common (Roach, 2009, vol. II, part II: 333–337), whereas on seals from Anshan (Tal-e Malyan), the second style (one hand closed, one open), also common in southeastern Iran from the second half of the third millennium onward, is more frequent (Roach, 2009, vol. II, part II: 362–419), indicating a strong connection between southeastern Iran and Susa during the Awan and Shimashki periods. In the Susa IV period, seal imagery already shows the pose with one hand open and one closed (Roach, 2009, vol. II, part I: 307), although the frequency of this theme rises sharply in Akkadian-period Susa. Both types of reverential gesture occur together on seals of early Elamite date from Chogha Mish (Delougaz *et al.,* 1996: pl. 150, 152), and the clasped hands pose also appears on early Elamite figurines from the same site (Alizadeh, 2008: pl. 26). Two stone figures from the time of Puzur-Inshushinak (c. 2100 BCE), one representing the goddess Narundi, show both hands held on the abdomen in the same respectful pose (Majidzadeh, 1991: 111–112), alongside a small female figure and a nude female figure dated to the early second millennium BCE (Majidzadeh, 1991: 123, 128). More than fifty fragmentary female figurines from Anshan display the same variation seen at Susa, some with hands on the abdomen in the clasped pose and others with hands on the chest (Sumner & Reiner, 1974: 170). Most Shahdad statues are male, except for one or two that may be considered female. It is notable that both types of reverential gesture occur at Shahdad. The importance of these statues emerges from the large number of clay models of cubic architectural or temple designs with crescent roofs found in the tombs (Hakemi, 1997: 48), as well as bottles (flacons) significant both for their architectural form and their inscriptions (Hakemi, 1997: 28). Both house models and human statues were recovered from Cemetery A, dating them to the second half of the third millennium BCE (Eskandari, 2021: 42), and perhaps even a century earlier, given the Mesopotamian examples. Connections between Bactrian materials and Shahdad were numerous and significant, reflected in the degree of iconographic similarity as well as the

technologies used to produce the most complex metal and stone objects, from seals to ornaments and tools. Trade cannot be considered the sole explanatory factor. Not only did economic exchanges link Kerman with Bactria and Margiana, but shared ideologies also permeated this system, shaping political structures and religious beliefs (Salvatori & Tosi, 1997: 122).

According to Karlovsky, in the latter half of the third millennium, the Iranian plateau was characterized by a union of kingdoms, each independent, interacting, and self-sufficient (Karlovsky, 2001: 279). Geographical proximity, environmental similarity, shared cultural heritage, integrated exchange systems, and mutual ideologies were the coordinating factors behind the results of growing integration.

At the end of the third millennium B.C., the northern hill in the Gonur 1 area of the Namazga VI complex, where in the second half of the third millennium B.C. objects were found in palaces and rich burial contexts, reveals a cultural identity shared with objects from the southwest. Additionally, the proximity of Namazga V productions to the Elamite world contributed to this connection. All this economic wealth fostered advanced forms of political integration, which, in the second half of the third millennium B.C., brought the region into direct contact with Shahdad and the emerging state formations of the Kerman region after 2300 B.C. (Salvatori & Tosi, 1997: 131). The seal found in the palace temple of North Gonur, which has been discussed in relation to connections between southern Turkmenistan and the Iranian plateau, is an indication of the ideological connections between southern Turkmenistan and the Iranian plateau during this period.

The ideological connections between Shahdad and Central Asia seem to have been close, since the first type of ritual respect is dominant at both sites, while at Jiroft the second type of respect was much more pronounced. It appears that in ancient Mesopotamia, it was generally believed that most humans survived after death in the form of spirits or ghosts living in the underworld. One of the duties of the living was to offer offerings of food, drink, and oil to their deceased relatives. Extensive records from Girsu, dating to the Early Dynastic period, provide evidence of offerings made before the cult statues of deceased rulers and members of the ruling family. It is assumed that these statues were originally made by living individuals to stand in temples and pray continuously to the gods. After the death of the donors, the statues could not be moved and therefore received offerings (Black *et al.,* 1998: 34). It is difficult to determine the function of these statues on the Iranian plateau because there is no written record to provide

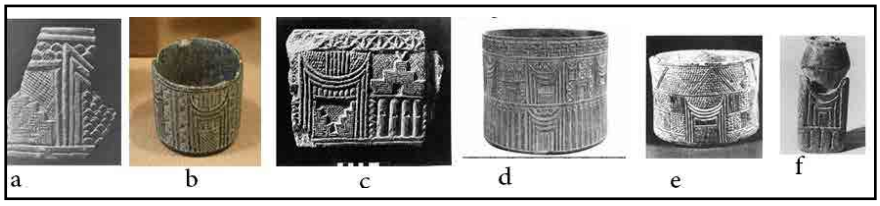
sufficient information about them. For example, Sarianidi suggests that these statues represent the deceased (which seems unlikely), local deities, or possibly images of a fertility goddess, such as the Sumerian Inanna (Sarianidi, 2007: 73–74), a view that differs somewhat from Hakemi's.

The importance of this type of ritual respect is also seen in Mesopotamian seals. In the list of Sumerian seals from the Diyala region, published by Frankfort, several seals depict such scenes (seal nos. 582, 586, and 612–618). Of course, the same posture, with an object in hand, is also seen on seals (seal nos. 591, 592, 593, 619, and 620), (Frankfort, 1955). Additionally, the features mentioned in these seals appear in the seal collection of Edward Knoll, published by von der Osten, in seals classified as Sumerian and Neo-Akkadian to Old Babylonian (von der Osten, 1934: 5, 6). In these, a god seated on a chair in the same style, with the same hand angle and gesture, is depicted giving something to a figure in front of him (plates XII, XIII, XV). This scene seems to have been a favorite of the Akkadians, as evidenced by a cylinder seal from the Akkadian period in which Ea, the water god, is shown seated on a chair, the only difference being that his fingers are open (Black *et al.,* 1998: 110, 117). Most Akkadian seals from the Diyala region depict the hand angled forward, offering something like a beaker, and later appearing empty-handed. Only one seal from this period (Glyptic Catalogue No. 700), (Frankfort & Jacobsen, 1955: plate 65) shows a gesture of reverence with hands clasped facing each other, involving a row of humans. During the Akkadian period, scenes of reverence or worship and theatrical scenes in which a human figure is led before a seated god became popular (Van Dijk, 2016: 264). A gray steatite seal from the Old Babylonian dynasty, found in Failaka, Kuwait, shows two gods seated facing each other (Potts, 2010: 24). The figures hold hands opposite and parallel to each other; although this seal differs in time from the one at Jiroft, it is similar in general pattern. At Susa, scenes depicting ideologically charged activities, such as combat and religious ceremonies, are usually accompanied by a larger-than-usual male figure representing a "king-priest" or city ruler. In contrast, scenes depicting various types of economic activity, such as agricultural labor and storage of agricultural produce, the transport of goods, herding of mountain goats and cattle, and the processing of wool and dairy products, are usually associated with niched buildings. The facades are generally thought to represent temples and/or palaces, based on similarities with excavated architecture (Algaze, 2009: 132). The angled hand position facing the body, with the elbows outstretched, is a common Akkadian motif, often showing a seated figure (king?) facing a standing figure. Another seal (seals 41–46) shows this

position. Several seals from the Third Dynasty of Ur are also of this type (49–51), (Eisen, 1940: VI, VII).

Images of gods, rulers, spirits, demons, and other beings, creatures, and symbols constantly surrounded the people of the ancient Near East. The visual impact of seeing these images everywhere on a daily basis is imaginable, and unlike much of contemporary Western art, these representations were not simply intended to record images or ideas, but to be imbued with the true essence and power of whoever or whatever they represented, thereby effecting change in the world (Benzel, 2010: 129).

In shared ideological concepts, the discussion of replica shrines and the role of the shrine on chlorite vessels as a sign of respect, similar to the Early Dynastic and Akkadian periods, is significant. On the chlorite vessels found in the Halil Rud area (Perrot & Madjidzadeh, 2006: 142), and also at Tepe Yahya (Karlovsky, 1970: 56; Potts *et al.,* 2001: 223), the importance of temple-like architectural design (Fig. 7) is evident on the chlorite vessels and plaques. The possibility that these vessels, which mainly emphasize ideological and mythological scenes and deal less with everyday matters, are related to a large temple located in southeastern Iran is not implausible, because a common motif of the architectural façade is repeated in the Halil Rud area, Tepe Yahya, and Shahdad.



◄ **Fig. 7: Types of temple models from chlorite vessels in southeastern Iran and the southern edge of the Persian Gulf. a. Tarout, gray steatite Height, 4.9 cm (Porada et al., 1971: 316). b. Khafajah (Frankfort and Jakobsen, 1935: 49). c. Tepe yahya (Karlovsky, et al., 2001: 223). d. Jiroft, (Perrot and Madjidzadeh, 2006: 140). e. Saar (Potts, 1992: 193). f. Shahdad (Hakemi, 1997: 29).**

Ascalone (2013: 21) attributes these common motifs, which are referred to as the Intercultural Style, to the second half of the third millennium B.C. However, the repetition of some architectural motifs on chlorite vessels in southeastern Iran is also related to certain ideological concepts. There is considerable evidence for an institutionally managed exchange that was conducted and supported by the temples and city palaces of early Mesopotamia in the third and second millennia B.C. Undoubtedly, as Polanyi claimed, a large part of this exchange was aimed at satisfying the ideological, not economic, needs of the early Mesopotamian religious and political elites (Algaze, 2009: 18). The importance of southeastern Iran's contacts with Mesopotamia cannot be ignored; the most obvious example was the chlorite and lapis lazuli vessels. This exchange introduced both material and non-material elements, but it should be noted that there was also an attempt to create a degree of ideological independence from

Mesopotamia, and that ideology became localized. The role of the temple, as seen on chlorite vessels from a range of sites in Iran, Mesopotamia, and the Persian Gulf, and whose origin dates back to southeastern Iran, indicates the presence of a significant temple in this region. The emphasis on the depiction of this role (apart from the issue of imitation in construction or a single origin) perhaps reflects its importance and sanctity. Religious categories, in other words, can carry direct economic functions just as 'high-status items' can serve as purely ideological symbols; while religion and wealth are easily distinguished at the level of cultural content, their function in material reproduction is harder to separate. This suggests that the dominant social structures or relations that organize production and reproduction may also organize other activities such that no cultural distinction is made between the economic and the non-economic (Kristiansen, 1984: 76).

Fagan argues that the combination of economic control over resources and the distribution of food and wealth, the development and maintenance of a stratified social system and its ideology, and the ability to maintain control by force were crucial to early states. Each of these domains was closely related to the others, but they can be studied separately in archaeology. Economic power depends on the ability to organize more specialized production and the various tasks of storing and distributing food. Over time, wealth stored in food and goods becomes dependent on relationships between those who produce or acquire wealth and those who control and distribute it. Economic power also relies on trade and long-distance exchange networks that provide access to goods not available locally (Fagan & Durrani, 2018: 273). Fagan and Durrani emphasize elsewhere that ideology did not cause the emergence of states; rather, after the emergence of states, it became an important and immutable part of their structure (Ibid: 276).

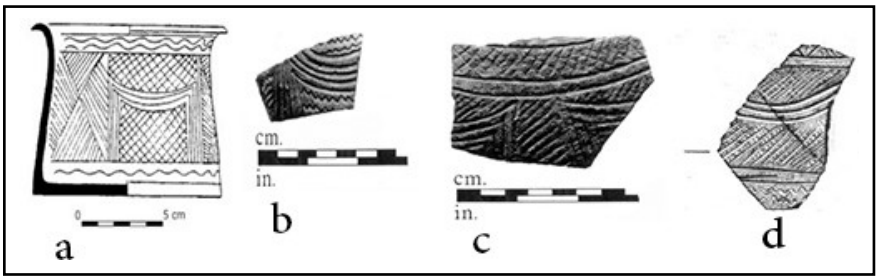


Fig. 8: a. Pottery with the motif of a temple entrance. Hili UAE Pottery from UAE (Thornton, 2013: 613). b, c, d, Pottery from Bampur Iran (De Cardi, 1970: 323). ▶

Westhead cites Ross, who states that cultures may maintain multiple, overlapping, or conflicting ideologies, although one usually dominates the others (Westhead, 2015: 11). Several external and internal factors may have altered the distribution and expression of ideology in southeastern Iran,

including environmental conditions, the extent of contact with Mesopotamia and Elam, local developments, changing political configurations, and the differing social contexts of individual communities. Potts attributes the motif on the Saar vessel, which depicts the front of a temple or shrine, to Sumerian designs also found in Elam (Potts, 1992: 192). Whatever its precise origin, the recurrence of architectural and gestural motifs suggests that ritual symbols could operate as social and political resources as well as ritual forms. Symbolic resources or prestige items may help focus attention on political power and the economic aspirations of emerging elites (Knapp, 1988: 156). The evidence from Shahdad and Jiroft is therefore important for comparative studies of the reproduction of ritual symbols in southeastern Iran. At the same time, the presence of both reverence gestures should not by itself be taken as proof of a centralized political structure; rather, it indicates the existence of shared symbolic conventions that could have been mobilized by elites in different local contexts. Ideology was not a stagnant phenomenon during the Bronze Age of southeastern Iran: material remains, especially chlorite vessels, reveal considerable ritual and ideological complexity (Knapp, 1988: 155).

Understanding this complexity requires attention to local forms of governance, the distances separating communities, and their differing social situations. Karlovsky cautions that political labels such as "Shimashki" can impose a coherence on what was probably a more complex and locally autonomous cultural landscape, and that such labels tell us little about indigenous social, ritual, economic, and political structures on the Iranian plateau (Karlovsky, 2013: 573). The material evidence indicates that several of the sites examined here shared certain ideological themes, expressed through funerary objects, seals, and carved figures (Pittman, 2013: 312), with the notable exception of Shahr-i Sokhta, where comparable ritual works are not well represented. Jiroft, Shahdad, and Tepe Yahya, by contrast, share several such elements, although differences in their archaeological contexts and in the frequency of particular gestures point to independent local expressions. The evidence therefore supports interaction and selective sharing rather than complete ideological homogeneity. The seal evidence from Anshan (Tal-e Malyan) and Susiana shows a strong regional alignment with southeastern Iran. In particular, the emergence of Linear Elamite script at Shahdad during the early third millennium B.C. (Eskandari *et al.,* 2025) confirms that visual and administrative tools circulated directly along the Elamite–southeastern Iranian axis, weakening the argument for direct Mesopotamian dominance in elite representation. These gestures served as markers of social status,

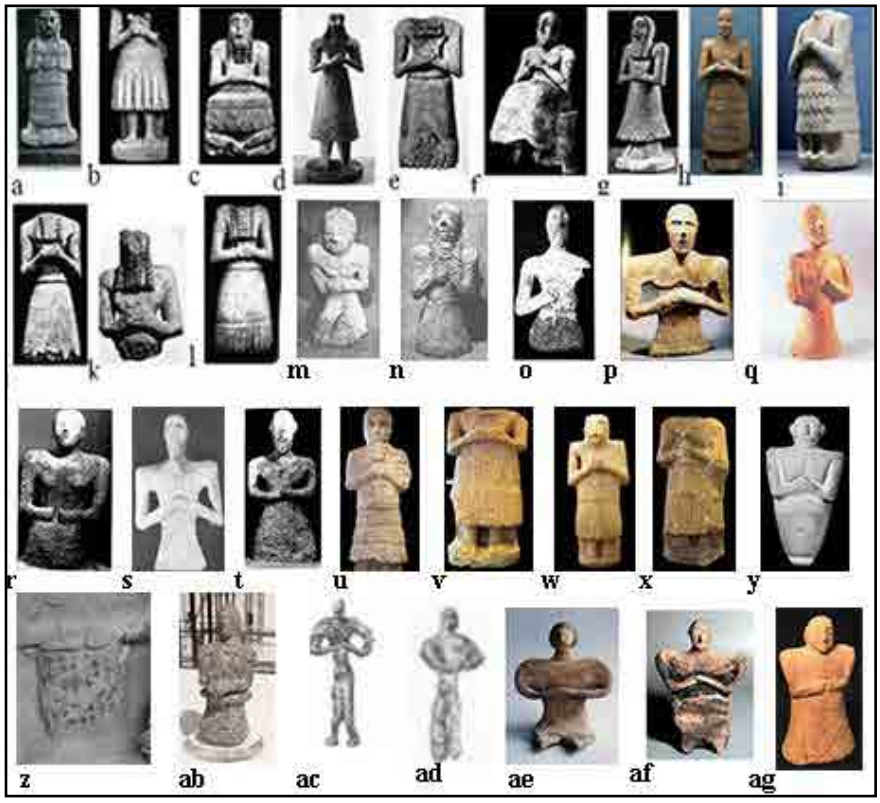


Table 1: Statues found in Mesopotamia and the Iranian Plateau. a. Statue of Ur (Woolley, 1931: 276). b. Statue from the Temple of Nintu V in Khafajah (Frankfort, 1943: 216). c. Statue from the Temple of Nintu V in Khafajah (Frankfort, 1943: 215). d. The square temple of Abu at Tell Asmar (Frankfort, 1943: 340). e. A statue from the Shara Temple at Tell Aqrab (Frankfort, 1943: 266). f. Statue of Ebih-Il from Mari (Parrot, 1938: VIII). g. Khafajah, the temple of Nintu V, (Frankfort, 1943: 209). h. Adab (Banks, 1912: 191). i. Adab (Banks, 1912: 443). j. Statue from the Temple of Nintu V in Khafajah (Frankfort, 1943: 227). k. A statue from the Shara Temple at Tell Aqrab (Frankfort, 1943: 263). l. Statue from the Temple of Nintu V in Khafajah (Frankfort, 1943: 214). m. Shahdad, 50×25 cm (Amiet, 1976: 4). n. Shahdad, (Amiet, 1976: 4). o. Shahdad, 64×50 cm (Hakemi, 1997: 457). p. Shahdad, (Kleiss *et al.*, 1973, n.p.). q. Shahdad, (Hakemi, 2006: 20). r. Shahdad, 55×31 cm (Hakemi, 1997: 347). s. Shahdad, 47×71 cm (Hakemi, 1997: 300). t. Shahdad, 29×60 cm (Hakemi, 1997: 382). u–y. Susa, u, statue, 50×12 cm, w, 27×12 cm, y, 1.8×5.7 cm (Álvarez, 2020: 90). x. Susa II, 19×12 cm (Álvarez, 2018: 604). z. Jiroft South KSS, statue (Madjidzadeh & Pittman, 2008: 82). ab. Jiroft Museum (author). ac–ad. Tepe Hissar (Gürsan-Salzmann, 2016: 257). ae–af. Gonur Depe (Sarianidi, 2007: 71, 72). ag. Gelot Cemetery (Natal'ja, 2020: 652). ▶

authority, and administrative affiliation rather than formal indicators of specific religious doctrines.

Conclusion

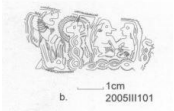
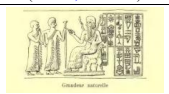
The evidence reviewed above suggests that two principal gestures of respect, namely clasped hands and the one-hand-open, one-hand-closed or raised gesture, together with the architectural motif on chlorite vessels, can reasonably be interpreted as components of ritual and ideological expression. Their recurrence on statues, figurines, seals, and vessels, as well as their association with funerary and other significant archaeological contexts, supports interpretations related to reverence, authority, and ritual practice. However, iconography alone cannot establish a single or precise religious meaning. Therefore, the first hypothesis is supported, although the ideological significance of these motifs remains probabilistic rather than definitive. The similarities among Shahdad, Konar Sandal, and Tepe Yahya do not indicate complete ritual homogeneity. Instead, differences in chronology, frequency, and archaeological context suggest selective adoption and local reinterpretation. The clasped-hands gesture appears earlier and more widely, whereas the one-hand-open, one-hand-closed or raised gesture becomes more prominent during the second half of the

Northeast Iran and Central Asia	Southwest Iran	Mesopotamia	Shahdad and Jiroft	Tepe Yahya
				
				
				
				
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◀**Table 2: Seals, Seal Impressions, and Other Objects Mentioned in the Text. Guide: A. Bactrian seal (Winckelmann, 2000: 50). B. Seal from Susa IVA (Matthews and Fazeli Nashli, 2022: 348). C. Akkadian seal from Diyala (Frankfort & Jacobsen, 1955: pl. 65). D. Shahdad (Hakemi, 1997: 661). E. Tepe Yahya (Karlovsky, 1970: 71). F. Bactrian/ BMAC seal (Winckelmann, 2000: 50). G. Susa (Roach, 2009: 333). H. Chlorite vessel from Bactria (Francfort, 2019: 259). I. KSS (Majidzadeh, 2019: 298). J. Shahdad (Amiet, 1974: 105). K. Tepe Yahya (Pittman, 2001: 263). L. Bactrian seal (Winckelmann, 2000: 50). M. Early Dynastic III (Porada, 1993: pl. IX). N. Shahdad copper/bronze stamp seal (Hakemi, 1997: 188). O. Tepe Yahya (Amiet, 1974: 106). P. Bactria (Salvatori, 1989:58). Q. Tepe Yahya (Pittman, 2001: 262). R. Gonur temple (Karlovsky, 2013: 26). S. Bronze female statue, Tell Asmar (Frankfort, 1943: 337). U. Akkadian seal (Al-Gailani, 2013: 389). V. Akkadian seal (Eisen, 1940: VI). W. Human figure, Jiroft Museum (author). X. Seal of Chogha Mish (Delougaz et al., 1996: pl. 150). Y. Seal of Susa related to Ur III (Roach, 2009: 390). Z. Female bone figurine from Chogha Mish (Alizadeh, 2008: pl. 26). AB. Figurine from Tal-e Malyan (Sumner and Reiner, 1974: 171).**

third millennium B.C. Accordingly, the second hypothesis is supported, as the evidence is more consistent with localized adaptation than with the transmission of a uniform ideological system. The comparison with Elam is particularly important in this interpretation. Evidence from Susa and Anshan demonstrates both similarities and differences in the distribution of these gestures across periods and object categories, highlighting Elam as a major comparative context for southeastern Iran. Mesopotamian parallels likewise demonstrate the existence of a broader regional visual repertoire, but they should not be regarded as evidence of a single direction of direct transmission. Overall, the evidence supports a connected Bronze Age interaction sphere involving southeastern Iran, Elam, Mesopotamia, the Persian Gulf, and Central Asia. Within this sphere, visual and ritual conventions circulated across regions but were adapted to local social and archaeological contexts. The archaeological record therefore favors a model of selective transmission, local reinterpretation, and overlapping ritual traditions rather than a single homogeneous ideology.

Table 3: Comparative of Artifacts: Susa / Persian Gulf / Central Asia – Mesopotamia – Jiroft – Shahdad (Authors, 2025). ▶

Susa / Persian Gulf / Central Asia	Mesopotamia	Jiroft	Shahdad
 Susa, Akkadian Related Style (Roach, 2009: 337)	 Cylinder seal of the Akkadian Period (Black *et al.*, 1998: 110)	 Seal impression (Majidzadeh & Pittman, 2008: 97)	 Shahdad Standard Flag (Ascalone, 2013: 18)
 Plaque from Susa IVA (Álvarez, 2020: 85)	 Plaque associated with Ur-Nanshe (Kramer, 1963: 64c)	 (Majidzadeh & Pittman 2008: 98)	 Cylinder seal (Pittman, 2016: 79)
 Early Babylonian from Failaka, Kuwait (Potts, 2010: 24)	 Seal from Girsu (Cros et al., 1910: 143)	 Seal Impression of KSS (Majidzadeh & Pittman, 2008: 98)	 Bronze pin (Amiet, 1974: 104)
 Seal of Gonur (Winkelmann, 2020: 274)		 Seal of Lapis Lazuli (Majidzadeh, 2003: 171)	
	 Akkadian seal (Eisen, 1940: VI)	 Seal of Lapis Lazuli (Majidzadeh, 2003: 171)	
	 Akkadian seal (Al-Gailani, 2013: 389)	 Jiroft Museum (Author)	
	 Late Akkadian seal (Frankfort, 1955: pl. 58:616)	 Seal impression from KSN (Majidzadeh, 2019: Vol. 2: 294)	

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Conflict of Interest

In adherence to ethical publication standards, the author affirm that there are no conflicts of interest, either personal or financial, that could have influenced the content or conclusions presented in this research.

Endnote

1. Potts considered the material from which these seals were obtained (the hole) to belong to Period IVB and dated it between Old Dynastic II, the earliest possible beginning of Period IVB, and the Akkadian period (Potts, 1981: 136). This chronology depends on accepting that Period IVC at Tepe Yahya was contemporary with Susa Acropolis III: 14–16, corresponding to the Jemdet Nasr period and Old Dynastic I.

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بازنمایی‌های ایدئولوژیک و رفتارهای آئینی در عصر مفرغ جنوب‌شرق ایران

مجتبی خوارزمی[I]

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چکیده

گسترش جوامع پیچیده در جنوب‌شرقی ایران در عصر مفرغ (هزارهٔ سوم پیش‌ازمیلاد) نه‌تنها تحت‌تأثیر مبادلات مادی و شبکه‌های تجاری، بلکه تحت‌تأثیر گردش باورهای ایدئولوژیک و اعمال آئینی بود که اغلب به‌صورت محلی بازتفسیر می‌شدند. باوجود پژوهش‌های گسترده دربارهٔ روابط تجاری و تعاملات فرهنگی، ابعاد آئینی و ایدئولوژیک فرهنگ مادی توجه کمتری یافته است. این مطالعه از طریق تحلیل شمایل‌نگاری دو حرکت احترام (دست‌های قلاب‌شده و یک دستِ باز همراه با دستِ بسته یا بالابرده) و نقوش معماری روی ظروف سنگ‌صابونی محوطه‌های شهداد، کنار صندل و تپه یحیی به این موضوع می‌پردازد. پرسش اصلی آن است که، چگونه این بازنمایی‌ها نشان‌دهندهٔ تأثیر مستقیم خارجی هستند یا اقتباس گزینشی و نوآوری آئینی محلی را بازتاب می‌دهند. فرضیهٔ پژوهش آن است که اگر نقوش به‌صورت گزینشی پذیرفته و محلی بازتفسیر شده باشند، تفاوت‌هایی در گونه‌شناسی، زمینهٔ کاربرد و توزیع زمانی آن‌ها مشاهده خواهد شد. روش پژوهش توصیفی-تحلیلی و مبتنی‌بر داده‌های منتشرشدهٔ جنوب‌شرقی ایران همراه با شواهد تطبیقی از ایلام، بین‌النهرین و آسیای مرکزی است. یافته‌ها نشان می‌دهد که اگرچه مشابهت‌های اولیه‌ای در شمایل‌نگاری بین‌النهرین و ایلام وجود دارد، رخدادهای جنوب‌شرقی ایران با هیچ مدل واحد انتقال فرهنگی همخوانی ندارد و الگوی پذیرش گزینشی همراه با بازتفسیر محلی را تأیید می‌کند. محوطه‌ها مجموعه‌ای انعطاف‌پذیر از رفتارهای آئینی را به اشتراک گذاشتند، اما تفاوت‌های زمینه‌ای و زمانی بیانگر تمایز محلی در بیان آئینی است. حرکت دست‌های گره‌کرده زودتر و گسترده‌تر ظاهر می‌شود؛ درحالی‌که حرکت یک دستِ باز در نیمهٔ دوم هزارهٔ سوم پیش‌ازمیلاد رایج‌تر می‌گردد. این نمادهای مشترک احتمالاً ارتباطات میان تولیدکنندگان، نخبگان و شبکه‌های تبادل را تسهیل کرده و جنوب‌شرقی ایران را با ایلام و فلات ایران پیوند داده‌اند. مشابهت‌های بین‌النهرینی بیشتر به‌عنوان چارچوب مقایسه‌ای ثانویه عمل می‌کنند تا منبع مستقیم انتقال؛ با این‌حال، سازوکارهای دقیق این ارتباطات را نمی‌توان تنها از شواهد شمایل‌نگاری تعیین کرد.

کلیدواژگان: احترام آئینی، ایدئولوژی، عصر مفرغ، جنوب‌شرق ایران، شمایل‌نگاری.

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The Last Traces of Archaic Elamite Engraving Traditions in the Achaemenid Seal Corpus

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Abstract

A substantial proportion of the archaeological material dating to the Achaemenid period consists of seals and seal impressions. This study examines a distinctive mode of execution and engraving evident in a corpus of Achaemenid-period seal impressions hitherto subsumed by previous scholarship under the broad category of "heterogeneous styles." The investigation pursues several interrelated objectives, notably characterizing the mode of execution evident in these seal impressions, an important material medium at the intersection of Achaemenid art and the imperial administrative apparatus, and elucidating a specific facet of the broader social history of Achaemenid art. To determine whether this distinctive mode of execution derives from an archaic Elamite tradition, the analysis situates the seal impressions within their specific historical, political, and geographical contexts and systematically compares their engraving techniques with diagnostic examples from the Elamite glyptic corpus. The results indicate that the designs preserved in these seal impressions exhibit a geometric style characterized by interconnected segments and by straight, angular, and curved lines combined with globular depressions, all executed through drill work. Together, these features represent the continuation of a tradition that originated in the early third millennium BCE, was attested during the Old Elamite period, reached its zenith in the Middle Elamite period, and persisted into the Neo-Elamite and Achaemenid periods. The clearly delimited administrative sphere in which these seal owners operated, western Fars and eastern Elam, strengthens the attribution of these impressions to an engraving style localized in the Elamite region. Thus, rather than subsuming these impressions within a broad, heterogeneous category, their distinctive mode of execution may be understood as the continuation of an archaic Elamite engraving tradition, preserved either in local workshops in Elam or through the work of local engravers employed by these seal owners and committed to this stylistic tradition.

Keywords: Achaemenid Seals, Elamite Seals, Persepolis, Geometric Style, Cultural Continuity.

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Introduction

Understanding the artistic and cultural traditions, as well as the material culture of the Achaemenids, requires that each individual piece of evidence, whether textual or iconographic, be examined within a dialectical framework (Pittman, 2014: 391). The seal impressions preserved in the Persepolis Fortification Archive (PFA)[1], a major component of Achaemenid material culture and the largest glyptic corpus available for reconstructing the history of Achaemenid art, offer considerable potential for studies of the empire's social, political, and religious history (Garrison, 1991: 9–10). The stylistic and iconographic analysis of these seal impressions reveals a highly diverse repertoire of Near Eastern and Mesopotamian motifs, indicating that a broad range of archaic styles persisted within the Achaemenid glyptic corpus.

Foundational studies of ancient Near Eastern and Iranian seals, particularly those of the Achaemenid period, were undertaken by pioneering scholars such as Richard Hallock and Heidemarie Koch and subsequently advanced by researchers including Margaret Cool Root, Mark B. Garrison, and Holly Pittman. Their research has demonstrated the critical importance of glyptic evidence for resolving historical ambiguities and investigating the social and ethnic histories of ancient societies. More specifically, the systematic study of seal impressions preserved in the Persepolis Fortification Archive (PFA) proceeded in tandem with the decipherment and translation of the clay tablets, culminating in Hallock's first specialized publication on the Persepolis cylinder seals in 1969 (Hallock, 1969). Hallock further developed this work in several subsequent publications, focusing primarily on the administrative functions of the seals[2]. A substantial portion of the cataloging and stylistic analysis of the Persepolis glyptic corpus was undertaken through the collaborative research of Garrison and Root (Garrison & Root, 2001). Garrison devoted much of his research to elucidating the organization of engravers and the structure of workshops (Garrison, 1988), while also undertaking comprehensive analyses of the styles represented in the PFA corpus, with particular emphasis on the "heroic encounter" motif (Garrison & Root, 2001: 14; Garrison, 1988). Root, whose research began in the late 1970s, has devoted much of her career to detailed investigations of the history of Achaemenid art[3], focusing on how the empire's sociopolitical framework shaped the iconographic programs of administrative seals throughout the empire, including in its most distant provinces (Root, 2013).

Persepolis functioned not only as a ceremonial center but also as a major hub of administrative and artisanal activity[4]. The evidence provided by the

Persepolis texts and seal impressions attests to a multicultural workforce, particularly along the routes connected to the Royal Road (Miller, 1997: 114; Garrison, 2000). More broadly, the Achaemenid Empire fostered an environment conducive to artistic syncretism, drawing on diverse cultural traditions and aesthetic sensibilities (Dandamayev, 1999; Garrison & Root, 2001: 10). In this context, identifying a specific seal, an important medium for expressing both individual identity and imperial administration, and determining the identity of its owner provide an invaluable opportunity to examine the relationship between the seal-bearer's status and their choice of iconographic style and engraving technique.

The central focus of this study is the analysis of a specific group of seal impressions in the PFA corpus featuring one of the most ubiquitous motifs in Achaemenid iconography: the "hero combating composite creatures" motif[5]. Although they share this subject, these impressions differ markedly from seals in the mainstream Persepolis glyptic corpus in their formal characteristics, modes of execution, and engraving techniques. Consequently, existing classification schemes have subsumed them under the broad category of "heterogeneous styles" (Garrison, 1988; 1991; 2000; Boardman, 1970: 305; Garrison & Root, 2001: 19; Dusinberre, 1997: 111).

By reassessing this prevailing categorization, this study seeks to
1) Characterize the distinctive execution and engraving style of the seal impressions under study; 2) Determine the cultural origins of this style; 3) Assess the potential influence of the geographical location of the seal-bearers' administrative activities or their ethnic ties to the Elamite region on their selection of an archaic local style.

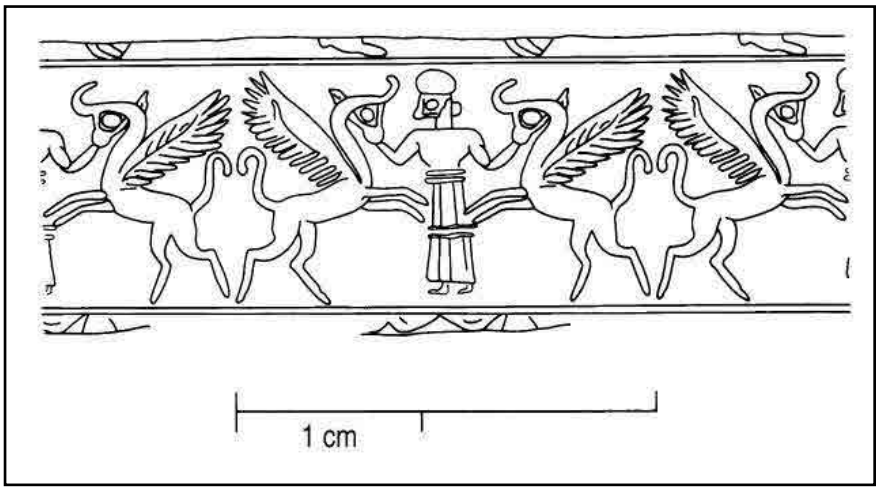
The broader iconographic programs of these seals within the PFA are not the primary focus of this study. Instead, the present study addresses the following key questions: Can the distinctive execution style evident in these seal impressions be traced to an archaic Elamite tradition? Should this style be classified as Elamite or Mesopotamian? Was the selection of this style influenced by the geographical location of the seal-bearers' administrative activities or by their ethnic ties?

The preliminary hypothesis posits that these seal impressions represent a localized style of engraving that was already prevalent in Elam before the rise of the Achaemenids. Given its continued use across multiple periods of Elamite history, this style should be recognized as an archaic, localized Elamite tradition. Furthermore, although the seal impressions derive from an administrative context, in which the seal-bearers' official functions

would theoretically have encouraged adherence to court-sanctioned artistic conventions such as the Court Style[6] for authenticating transactions, they retain distinctive indigenous cultural markers. The study proceeds by analyzing the seal impressions within their historical, political, and geographical contexts and by comparing their engraving techniques with diagnostic Elamite and Mesopotamian parallels. Ultimately, analysis of these distinctive seal impressions sheds new light on the social history of Achaemenid art.

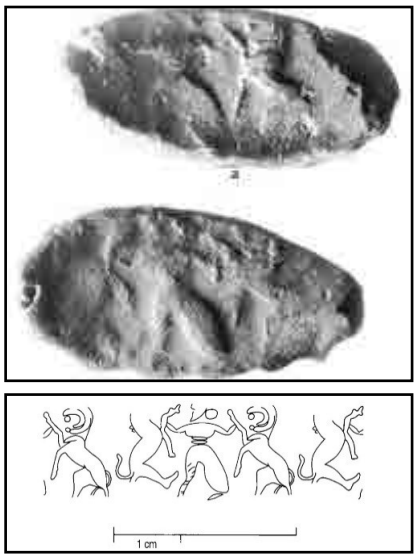
Iconographic Patterns of the Seals in Question

The seal impressions examined in this study—PFS 2, PFS 20, PFS 690, PFS 1519, PFS 740, PFS 1475, PFS 418, PFS 463, and PFS 249—date to the reign of Darius I (522–486 BCE). This section analyzes their iconographic programs and engraving characteristics.

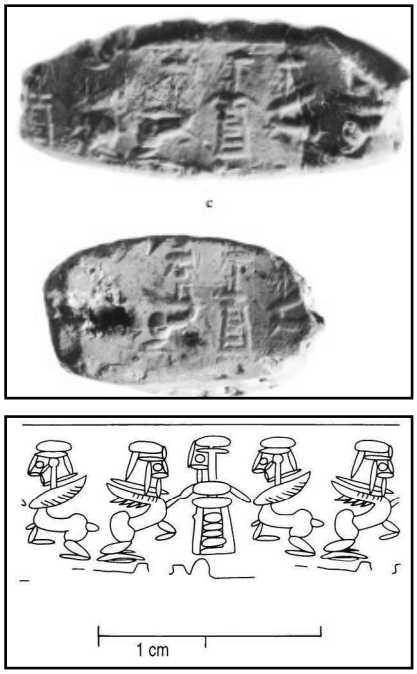


◄ **Fig. 1. Cylinder seal impression, PFS 2 (Cat. no. 3), (Garrison & Root, 2001: 66–67)..**

On PFS 2 (Cat. No. 3; Fig. 1), the hero is depicted with the torso shown frontally and the head in profile, controlling two-winged bulls with long, curved horns. The design of this seal impression is rendered through drill work and characterized by interconnected segments, globular depressions, geometric forms, and straight vertical lines. PFS 2 was the personal seal of Irtupiya (Irtupie). In the administrative tablets, he is identified as the official responsible for grain provisioning between 503 and 499 BCE. In PF 710, which probably belongs to the Group J[7] category (Travel Rations) and dates to 507 BCE, Irtupiya appears as the official overseeing livestock. He also held several other positions within the Achaemenid administrative apparatus (Hinz, 1971; Koch, 1990; Garrison, 1996: 30–31). More broadly, Irtupiya is named in 74 administrative transaction texts from the Persepolis Fortification Archive (PFA), and some tablets that specifically mention him



▲ Fig. 2. Cylinder seal, PFS 249 (Cat. no. 27). (Garrison & Root, 2001: 100).



▲ Fig. 3. Cylinder seal, PFS 20 (Cat. no. 145). (Garrison & Root, 2001: 229).

are sealed with PFS 7, a royal-name seal of Darius I, probably the king's personal signet (Aperghis, 1999: 180).

On PFS 249 (Cat. No. 27; Fig. 2), the hero is again depicted in profile, controlling two figures that appear to be rampant, roaring lions or composite creatures standing on their hind legs, their forelegs raised toward the hero. In PFS 249, details such as the hero's double-strand belt, the head of the roaring lion on the right, and the contours of the bodies of both the hero and the lions are rendered using curved lines, interconnected segments, and geometric forms.

On PFS 20 (Cat. No. 145; Fig. 3), the hero is depicted frontally, with his head turned to the left and his arms extended vertically downward as he controls two rampant, winged, human-headed creatures. In the design of PFS 20, the engraver relied extensively on geometric forms, interconnected segments, and angular and straight lines to delineate the hero and the composite creatures. This rendering constitutes a highly abstract variant of a classical Near Eastern glyptic motif: the hero's mastery over animals or composite creatures.

On PFS 463 (Cat. No. 264; Fig. 4), of which only the right-hand portion survives, the hero, who may be winged, controls a composite creature, probably a winged horse advancing toward him. In PFS 463, as in PFS 249, the engraver employed straight and curved lines, interconnected segments, and geometric forms to render the composition, although their use was far less extensive than in PFS 20.

On PFS 690 (Cat. No. 139; Fig. 5), the hero is depicted facing right, using his bent arms to control two abstractly rendered animals. These two rampant beasts, likely lions, feature long, pointed ears and gaping mouths. The rendering of the hero's face on PFS 690 closely resembles that on PFS 2 and, to some extent, that on PFS 20; the engraver clearly relied on geometric forms, interconnected segments, and straight and curved lines to render the motifs.

On PFS 1475 (Cat. No. 177; Fig. 6), although portions of the upper and lower edges of the impression are missing, a densely composed combat scene between the hero and animals remains visible. In this impression, the hero is rendered in an abstract manner through straight and curved lines and geometric forms, particularly in the treatment of the head. The hero, with his bent arms, grasps the inverted creatures, each by one of its hind legs. Among the beasts, only the outline of an ibex in the center of the scene is clearly identifiable.

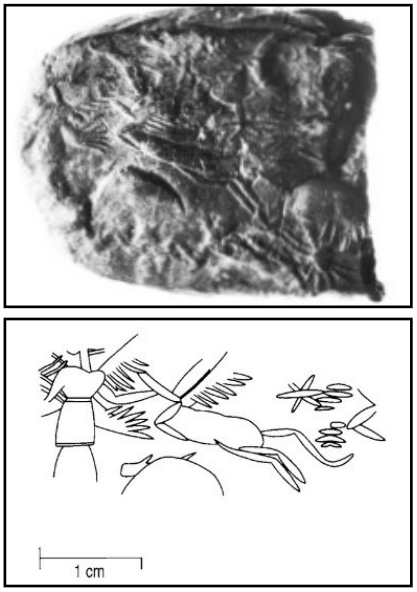
On PFS 418 (Cat. No. 201; Fig. 7), a fully abstract representation of a winged human figure wearing a long robe is rendered through drill work

using geometric forms, interconnected segments, and straight and curved lines. Additionally, at the center of the composition, an abstract human figure is depicted controlling two serpent-like creatures. Triangular motifs are engraved above the heads of both abstract human figures.

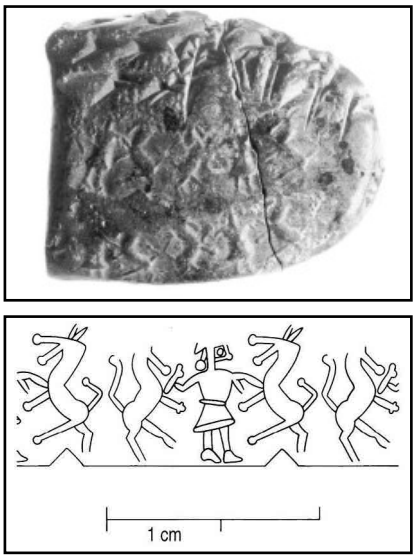
On PFS 740 (Cat. No. 146; Fig. 8), the hero is depicted in profile, his right arm bent as he grasps the foreleg of a winged creature, while his left hand extends toward a second winged beast. The engraver employed globular depressions, geometric forms, interconnected segments, and straight, angular, and curved lines to render the motifs, particularly to convey a sense of movement in the wings and bodies of the composite beasts.

On PFS 1519 (Cat. No. 167; Fig. 9), the hero is depicted frontally, his head turned to the right, controlling two-winged animals with both hands. These composite beasts are carved in a configuration unlike those in the other seal impressions analyzed here; they face one another, with one pair of forelegs meeting while the other pair overlaps the opposing shins, creating a dynamic composition. Although the hero's damaged headgear cannot be identified, his attire comprises a tiered skirt and a double belt. The hero's attire and body, together with the composite beasts, are rendered through drill work using geometric forms, interconnected segments, straight, angular, and curved lines, and globular depressions. The prominent use of curved lines for the composite creatures, in contrast to the more rigid rendering of the hero, was probably intended to emphasize the beasts' forward momentum.

In sum, all seal impressions from the PFA examined here share the general iconographic program of a hero combating composite creatures (such as winged horses) or animals (such as snakes). Although PFS 1475, PFS 418, PFS 463, and PFS 249 bear no inscriptions or direct indicators of ownership, their stylistic attributes, particularly the use of drill work to produce straight, angular, and curved lines, globular depressions, geometric forms, and interconnected segments, closely correspond to those of the other five seal impressions: PFS 2, PFS 20, PFS 690, PFS 1519, and PFS 740.



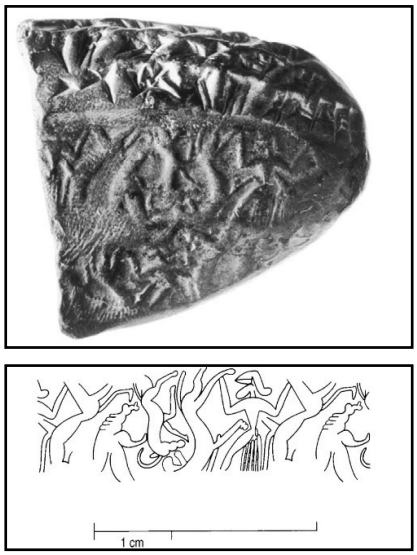
▲ Fig. 4. Cylinder seal, PFS 463 (Cat. no. 264), (Garrison & Root, 2001: 374).



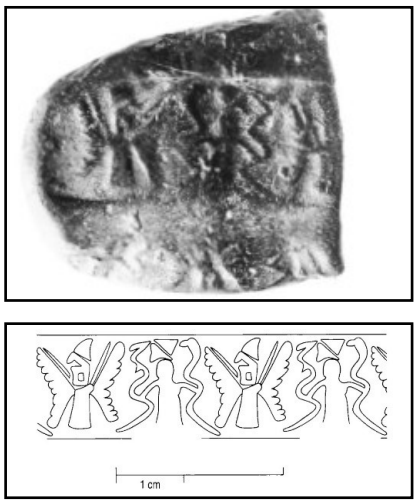
▲ Fig. 5. Cylinder seal, PFS 690 (Cat. no. 139), (Garrison & Root, 2001: 223).

Engraving Style and Execution of the Motifs

Although administrative seals generally belonged to offices rather than specific individuals, the Achaemenid glyptic corpus, particularly the seal impressions from Persepolis, attests to several prominent officials who directed particular administrative bureaus and used their corresponding office seals. PFS 2, examined in this study, is attested alongside PFS 859,



▲ Fig. 6. Cylinder seal, PFS 1475 (Cat. no. 177), (Garrison & Root, 2001: 265).



▲ Fig. 7. Cylinder seal, PFS 418 (Cat. no. 201), (Garrison & Root, 2001: 294).

PFS 38, and PFS 51 on the J texts (travel rations)—a group of tablets associated with designated individuals (Garrison, 1996: 25)—within the Persepolis Fortification Archive (PFA). As noted above, PFS 2 belonged to the administrative official Irtupiya. Irtupiya's administrative prominence is demonstrated by the exceptional frequency of his personal seal, one of the few seals of Achaemenid officials to occur consistently alone; on the J tablets, it appears more frequently than any other personal seal in the PFA corpus and is attested far more often outside the J texts (Aperghis, 1999: 181). Analysis of the administrative transactions supervised by Irtupiya underscores his considerable importance within the Achaemenid administrative apparatus (Garrison, 1996: 30).

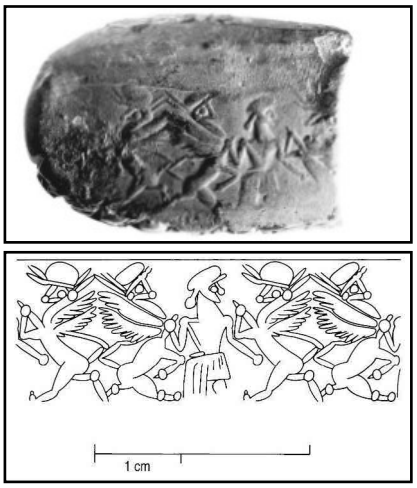
The engraving style of PFS 2 differs markedly from the established stylistic categories of Achaemenid glyptic art. The engraver demonstrated considerable technical proficiency in executing this seal design, using drill work to create precise straight, angular, and curved lines alongside geometric forms. By giving the human figure a square-shaped head and the animal figures triangular heads, and by carefully accentuating the human figure's eyes, nose, and headgear, the engraver produced a highly detailed, complete, and stylistically distinctive glyptic composition. The rendering of the hero's skirt, characterized by the geometrically precise execution of vertical and horizontal lines, finds close parallels in PFS 740 and PFS 1475. By employing condensed geometric imagery and stylized linear configurations to delineate both human and animal anatomies within a composition framed by horizontal borders at its upper and lower edges, the maker of PFS 2, whether consciously or unconsciously, produced a distinctive seal design that remains stylistically separate from the broader Achaemenid glyptic corpus.

The stylistic characteristics and design syntax of PFS 2 are echoed in PFS 740, PFS 690, PFS 20, PFS 1519, PFS 418, PFS 1475, PFS 463, and PFS 249, though these examples were likely executed by different hands with less precision. Among this group, PFS 740 and PFS 249 exhibit the closest compositional affinity to PFS 2, while PFS 1519, PFS 1475, and PFS 418 display a strong resemblance in the geometric schematization of the human and animal heads. Although some of these impressions differ from PFS 2, particularly in the execution of the wings and the placement of the composite beasts flanking the hero, a more pronounced exaggeration of the geometric style is evident in PFS 463, PFS 690, PFS 740, and PFS 418. According to Garrison and colleagues, the style of PFS 2 shares certain features with both the Fortification Style and the Court Style, but this seal impression, like the others analyzed here, must be assigned to the category

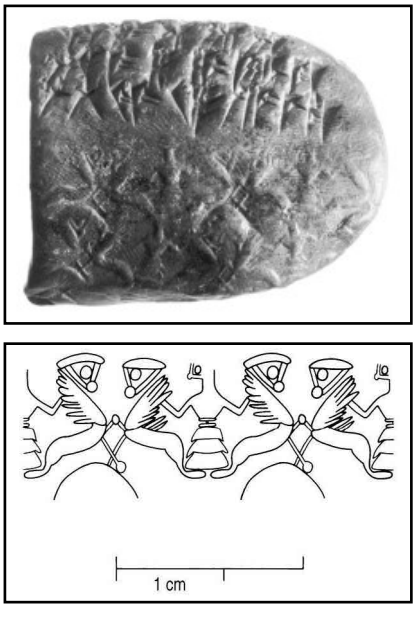
of "heterogeneous styles" (Garrison, 1988; Garrison & Root, 2001: 20, 67). The stylistic divergence and formal irregularities evident in the execution and engraving of PFS 740 and the related impressions examined here, especially the geometric configurations employed to render faces, mark them as highly distinctive artistic products.

Analysis of the geographical distribution of these seal-bearers' administrative activities may help reconstruct the possible ethnic affiliations of the owners or patrons and identify the local workshops or engravers responsible for producing the seals. Records of the administrative duties performed by Irtupiya, the user of PFS 2, during the sixteenth and seventeenth regnal years of Darius the Great identify him as a distributor of sesame, barley, figs, sheep, and goats in Hunar (near the Elam–Parsa border), Teleman, and Kasat in western Parsa. However, in regnal year 18 or possibly 19, PF 1790 records that Irtupiya received instructions from Parnaka to provide sheep as rations for a vast administrative territory stretching from Hunar, near the Elam–Parsa border, and Liduma in the west to Hidali on its eastern frontier. This administrative record indicates that a major shift in Irtupiya's administrative jurisdiction had occurred by this date (Aperghis, 1999: 181). Between regnal years 19 and 23, Irtupiya is recorded as the supplier or recipient of a wide range of commodities across a territory extending along the Royal Road between Kurdushum and Hidali and encompassing eastern Elam and western Parsa. In one instance (PF 15), Irtupiya was required to transport grain beyond his immediate administrative zone to Matezzish, near Persepolis. The administrative use of PFS 2 on Persepolis documents began in year 19 and continued through year 23, indicating that this seal was the second most frequently occurring seal within the Persepolis corpus (Ibid: 181–182).

According to Garrison (Garrison, 1991: 12–13), PFS 2 reflects the deliberate choice of an influential state official who sought a distinctive seal produced outside mainstream glyptic workshops and differentiated from conventional engraving templates, presumably as an expression of his awareness of both his administrative status and the seal's transactional authority. The present study, however, departs from Garrison's hypothesis on the basis of the formal similarities in execution technique and engraving style between this seal impression and examples from Elamite glyptic traditions, together with the geographical scope of Irtupiya's activities in western Parsa and eastern Elam. Instead, the present study argues for the influence of regional and ethnic affiliations on the selection of this specific execution style and engraving technique. Accordingly, the present study suggests that this seal impression and probably the others examined



▲ Fig. 8. Cylinder seal, PFS 740 (Cat. no. 146), (Garrison & Root, 2001: 230).



▲ Fig. 9. Cylinder seal, PFS 1519 (Cat. no. 167), (Garrison & Root, 2001: 251).

here were produced in a local workshop or by regional engravers who specialized in a distinctive local style whose products are only sporadically represented in the Persepolis archive.

Heidemarie Koch (1990) attributes PFS 20 to an official named Mamannuwiš, who supervised the grain storehouses at Kesat in the sixth region of Elam during regnal years 21–26 (501/500–496/495 BCE). The linear carving style of the heads on this seal closely recalls the engraving style of PFS 2. Furthermore, the rendering of the hero's body exhibits close affinities with the classic Middle Elamite "connected segments style" (Negahban, 1991: 91, 101).

PFS 690 was rolled twice on the reverse of tablet PF 460, dated to year 22 (499/500 BCE), with the two impressions vertically superimposed, while PFS 69 was impressed on the tablet's edge. The text of the tablet, likewise, dated to year 22, states: "30 (BAR) of grain for seed were received and entrusted to Harzakka. Azzakra (received it) and set (it) aside in the Ibat (place) storehouse. Year 22" (Hallock, 1969: 173). Most likely, the geometric composition of the scene and the extensive drill work characterizing this and the previously discussed impressions indicate that they were produced by a single engraver or in a particular local workshop (Garrison, 1988: 447–450; Garrison & Root, 2001: 223).

In PFS 740, as in PFS 249, PFS 1475, and PFS 418, the engraver represented the hero with a frontal torso and profile head, whereas the composite beasts were deeply carved using straight and curved lines together with geometric forms and globular depressions produced by extensive drill work. Whereas the wings and animal bodies are rendered with fluid, curving lines, the hero's body is executed using a combination of curved, straight, and angular lines. According to Garrison and Root (2001: 230), the design preserved in this seal impression appears to have been engraved in haste and depicts an Assyrianizing garment that combines several earlier iconographic models. Amiet (1972: 256, pl. 175, no. 2005), however, argues that the hero's garment partly reflects Old Elamite designs of the early second millennium BCE, characterized by narrow-waisted figures wearing vertically striped skirts that project sharply at a right angle from the waist. This seal was impressed on the reverse of tablet PF 513, dated to 499/498 BCE (Garrison, 1988: 447–450). The text, dated to year 23, records the delivery of seed grain for sowing: it was prepared by Parru, delivered to Padadda, and distributed by Pirtiš at Saramina (Hallock, 1969: 182).

In PFS 1519, as in PFS 740, the engraver employed drill work to combine angular and curved lines, globular depressions, and geometric

forms in rendering the glyptic imagery, although PFS 1519 exhibits greater precision of execution than PFS 740. PFS 1519 was rolled twice on the reverse, producing superimposed impressions, and once on the upper edge of PF 1667, dated to 505/504 BCE (Garrison, 1988: 462). This administrative text, dated to year 17, records that grain prepared by Napunuš was received by Kapriya to feed four horses kept at Pitlan (Hallock, 1969: 458–459). As these records demonstrate, the administrative sphere of the seal-bearers discussed here—particularly the activities associated with the seals of Irtupiya (PFS 2) and Mamannuwiš (PFS 20)—was concentrated in the borderlands between western Parsa and eastern Elam. Consequently, it may be argued that, owing either to their regional administrative functions or ties with local ruling elites, these officials deliberately favored workshops near Elam—or local engravers preserving ancient engraving and iconographic traditions—over the newer, court-centered workshops of Parsa and other satrapies. The engravers who carved these seals adopted standard iconographic programs shaped by the political and artistic models of the Achaemenid period yet remained technically and stylistically committed to an archaic Elamite tradition that had persisted since the third millennium BCE.

Tracing a Comparable Engraving Technique in Elam

The geographical sphere of administrative activity associated with the owners and/or users of the seals examined in this study, all from the Persepolis Fortification Archive (PFA), together with the close stylistic parallels in motif rendering between these examples and seals and seal impressions recovered from Mesopotamia and Elam, warrants closer examination of this engraving technique. These parallels include the use of geometric imagery, interconnected segments, and drill-produced globular depressions; the technique has long and broadly parallel trajectories in Mesopotamia and, especially, Elam.

Elam is recognized as one of the earliest centers for the emergence, growth, and development of glyptic art within the cultural sphere of southwestern Iran. Its glyptic corpus is comparable to assemblages recovered from archaeological sites farther east, specifically Tepe Yahya and Tepe Shahdad, as well as to material from Mesopotamia to the west. The Elamite engraving tradition followed a distinct trajectory, originating in the early third millennium BCE, appearing during the Old Elamite period, reaching its zenith in the Middle Elamite period, and persisting through the Neo-Elamite and Achaemenid periods. Many motifs employed on seals of the Middle Elamite period have no known precedents. Indeed,

the art of seal production during the Middle Elamite period may be regarded as superior to that of Elam's western neighbours (Talayi, 2013: 100–102). However, during the Neo-Elamite period (ca. 1000–539 BCE), Elam's long-established culture and civilization gradually declined amid political and military rivalry with the powerful Assyrian Empire (Ibid: 102–104). Under such political conditions, it is unlikely that substantial innovation would have occurred in the cultural and artistic spheres, at least in the production of seals, during this phase of Elamite history. Rather, one should anticipate the continuation of earlier traditions from the Old Elamite and, especially, the Middle Elamite periods into the Neo-Elamite period.

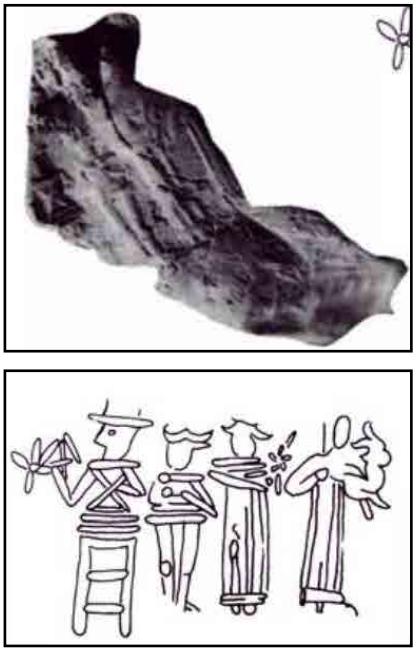
Nevertheless, on the basis of his study of a group of Neo-Elamite seals recovered from the Apadana and Acropolis at Susa and dated to the early seventh or sixth century BCE, Amiet interpreted advances and refinements in their manufacture as evidence of a third phase in the development of Late Neo-Elamite art. He associated this phase with Elam's revival after the Assyrian attacks of 645 BCE and termed it the "glyptic art of the end of Elam" (la glyptique de la fin d'Élam), (Amiet, 1973a). Amiet further interpreted the resemblance between a few seals from the PFA and Neo-Elamite examples as evidence for the reuse of Late Neo-Elamite seals (Ibid: 15, 25), at times presenting PFA seal impressions as evidence of this third phase of Late Neo-Elamite glyptic art. He further suggested that this style spread from Susa to Anshan and other regions (Ibid: 4–6, 24–25). By contrast, Garrison identifies a group of seals in the PFA that are stylistically very close to the cylinder-seal corpus represented on the Acropolis and Apadana tablets—a corpus that Amiet designates as the "glyptic art of the end of Elam" (Garrison, 2002: 68). Garrison and Root further note that the number of seals bearing Elamite inscriptions and engraved in Elamite styles within the PFA and dating to the reign of Darius I in the Achaemenid period is substantially greater than Amiet had previously recognized (Ibid: 70).

Although the Neo-Elamite period, especially when compared with the Middle Elamite period, was characterized by decline, considerable developments in seal production, particularly advances in engraving techniques and the tools employed, occurred in the regions surrounding Elam, resulting in high-quality output. Therefore, some seal-making workshops operating in Elam during the sixth and fifth centuries BCE may have been overshadowed by workshops in neighbouring regions; nevertheless, archaic and localized traditions of administrative and official seal production may have persisted within these Elamite workshops and among particular Elamite engravers.

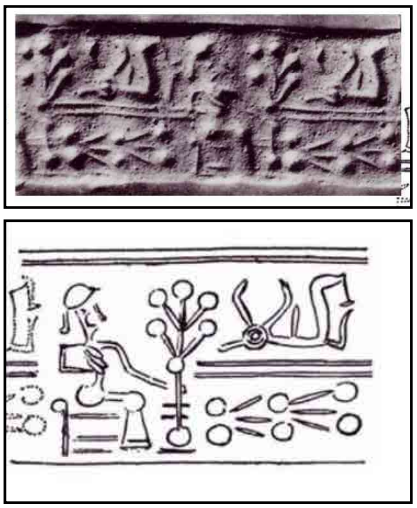
Seals and seal impressions recovered from Elam have been studied extensively by scholars including Amiet (1959, 1971, 1972, 1973a, 1973b), Pittman (1990, 1994, 1997, 2001, 2006), Porada (1948, 1964, 1965, 1993), and Roach (2008), leading to the establishment of stylistic classifications.

One such mode of image rendering attested during the Old Elamite period is the Jemdet Nasr-related style (JNRS). In this style, human and animal figures were rendered geometrically, through interconnected segments, shallow incisions, and drill work. As its name suggests, the JNRS reflects the Jemdet Nasr period in southern Mesopotamia (Amiet, 1980: 29–31); however, the evidence clearly indicates the coherent, contemporaneous presence of this style in both Mesopotamia and southwestern Iran before the emergence of Elam (Roach, 2008, vol. 1: 351). This mode of image rendering continued into the Susa III/IV style (STF) during the early third millennium BCE. Amiet dates STF to the same period as the Proto-Elamite tablets and recognizes two subgroups within this style: the glazed steatite style and the ancient geometric-pattern style (Amiet, 1972: 173–183). In both the Susa III/IV and the subsequent Susa IV (SF) styles, geometric rendering and interconnected segments are widely attested on Elamite seals. During the SF phase, the subject matter consists predominantly of banquet, contest, and mythological scenes (Collon, 2005: 27–31). The use of this style persisted through several phases of the Old Elamite period and continued into the Middle Elamite period. In the Early Middle Elamite (EME) style, dating to approximately the mid-second millennium BCE, Elamite seals and seal impressions include examples closely comparable to the style examined in this article and characterized by increased use of the heavy drill (Figs. 10 and 11; Amiet, 1972: 258–264).

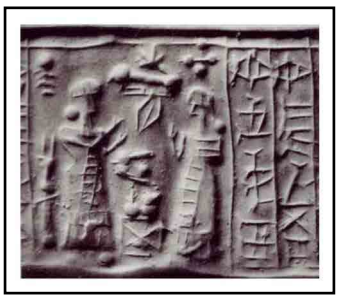
The subsequent Kassite-related style (KRS) was a shared style with Mesopotamia, in which most Elamite seals were executed. However, in the Late Middle Elamite (LME) style, the seal style of the pre-KRS period was revived, and more examples like the style under discussion here appear among Elamite seals and seal impressions (Figs. 12 and 13), (Ibid: 265-272).

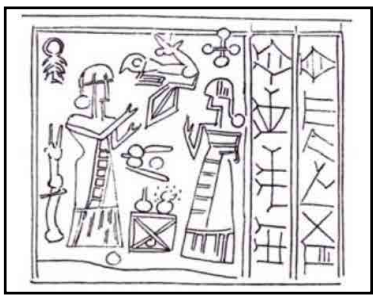


▲ **Fig. 10. Cylinder seal recovered from Haft Tappeh, EME period (Roach, 2008, vol. 2: 460).**



▲ **Fig. 11. Cylinder seal recovered from Chogha Zanbil, EME period (Roach, 2008, vol. 2: 476).**





▲ **Fig. 12. Cylinder seal recovered from Chogha Zanbil, LME period (Roach, 2008, vol. 2: 521).**

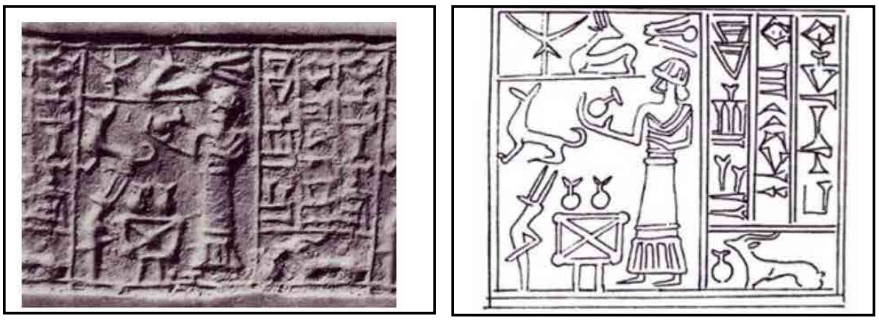


Fig. 13. Cylinder seal recovered from Chogha Zanbil, LME period (Roach, 2008, vol. 2: 520). ▶

Among the Neo-Elamite seals, we can also trace the continued execution of geometric images, connected segments, and globular cavities created via drill-work, alongside straight, angular, and curved lines. Several of these will be examined below. In the execution of images on seals 14, 15, and 19, the use of geometric images, connected segments, and globular cavities is evident, while the designs on seals 16, 17, 18, and 20 display a combination of geometric forms and connected segments executed with drill-work and straight, angular, and curved lines. Thus, this engraving technique, characterized by geometric and connected-segment execution, can be traced among certain Neo-Elamite seals, much like in the Late Middle Elamite (LME) style.

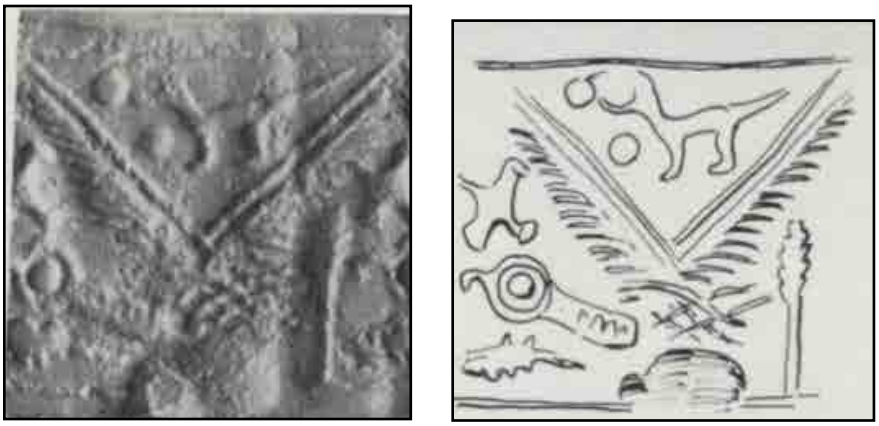
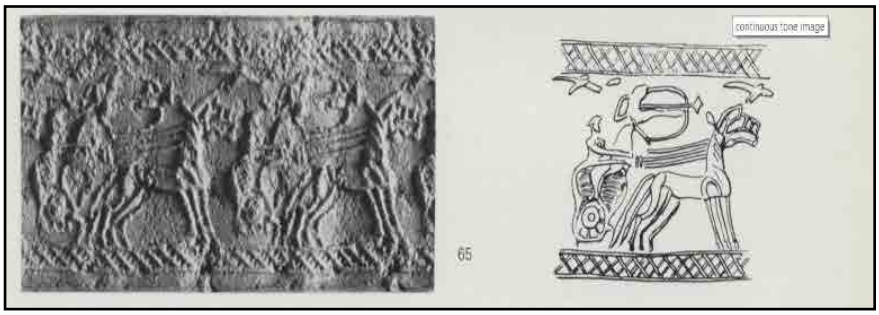


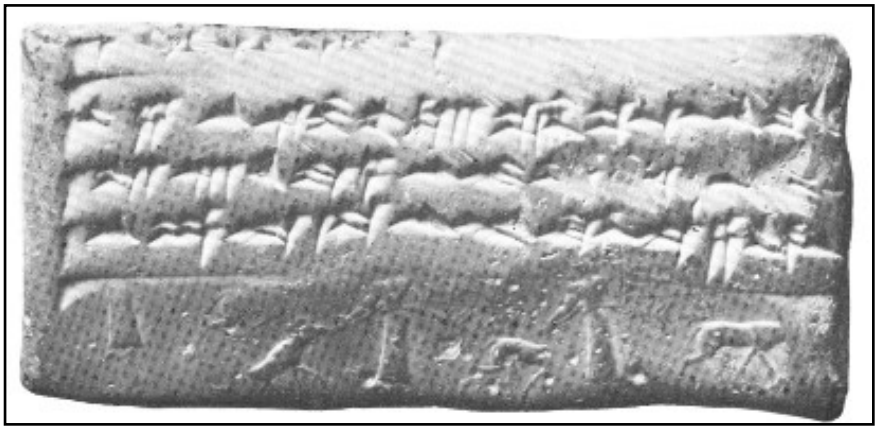
Fig. 14. Cylinder seal from the Neo-Elamite period (Amiet, 1973a, plate XV, no. 62). ▶

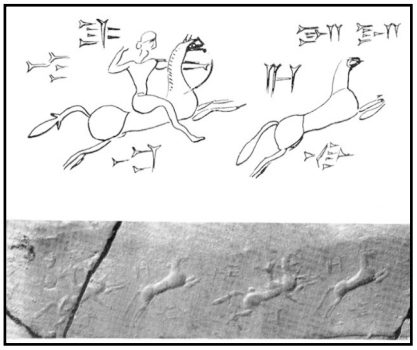


Fig. 15. Cylinder seal from the Neo-Elamite period, with a combination of faunal and floral imagery (Amiet, 1973a, plate XV, no. 64). ▶

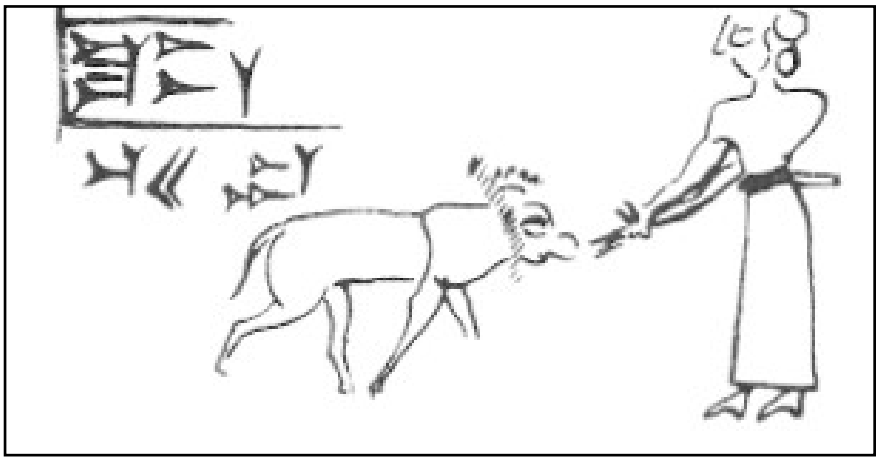


◄Fig. 16. Cylinder seal from the Neo-Elamite period (Amiet, 1973a, plate XV, no. 65).





▲Fig. 17. Cylinder seal from the Neo-Elamite period (Potts, 2004: 300; Amiet 1973b, plate IV, no. 16).



◄Fig. 18. Cylinder seal from the Neo-Elamite period (Potts, 2004: 300; Amiet 1973b, plate V, no. 19).





◄Fig. 19. Cylinder seal from the Neo-Elamite period. (The Metropolitan Museum of Art (https://www.metmuseum.org/art/collection/search/323996).



▲ Fig. 20. Cylinder seal from the Neo-Elamite period. (Catawiki Archaeology category, https://www.catawiki.com/en/c/569-archaeology).

Although the absolute number of seals declines markedly in the Neo-Elamite period, the execution of seal imagery through geometric forms, connected segments, and globular cavities created by drill-work remains traceable. This engraving style and technique of motif execution were incorporated into the Elamite glyptic corpus from the Old Elamite period under the influence of the Jemdet Nasr style, reached their peak in the Middle Elamite period, and persisted into the Neo-Elamite era. Accordingly, this style may be characterized as an archaic, localized style within Elamite civilization. The use of this style on Achaemenid seals, irrespective of possible influences from other regions (such as Mesopotamia or Egypt) or the independent initiatives of Achaemenid engravers, may, given the temporal and spatial proximity of the Achaemenid political center to Elamite cultural centers, reflect a continuation of Elamite seal-making practices in the Achaemenid era.

Conclusion

The seal impressions examined in this study, PFS 2, PFS 20, PFS 690, PFS 1519, PFS 740, PFS 1475, PFS 418, PFS 463, and PFS 249, although belonging to the wider PFA glyptic corpus and displaying features associated with the Court Style, differ significantly from the broader Achaemenid-era glyptic corpus recovered from Persepolis in terms of their engraving technique, mode of execution, and rendering of motifs. This distinction is explained by three key factors: 1) the clearly defined administrative sphere of activity of the owners of two of these seals, Irtupiya and Mamannuwiš, in western Fars and eastern Elam; 2) the distinct engraving technique of the seal impressions in question, characterized by straight and curved lines combined with globular cavities created by drill-work; and 3) the stylistic rendering of these motifs, which utilizes a geometric, connected-segment style closely related to Elamite engraving traditions current since the early third millennium BCE. Consequently, the Achaemenid-era seal impressions analyzed here represent the latest surviving manifestations of an archaic, localized style rooted in the cultural history of Elamite civilization.

Therefore, although contemporary engraving techniques and advanced methods of motif execution were readily available within official Achaemenid workshops, and although their administrative function would, in theory, have aligned them with court-sanctioned artistic conventions such as the Court Style, the deliberate choice of engravers or workshops practicing such an archaic style and technique suggests a conscious effort. The owners of these seals appear to have sought to project their

ethnic and regional affiliations, or to emphasize their connection to local administrative and governmental institutions.

Seals, used by individuals or administrative offices to establish personal identity and authenticate administrative transactions, provide an invaluable medium for tracing the personal preferences, ethnic backgrounds, and religious identities of their owners. Furthermore, they facilitate the identification of localized styles and the study of how the Achaemenid administrative apparatus, and its standardized artistic canons influenced the art and culture of subject populations. In this regard, glyptic evidence serves as a unique diagnostic tool for reconstructing ancient societies, offering deeper insights into culture, religion, ritual beliefs, and the social history of art in antiquity. Ultimately, within the framework of the social history of art, the findings of this study elucidate the complex reciprocal interactions between glyptic styles in the ancient Near East and the persistence of regional artistic traditions within the vast administrative network of the Achaemenid Empire.

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Conflict of Interest

In adherence to ethical publication standards, the author affirm that there are no conflicts of interest, either personal or financial, that could have influenced the content or conclusions presented in this research.

Endnote

1. For further discussion of the history of the discovery of the Persepolis documents, seals, and seal impressions, see: Wouter F. M. Henkelman, "Administrative Realities: The Persepolis Archives and the Archaeology of the Achaemenid Heartland," in The Oxford Handbook of Ancient Iran, ed. D. T. Potts (Oxford: Oxford University Press, 2013), 530–534.

2. For a representative example, see: Richard T. Hallock, "The Evidence of the Persepolis Tablets," in The Cambridge History of Iran, vol. 2, The Median and Achaemenian Periods, ed. I. Gershevitch (Cambridge: Cambridge University Press, 1985), 588–609.

3. For further discussion, see: Margaret C. Root, "The Cylinder Seal from Pasargadae: Of Wheels and Wings, Date and Fate," in Neo-Assyrian, Median, Achaemenian and Other Studies in Honor of David Stronach, Iranica Antiqua 34, eds. R. Boucharlat, J. E. Curtis, and E. Haerinck (1999): 271–303; and Margaret C. Root, "Defining the Divine in Achaemenid Persian Kingship: The View from Bisitun," in Every Inch a King: Comparative Studies on Kings and Kingship in the Ancient and Medieval Worlds, eds. L. Mitchell and C. Melville (Leiden: Brill, 2013), 23–65.

4. Many of the documents recovered from Persepolis preserve evidence for reconstructing both discrete and interrelated functions within administrative offices, as well as information concerning the officials responsible for administrative matters relating to food commodities. These documents further demonstrate that Persepolis was not merely a center of royal ceremony but also one of the principal administrative centers connected to other administrative regions throughout the empire

(Garrison & Root, 2001: 9–10). As a critical administrative node, Persepolis drew activity from a territory encompassing much of the Marvdasht Plain, the area surrounding modern Shiraz, and the road from Shiraz to Susa, thereby functioning as a magnet for administrative activity (Stolper, 1992; Garrison, 1996; Koch, 1990: 247–310).

5. According to Garrison, the recurrence of only a limited range of scenes on Court Style seals—namely heroic encounters, archery scenes, offering scenes, and scenes of worship before an altar—indicates that officially sanctioned glyptic imagery was closely controlled by the Achaemenid court (Garrison, 1991: 17).

6. Achaemenid seals and seal impressions have been classified according to their stylistic treatment into the "Court Style," the "Fortification Style," the "Persepolitan Modeled Style," the "Linear Style," the "Mixed Styles I and II," and the "Broad and Flat Styles" (Garrison, 1988; Garrison, 1991; Garrison, 2000; Boardman, 1970: 305; Dusinberre, 1997: 111).

7. A classification system has also been established for the texts recovered from Persepolis, encompassing the T, Q, and J categories. The J texts concern the distribution of commodities presented to the king, issued by him, or presented to other high-ranking members of the court, such as royal women; consequently, the seals impressed on tablets in this category are particularly well documented. Accordingly, only a restricted group of seals occurs on the J texts; these function as personal seals identifying the principal individuals involved in the transactions, such as the seal of Darius I (PFS 7*), that of Irdabama (PFS 51[II]), and that of Irtašduna (PFS 38), (Garrison & Root, 2001: 11).

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انجمن علمی باستان‌شناسی ایران



آخرین نشانه‌های سبکی کهن از سنت‌های حکاکی ایلامی در مجموعهٔ مهرهای هخامنشی

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چکیده

بخش مهمی از شواهد مادی به‌دست آمده از دورهٔ هخامنشیان مهرها و اثرمهرها هستند. مسئلهٔ اصلی در این پژوهش بررسی سبک متفاوت اجرا و حکاکی تعدادی از اثرمهرهای مکشوفه از دورهٔ هخامنشی است؛ که تاکنون در پژوهش‌های انجام شده در مجموعهٔ سبک‌های ناهمگون دسته‌بندی شده‌اند. در بررسی این سبک متفاوت اهدافی دنبال می‌شود، ازجمله مشخص نمودن سبک اجرای تعدادی از اثرمهرهای به‌دست آمده از دورهٔ هخامنشی، به‌عنوان یکی از بسترهای مهم تجلی هنر قوم و یا سیستم حکومتی هخامنشی، و همچنین روشن نمودن بخشی از تاریخ اجتماعی هنر هخامنشیان. بررسی مسئله مطرح در این پژوهش و پاسخ به این پرسش که، آیا سبک متفاوت اجرای اثرمهرهای مورد بررسی در این پژوهش را می‌توان به سبکی کهن در ایلام نسبت داد؟ ازطریق تحلیل اثرمهرهای موردنظر در بافت تاریخی، سیاسی و جغرافیایی آن‌ها و همچنین مقایسهٔ تکنیک اجرا و حکاکی آن‌ها با نمونه‌هایی از حکاکی مهرهای ایلامی انجام خواهد شد. نتایج این پژوهش نشان‌داد، سبک‌هندسی و قطعات متصل در اثرمهرهای موردنظر، که ازطریق متهکاری و با استفاده از خطوط صاف، زاویه‌دار و منحنی و حفره‌های گوی‌مانند اجرا شده‌اند، تداوم سبکی از دورهٔ ایلام کهن است که ترقی و اوج کاربرد آن در دورهٔ ایلام میانه اتفاق افتاد. محدودهٔ اداری مشخص فعالیت مالکان تعدادی از این مهرها در غرب فارس و شرق ایلام احتمال تعلق اثرمهرهای موردنظر به سبکی بومی‌شده در ایلام را تقویت می‌کند. به این‌ترتیب، سبک اجرای خاص اثرمهرهای مورد بررسی در این پژوهش را به‌جای دسته‌بندی کلی در مجموعه سبک‌های ناهمگون می‌توان تداوم یکی از سبک‌های کهن ایلامی دانست، که در کارگاه‌های محلیِ محدودهٔ ایلام و یا توسط هنرمندان محلی استخدام‌شده توسط مالکان این مهرها، که متعهد به این سبک بودند، اجرا شده‌اند.

کلیدواژگان: مهرهای هخامنشی، مهرهای ایلامی، تخت‌جمشید، سبک هندسی، تداوم فرهنگی.

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Manufacturing Technology and Corrosion Mechanisms of Ancient Metal Artifacts from Qalaichi Tepe

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Abstract

The Mannaean Kingdom was one of the major Iron Age polities that flourished in northwestern Iran during the first millennium BCE. Qalaichi Tepe, identified as the Mannaean capital Izirtu, represents one of the most significant archaeological sites of this period. This study investigates nine copper-based artifacts recovered from systematic excavations conducted at Qalaichi between 2002 and 2004 under the direction of Bahman Karegar. The assemblage comprises a complete bracelet, one fragmented object, and seven additional metal fragments dating to the first millennium BCE. The research aims to reconstruct manufacturing technology, characterize microstructural features, identify corrosion products, and assess the corrosion mechanisms affecting these artifacts. To achieve these objectives, optical microscopy, metallography, scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM–EDS), and X-ray diffraction (XRD) were employed. Microstructural observations indicate that the artifacts were manufactured through combinations of casting, cold working, hot working, and repeated annealing, reflecting advanced metallurgical knowledge. SEM–EDS analyses showed that seven artifacts were made of tin bronze, whereas two specimens consisted of nearly pure copper. Elongated sulfide inclusions preserved within the metallic matrix indicate incomplete smelting of sulfidic copper ores and provide evidence for the nature of raw materials and extraction technology. XRD identified the principal corrosion products as cuprite (Cu_2O), nantokite (CuCl), malachite ($Cu_2CO_3(OH)_2$), and brochantite ($Cu_4SO_4(OH)_6$), reflecting complex burial-induced corrosion processes. Microstructural evidence further demonstrates selective corrosion characterized by preferential dissolution of the copper-rich phase, secondary tin enrichment, intergranular corrosion, microcracking, and localized porosity. Despite variations in corrosion intensity, the artifacts exhibit notably similar manufacturing characteristics, suggesting standardized metallurgical practices within Mannaean workshops. These findings provide new insights into Iron Age copper-alloy production technology in northwestern Iran while contributing valuable archaeometallurgical data for understanding Mannaean metallurgy and informing the conservation of archaeological copper-based cultural heritage.

Keywords: Qalaichi Tepe, Mannaean Culture, Manufacturing Technology, Corrosion Mechanisms, SEM–EDS.

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Introduction

The Mannaean Kingdom was one of the most prominent civilizations of northwestern Iran during the first millennium BCE. Prior to the emergence of the Median Kingdom, several local polities had developed across western and northwestern Iran, among which the Mannaean Kingdom distinguished itself through its political authority, territorial extent, cultural achievements, and historical significance. Established during the first millennium BCE, the kingdom endured for more than three centuries. According to Assyrian textual sources, Manna was governed under a monarchical political system. Several important archaeological sites associated with the Mannaean cultural horizon have been excavated, including Qalaichi, Ziwiyeh, Zendan-e Soleyman, Kul Tarikeh, and Hasanlu. Qalaichi Tepe is located approximately 8 km northeast of the city of Bukan in West Azerbaijan Province, Iran. Archaeological evidence indicates that the site represents a Mannaean occupation layer dating to approximately the eighth and seventh centuries BCE (ca. 800–600 BCE). Based on the Aramaic inscription discovered at the site, Qalaichi has been identified as Izirtu (also rendered as Zirtu), the capital of the Mannaean Kingdom (Molazadeh, 2009: 45–53). Despite extensive looting and the illicit removal of numerous archaeological objects, the remaining artifacts recovered from Qalaichi continue to demonstrate the exceptional archaeological significance of the site, while archaeological evidence strongly supports its identification as the Mannaean capital. Following widespread illegal excavations, a rescue excavation was undertaken in 1985 under the direction of Ehsan Yaghmaei (Yaghmaei, 2023). Archaeological investigations subsequently ceased for several years before systematic excavations resumed in 1999 under the direction of Bahman Karegar and continued until 2006. However, the results of these excavations have been reported only in a brief publication (Karegar, 2004: 229–245). Excavations at Qalaichi uncovered an extensive architectural complex comprising a monumental entrance gateway, a stone-paved courtyard, a columned hall, a series of adjoining rooms, and several raised platforms. The buildings were constructed on stone rubble foundations bonded with mud mortar and featured large mudbrick walls comparable in architectural style to those identified at Ziwiyeh. These architectural remains, together with the rich assemblage of archaeological materials recovered from the site, provide valuable evidence for understanding the political organization, architectural traditions, and material culture of the Mannaean Kingdom during the Iron Age.

Research Aims and Significance: The artifacts examined in this study were recovered from Qalaichi Tepe during archaeological excavations conducted between 2002 and 2004 under the direction of Bahman Karegar. Dating to the first millennium BCE, the assemblage comprises two principal groups. The first group consists of an intact bronze bracelet and a fragment of a broken bronze object, whereas the second comprises seven metal artifacts that vary in morphology, dimensions, degree of corrosion, and alloy composition. Collectively, these objects are likely to represent a range of functions within Mannaean society, including ornamental, utilitarian, and possibly ritual purposes.

The primary objective of this study is to characterize these artifacts through archaeometallurgical investigation by identifying their manufacturing technology, alloy composition, and corrosion products. Owing to their geographical provenance and chronological attribution to the first millennium BCE, these artifacts constitute an important source of evidence for reconstructing the technological, cultural, and socioeconomic development of Iron Age communities in northwestern Iran. The significance of this research lies in two complementary aspects: first, the investigation of ancient metallurgical technology, including manufacturing techniques and alloy composition; and second, the characterization of corrosion processes and structural alterations resulting from long-term burial and post-depositional environmental conditions. Determining the chemical composition and manufacturing technology of these artifacts provides valuable insights into the technological capabilities, availability of raw materials, and metallurgical traditions of the Mannaean Kingdom. For example, variations in the tin-to-copper ratio of bronze alloys may reflect the extent to which ancient craftsmen intentionally controlled the mechanical properties of their products. Likewise, the identification of minor and trace alloying or impurity elements, such as arsenic, lead, iron, and nickel, can contribute to provenance studies, the reconstruction of ancient exchange networks, and the assessment of technological interactions between the Mannaeans and neighboring cultures, including Urartu, Assyria, and the Caucasian communities. From a conservation perspective, investigating corrosion mechanisms and deterioration processes not only improves our understanding of burial environments and post-depositional alteration but also provides essential information for developing appropriate conservation and preservation strategies. Mineralogical characterization of corrosion products including malachite, cuprite, and tenorite using X-ray diffraction (XRD) and scanning electron microscopy coupled with energy-

dispersive X-ray spectroscopy (SEM–EDS) enables accurate identification of corrosion phases and their stability, thereby providing insights into the long-term degradation behavior of copper-based alloys in the burial soils of the region. Beyond the characterization of individual artifacts, studies of this nature contribute to a broader understanding of the role of metallurgy within the economic, technological, and cultural framework of the Mannaean Kingdom and the evolution of metalworking traditions in northwestern Iran. Given the scarcity of written historical sources for the Mannaean period, archaeometallurgical evidence derived from material culture represents an indispensable source of information for reconstructing the technological history of this Iron Age civilization.

Research Questions: This study investigates nine archaeological metal artifacts recovered from Qalaichi Tepe through an integrated archeometallurgical and conservation-based approach to elucidate their manufacturing technology and deterioration processes. The research addresses the following questions: 1) What manufacturing techniques were employed in the production of these artifacts, as inferred from their microstructural and metallurgical characteristics? 2) What are the principal corrosion products present in the artifacts, and what is their degree of stability? 3) What corrosion mechanisms and environmental factors have governed the deterioration of these archaeological objects during burial?

Literature Review

Archaeological and historical investigations of the Mannaean Kingdom and its associated sites in northwestern Iran have attracted considerable scholarly attention since the 1960s. Among the earliest contributions, Dyson (1965) conducted extensive archaeological investigations at major sites such as Hasanlu and Ziwiyeh, publishing a series of studies on their cultural sequence, archaeological context, and material remains (Dyson, 1965: 193–217). Subsequently, Muscarella (1988: 105–109) provided a comprehensive overview of Urartian sites and the archaeological landscape of northwestern Iran, thereby placing the Mannaean cultural sphere within a broader regional context. Iranian scholars have likewise made significant contributions to the study of the Mannaean Kingdom. Behzadi (1993) examined its political organization, socioeconomic structure, relationships with neighboring states, as well as its language, religion, artistic traditions, and selected archaeological finds. Hassanzadeh (2006) investigated the architectural remains of Mannaean sites while also discussing the kingdom's political history, administrative organization,

language, script, and artistic achievements. Malekzadeh (2009) focused on the emergence of the Medes and the Mannaeans in northwestern Iran, emphasizing the historical geography and political development of the region. Similarly, Mollazadeh (2009) identified the Mannaean Kingdom as one of the earliest political entities in western and northwestern Iran and provided a comprehensive assessment of its cultural history, ethnicity, language, writing system, political organization, economy, and provincial administration. In this study, Qalaichi was identified as Izirtu, the capital of the Mannaean Kingdom. Further archaeological investigations have expanded knowledge of the Mannaean cultural landscape. Qodratabadi & Co-workers (2009) examined the Qaplantu archaeological site, describing its geographical setting, archaeological context, chronological sequence, and excavated artifacts. Another significant discovery is the Bukan Stele, unearthed during excavations between 1999 and 2004, whose Aramaic inscription explicitly identifies Qalaichi as the capital of the Mannaean Kingdom. Despite these substantial archaeological and historical investigations, archaeometallurgical research on Mannaean metal artifacts, particularly material from Qalaichi, remains notably limited. To date, no comprehensive study has specifically examined the manufacturing technologies and corrosion characteristics of copper-based artifacts from this site. Several technical studies have nevertheless examined archaeological metals recovered in the Bukan region. Bahadari & Ahmadi (2000) conducted laboratory analyses of corrosion phenomena in excavated iron artifacts using microscopy and phase-identification techniques. Their study identified corrosion phases including goethite, lepidocrocite, and magnetite, and demonstrated the substantial influence of soil composition, moisture, and acidic environmental conditions on the progressive deterioration of archaeological iron (Bahadari & Ahmadi, 2000: 117–125). Soudagar (1995) investigated the technological characteristics of metal artifacts from Bukan, focusing on alloy composition, production techniques, manufacturing processes, and decorative practices. The study emphasized the importance of interdisciplinary archaeometallurgical approaches for understanding ancient metalworking traditions. Likewise & Bahadari (1998) examined the structural characteristics and deterioration patterns of several iron objects excavated from Qalaichi (Bahadari, 1998). Their research documented layered, exfoliative, and intergranular forms of corrosion and highlighted the role of chloride- and sulfide-bearing burial environments in accelerating deterioration. The authors further proposed conservation strategies for stabilizing these archaeological metals. More

recently, Hassanzadeh (2022) produced one of the most comprehensive archaeological syntheses of the Mannaean Kingdom. Drawing on archaeological excavations and regional surveys undertaken over the past five decades, the study reconstructs Mannaean material culture from archaeological evidence rather than relying primarily on Assyrian and Urartian textual sources. Hassanzadeh identifies a set of diagnostic archaeological indicators for recognizing Mannaean sites, including columned halls, raised floors, stone foundations, decorated mudbrick architecture, glazed or ochre-colored bricks, glazed pottery, and ivory artifacts. Although not all these characteristics occur at every site, their co-occurrence provides a reliable framework for identifying Mannaean settlements. The study further highlights the geopolitical significance of the Mannaean Kingdom as an intermediary power situated between Assyria and the polities of the Zagros Mountains. This strategic position contributed significantly to the kingdom's political influence, economic prosperity, and cultural development. By integrating archaeological evidence with regional chronology, Hassanzadeh further distinguishes the formative phases of Mannaean civilization from the subsequent period in which the kingdom became incorporated into the Median political sphere. Consequently, this study represents one of the principal references for understanding the archaeology and cultural development of the Mannaean kingdom in the northwestern Zagros. Although these studies have substantially advanced understanding of Mannaean archaeology and archaeological iron corrosion, comprehensive archaeometallurgical investigations integrating manufacturing technology, alloy characterization, microstructural analysis, and corrosion mechanisms in copper-based artifacts from Qalaichi remain lacking. The present study seeks to address this research gap through a multidisciplinary analytical approach combining metallography, SEM–EDS, XRD, and complementary archaeometallurgical methods.

Materials and Methods

This study examined nine archaeological samples recovered from Qalaichi Tepe (Fig. 1a–i).

- Methods

A multidisciplinary analytical approach was adopted to investigate the manufacturing technology, microstructural characteristics, chemical composition, and corrosion processes of archaeological metal artifacts recovered from Qalaichi Tepe. The analytical protocol comprised optical

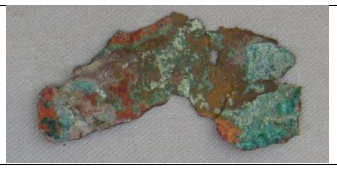
		
a	b	c
Specimen: M-A-1, a ring with a diameter of 5.6 cm. Maximum thickness 0.5 cm, minimum thickness 0.23 cm. weighs 240 g.	Sample: M-A-4, weighing 7.2 g and 0.7 mm thick; its diameter is 3.9 cm at the widest point and 1.4 cm at the narrowest point.	Sample M-B-1: Weight 4 g, thickness 5 mm, length approximately 5 cm; active chlorine corrosion.
		
d	e	f
Sample M-B-2: Weighing 3.2 g and 0.5 mm thick, with a small, attached sheet fragment; shows blue, green, brown, and black corrosion. Dimensions: 3.5 cm in length and 2 cm in width.	Specimen M-B-3: A bronze specimen weighing 4.2 g and 0.7 mm thick; dimensions are 3.3 cm in length and 1.7 cm in width; exhibits corrosion in green, blue, brown, black, and orange hues.	Sample M-B-4: A small sheet fragment weighing 0.9 g, with a thickness of 0.5 mm, a length of 1.9 cm, and a width of 1.5 cm; showing areas of black, dark green, light green, brown, and blue corrosion.
		
g	h	i
Specimen M-B-5: Thickness 1.1 mm, weight 0.8 g, length 2 cm, and width 1 cm. Corrosion products appear in pale green, dark green, brown, white, and black.	Sample M-B-6: Weight 0.8 g; thickness 1 mm; dimensions 1.2 cm by 1 cm; featuring pale green powdery, white, and brown corrosion products.	Specimen M-B-7: Weighing 0.6 g with a thickness of 1.2 mm, a length of 1.6 cm, and a width of 1.3 cm; showing pale powdery green, dark green, and brown corrosion.

Fig. 1: (A–I), Nine sample fragments recovered from Qalaychi Tepe (Authors, 2025). ▶

microscopy (OM), metallographic examination, scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM–EDS), and X-ray diffraction (XRD). These complementary techniques were applied to characterize the manufacturing technology, alloy composition, microstructure, corrosion products, and deterioration mechanisms of the artifacts.

Optical Microscopy (OM): Optical microscopy was initially employed as a rapid, non-destructive technique for the preliminary examination of the archaeological specimens. This approach enabled characterization of surface morphology, corrosion layers, surface deposits, and deterioration features prior to destructive sampling. Optical microscopic observations provided essential information on the preservation state of the artifacts and facilitated the selection of representative areas for subsequent analytical investigations (Stewart, 2007: 79–83).

Metallographic Examination: Metallographic analysis was performed to characterize the microstructure and manufacturing technology of the artifacts. Representative samples were mounted in epoxy resin, ground

with progressively finer silicon carbide abrasive papers, polished using diamond suspensions, and chemically etched to reveal their metallographic structure. Examination by reflected-light microscopy provided information on manufacturing processes such as casting, cold working, hot working, annealing, and other thermomechanical treatments, as well as alloy composition, grain morphology, and corrosion-induced microstructural alterations (Scott, 1991: 70–72). Metallographic observations were conducted using an OGAWA SEIKI Co., Ltd. MR-11 reflected-light metallurgical microscope at the Art University of Isfahan.

SEM–EDS: Scanning electron microscopy (SEM) was employed to examine the surface morphology and microstructural features of the archaeological metal artifacts at high magnification. Unlike optical microscopy, SEM employs a focused electron beam to generate high-resolution images of the specimen surface (Frahm, 2014). When coupled with energy-dispersive X-ray spectroscopy (EDS), SEM enables qualitative and semi-quantitative elemental analysis of both the metallic substrate and corrosion layers, providing valuable information on alloy composition, manufacturing technology, and corrosion processes. SEM–EDS analyses were conducted at the Razi Applied Science Foundation using a TESCAN MIRA3 scanning electron microscope equipped with an energy-dispersive X-ray spectroscopy (EDS) detector.

XRD: X-ray diffraction (XRD) analysis was conducted to identify the crystalline phases present in the corrosion products. As an established technique for phase identification in archaeological metals, XRD enables characterization of crystalline corrosion compounds by comparing their diffraction patterns with standard reference databases. Powdered corrosion samples were analysed using a Bruker D8 ADVANCE X-ray diffractometer (Bruker AXS, Germany) at the Central Laboratory of the University of Isfahan.

Results and Discussion

- Microstructural Characterization

Sample M-A-1: In Figure 2a (before etching), the yellowish matrix and its metallic luster are clearly visible. Several phases with distinct colors are observed within the metallic matrix, together with blue-gray regions corresponding to sulfide inclusions and intergranular corrosion products (see the SEM–EDX analysis for further details).

In the etched microstructure of the sample (Fig. 2b), recrystallized grains and annealing twins are clearly visible. In several regions, the

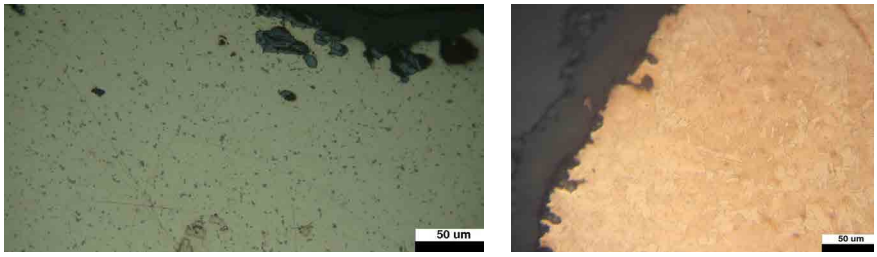


Fig. 2: Optical micrographs of sample M-A-1: (a) before etching and (b) after etching (100×). (Authors, 2025). ▶

twin boundaries exhibit a curved morphology, indicating that the object underwent multiple cycles of mechanical working and annealing during manufacture. The presence of well-developed annealing twins further suggests that annealing constituted the final stage of the manufacturing process (Scott, 1991: 5–6). Sample M-A-4: In Figure 3a, the yellowish metallic matrix and its metallic luster are clearly visible. Elongated blue-gray sulfide inclusions are distributed within the matrix. The gray and black phases correspond to intergranular and grain-boundary corrosion. Grain-boundary corrosion has progressed to such an extent that the fine-grained microstructure of the sample is clearly discernible in several areas.

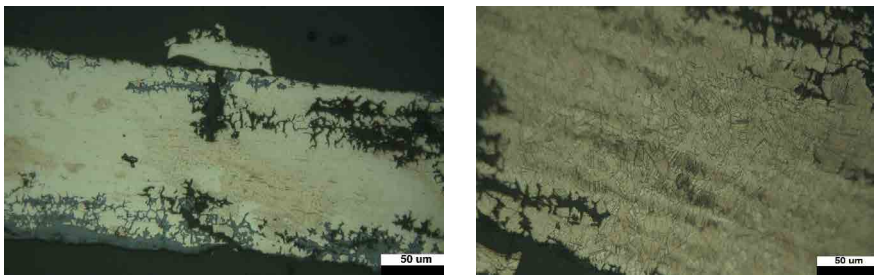
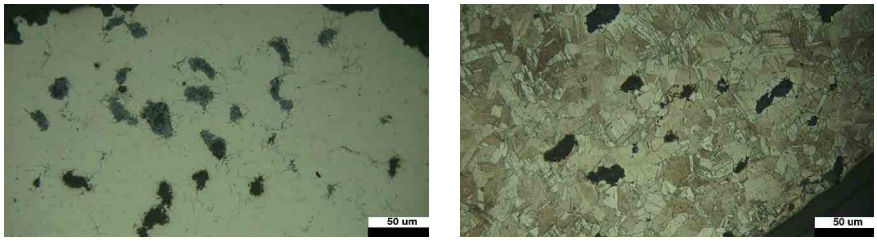


Fig. 3: Optical micrographs of sample M-A-4: (a) before etching (100×) and (b) after etching (200×), (Authors, 2025). ▶

In the etched microstructure of sample M-A-4 (Fig. 3b), recrystallized grains, annealing twins, and pronounced deformation (strain) bands are clearly observed. The twin boundaries exhibit extensive bending and fragmentation, indicating that the artifact experienced repeated cycles of mechanical working. Based on the pronounced deformation features and the morphology of the twin boundaries, the final stage of manufacture is interpreted to have been cold working (Oudbashi and Davami, 2014: 7–10).

Sample M-B-1: In Figure 4a (before etching), black and gray phases are visible together with grain-boundary and intergranular corrosion. Corrosion has progressed to such an extent that twin boundaries and deformation bands are clearly discernible in several grains.

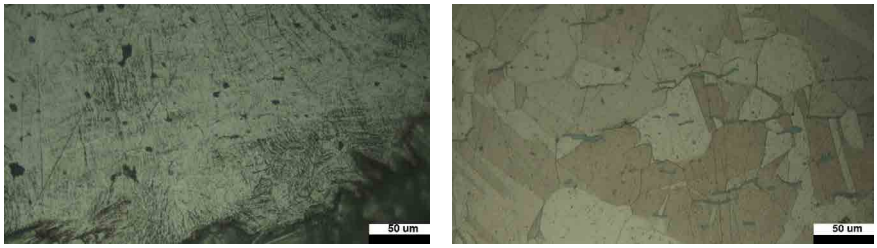
In the etched microstructure of sample M-B-1 (Fig. 4b), recrystallized grains, annealing twins, and deformation bands are clearly observed. These microstructural features indicate that the object underwent multiple cycles of mechanical working and annealing. The presence of deformation bands



◄ Fig. 4: Metallographic micrographs of sample M-B-1: (a) before etching (100×) and (b) after etching (100×), (Authors, 2025).

within the grains further suggests that cold working constituted the final stage of manufacture. Variations in grain size across the microstructure indicate that different regions of the object were subjected to different degrees of mechanical deformation.

Sample M-B-2: In Figure 5a (before etching), the yellowish metallic matrix is clearly visible. Elongated sulfide inclusions are distributed throughout the matrix, together with abundant black intergranular corrosion products. The matrix also contains numerous fine pores. In cast metals, such porosity and voids may result from gases dissolved in the molten metal or from interdendritic shrinkage cavities that were not completely filled during solidification (Scott, 1991: 5–6).



◄ Fig. 5: Metallographic micrographs of sample M-B-2: (a) before etching (200×) and (b) after etching (400×), (Authors, 2025).

In the etched microstructure of sample M-B-2 (Fig. 5b), coarse recrystallized grains and well-developed annealing twins are clearly observed. The presence of annealing twins indicates that annealing constituted the final stage of the manufacturing process. The elongated sulfide inclusions suggest that the artifact underwent repeated cycles of mechanical working, while the fragmented and distorted twin boundaries further support this interpretation. The pronounced grain coarsening indicates that the object was subjected to prolonged heat treatment at an elevated temperature, resulting in the development of a coarse-grained microstructure (Scott, 1991: 7). Sample M-B-3: In Figure 6a, the matrix exhibits a yellowish appearance with a distinct metallic luster. Blue-gray, black, and gray phases are observed throughout the microstructure. According to the SEM–EDS analysis, the elongated inclusions distributed along the matrix are identified as sulfide inclusions. In addition, intergranular and grain-boundary corrosion, together with numerous fine, rounded pores, are clear.

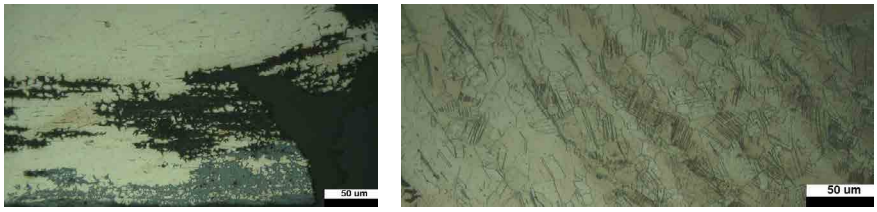


Fig. 6: (a) Metallographic micrograph of sample M-B-3 before etching, at 200×. (b) Metallographic micrograph of sample M-B-3 after etching, at 400×, (Authors, 2025). ▶

The etched microstructure of sample M-B-3 (Fig. 6b) consists of recrystallized grains, annealing twins, and deformation bands. The presence of deformation bands indicates that mechanical working constituted the final stage of the manufacturing process, suggesting that no final annealing treatment was performed. The bent and fragmented twin boundaries, together with the very fine grain structure and elongated sulfide inclusions, indicate that the artifact underwent numerous cycles of mechanical working.

Sample M-B-4: Figure 7a (before etching) reveals a metallic matrix containing gray and black phases associated with intergranular and grain-boundary corrosion. In addition, blue-gray phases corresponding to highly elongated sulfide inclusions are clearly observed.

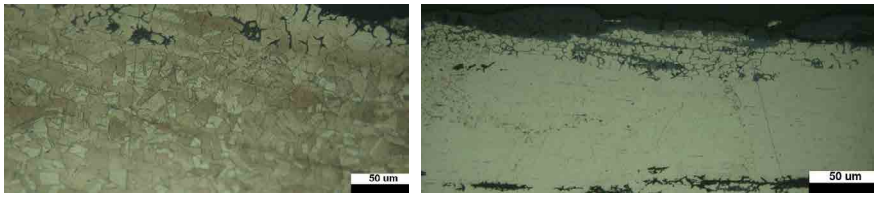
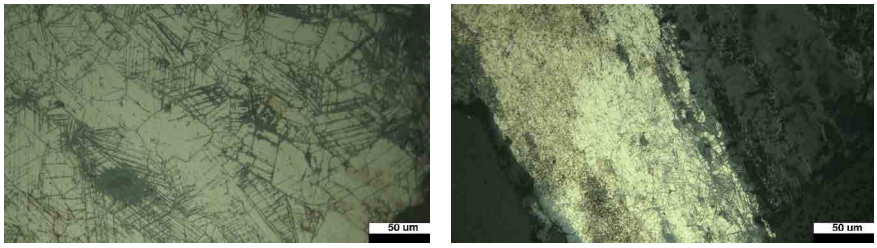


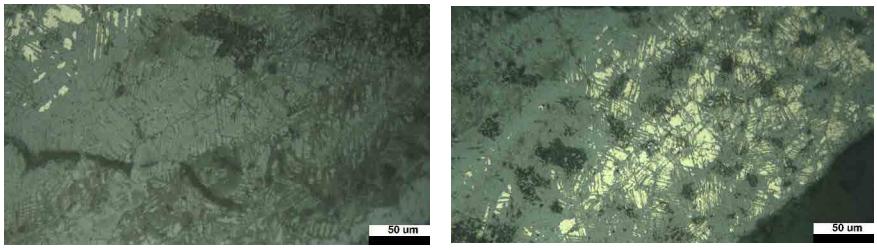
Fig. 7: (a) Metallographic micrograph of sample M-B-4 before etching, at 100× n. (b) Metallographic micrograph of sample M-B-4 after etching, at 200×. (Authors, 2025). ▶

In the etched microstructure of the sample (Fig. 7b), recrystallized grains, along with annealing twins and deformation lines, are clearly visible. In some regions, the annealing twins appear bent or discontinuous. Deformation lines observed within the grains may indicate that the artifact underwent mechanical working as the final stage of manufacture. This suggests that the object either did not undergo a final annealing treatment after deformation, or that the final annealing was insufficient to completely eliminate the deformation features. Consequently, a limited number of deformation lines remain preserved within the grains (Scott, 1991: 5–6). Sample M-B-5: As shown in Figures 8a and 8b, the sample exhibits extensive intergranular and grain boundary corrosion throughout the entire cross-section. The high degree of corrosion has naturally revealed the deformation lines, annealing twins, and the fine-grained microstructure, effectively producing a naturally etched surface. Consequently, no additional chemical etching was required prior to metallographic examination.

At higher magnification (Fig. 8b), the grain structure is more clearly resolved. The widespread presence of deformation lines further indicates

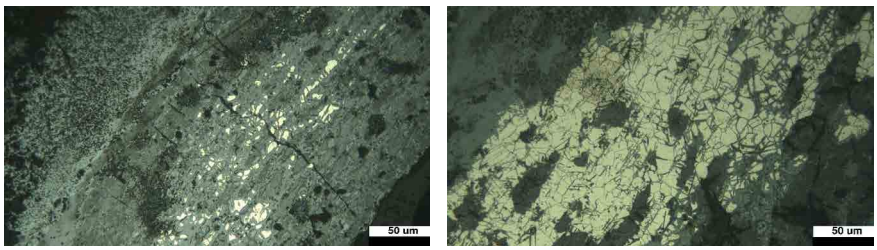


◄ Fig. 8: (a) Metallographic micrograph of sample M-B-5 in unetched condition, at 100× (b) Metallographic micrograph of sample M-B-5 in the unetched condition, at 400×. (Authors, 2025).



◄ Fig. 9: (a) Metallographic micrograph of sample M-B-6 in unetched condition, at 200×. (b) Metallographic micrograph of sample M-B-6 in unetched condition, at 200×. (Authors, 2025).

that mechanical working, most likely hammering, constituted the final stage of the manufacturing process. The yellow-colored phase represents remnants of the original grain structure within the metallic matrix that has not yet undergone corrosion. Extensive corrosion has preferentially attacked the grain boundaries, making them clearly distinguishable. Traces of deformation lines are also visible, suggesting that the artifact underwent mechanical working, most likely hammering, as the final stage of manufacture. Furthermore, Figure 9b illustrates that the corrosion features have effectively revealed the microstructure. In this image, the grains, grain boundaries, and corrosion-induced cracks are clearly discernible. Localized intergranular and grain boundary corrosion can be observed in several regions of the sample. The micrograph reveals gray and black corrosion products, together with the yellow-colored grains of the metallic alloy. Corrosion-induced surface features and fine cracks are also evident. P20-R20.



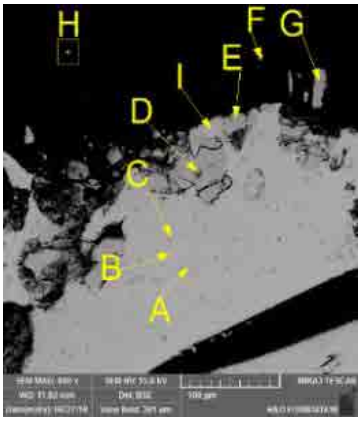
◄ Fig. 10: (a) Metallographic micrograph sample M-B-7 in unetched condition, at 200×. (b) Metallographic micrograph of sample M-B-7 in unetched condition, at 100×. (Authors, 2025).

Scanning Electron Microscopy (SEM–EDS)

Scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM–EDS) was employed to perform semi-quantitative elemental analyses at selected locations on the archaeological specimens. The elemental data obtained from SEM–EDS were used to characterize the

corrosion state of the samples and to identify the distribution of the major elements within the metallic substrate and corrosion products.

MA1



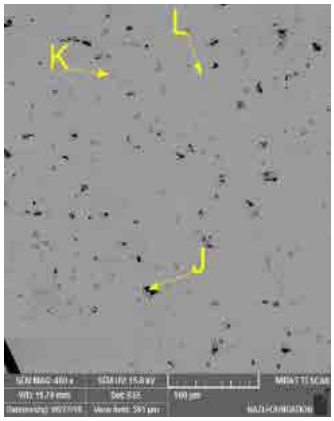
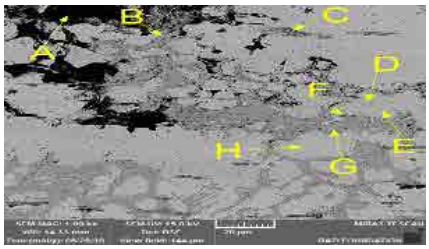


Fig. 11: SEM micrographs (a–r) and corresponding EDS elemental compositions of the studied samples, expressed as weight percentages (wt.%), (a), (Authors, 2025). ▶
Fig. 11: (b), (Authors, 2025). ▶▶

Table 1-1: Elemental analysis results of the sample expressed as weight percentages (Authors, 2025). ▶

M-A-1	A	B	C	D	E	F	G	H	I	J	K	L	M
S	1.40	1.87	17.69	1.50	1.87	0.97	4.58	0.90	2.47	10.40	20.01	1.99	0.00
C								72.79					
Cu	96.82	95.84	80.01	84.56	82.69	80.64	76.75	0.61	95.90	86.77	76.81	95.62	45.00
Zn	0.47	0.63	0.60	0.67	0.50	0.45	0.46	0.51	0.49	0.54	0.54	0.65	1.01
Sn	1.31	1.18	0.85	0.52	0.69	0.77	1.57	0.34	0.99	1.18	0.92	0.76	1.34
Pb		0.48			0.00	0.75	2.46	0.00	0.00			0.68	52.23
Fe			0.84	0.14	0.12	0.15	0.13	0.20	0.15	0.78	1.72	0.29	0.42
O				12.61	14.11	14.49	12.44	24.47					
Cl						1.78	1.60	0.18		0.32			

MA4



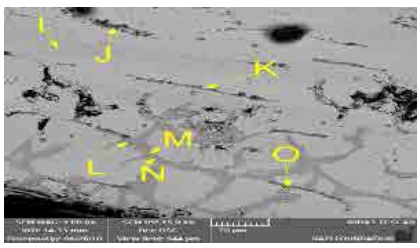
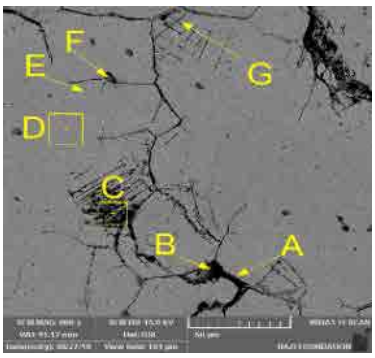


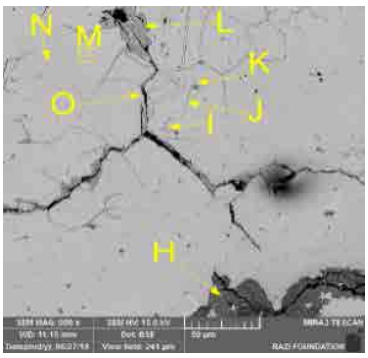
Fig. 11: (c), (Authors, 2025). ▶
Fig. 11: (d), (Authors, 2025). ▶▶

Table 1-2: Elemental analysis results expressed as weight percentages (wt.%), (Authors, 2025). ▶

M-A-4	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
C	58.78					54.40										
O	6.77	17.31	8.05	3.89	20.29	5.42	19.28			8.97		15.49	21.99	20.67	10.69	14.28
S	0.97	0.77	13.99		2.50	1.44	1.47	1.30	0.57	9.54	17.06	0.54	0.73	0.85	7.59	1.03
Ca					7.07	0.00										
P						0.23										
Cu	9.78	56.23	75.38	88.25	62.36	32.43	57.70	86.05	89.97	76.35	79.10	80.75	44.64	48.92	77.45	67.39
Zn	0.76	0.42	0.43	0.68	0.62	0.43	0.58	0.51	0.60	0.86	0.81	0.56	0.53	0.75	0.69	0.45
Sn	22.59	22.28	1.93	6.98	6.91	5.50	20.73	11.98	6.97	3.93	2.81	2.54	31.81	28.30	3.34	16.71
Fe	0.36	0.27	0.22	0.20	0.25	0.17	0.23	0.16	0.22	0.35	0.22	0.12	0.31	0.50	0.24	0.15
Pb		2.72						0.00	1.68							

MB1



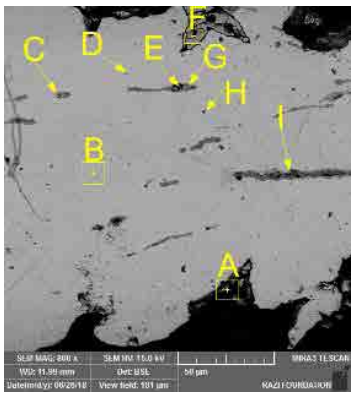


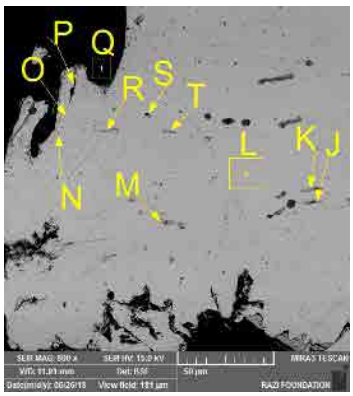
◄Fig. 11: (e), (Authors, 2025).
◄◄Fig. 11: (f), (Authors, 2025).

M-B-1	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
C	21.12	32.77			50.77									55.74	56.39		
O	1.12	3.52	13.94				13.26	34.21	12.91	11.29		16.22			3.18		
S	0.00	0.85	1.42	2.09	1.94	18.35	1.57	1.20	1.90	2.13	7.63	1.80	2.25	1.55	0.22	0.82	0.32
Cl	0.04	0.25	0.81														
Cu	66.35	46.57	44.78	81.99	38.40	79.17	78.32	26.09	70.88	70.80	88.97	57.39	79.98	36.12	35.26	4.26	37.36
Zn	0.62	0.39	0.33	0.40	0.20	0.55	0.50	0.34	0.46	0.29	0.77	0.37	0.56	0.28	0.32	0.37	0.71
Sn	10.74	15.67	36.29	15.52	8.05	1.93	6.35	35.17	13.85	15.49	2.62	22.36	17.21	6.31	4.64	2.42	10.06
Pb	0.00	0.00	2.43	0.00	0.63		0.00	0.00	0.00	0.00		1.85	0.00	0.00	0.00	0.00	51.54
Si								0.86									
Ag																92.12	
P								2.13									

◄ Table 1-3: Elemental analysis results expressed as weight percentages (wt.%), (Authors, 2025).

MB2





◄Fig. 11: (g), (Authors, 2025).
◄◄Fig. 11: (h), (Authors, 2025).

M-B-2	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
C	57.29			42.50	51.07									35.84	16.02	54.67	29.21
O	14.09		8.47		4.73	12.41		23.16		22.09							
S	1.41	0.63	9.60	1.13	4.15	0.94	18.04	1.41	12.85	6.22	19.33	0.40	19.92	1.13	1.25	0.60	0.68
Fe								43.95	0.21	43.12	0..22	0.11	0.13	0.08	0.07	0.11	0.24
CU	25.85	93.59	74.18	54.76	37.05	84.23	80.09	28.30	85.26	27.06	78.62	95.09	78.41	61.08	80.33	43.88	68.98
Zn	0.20	0.71	0.31	0.39	0.18	0.52	0.37	0.38	0.69	0.34	0.82	0.73	0.50	0.54	0.53	0.33	0.63
Sn	1.17	2.62	2.19	1.21	0.84	1.89	1.49	0.76	0.98	1.17	1.00	1.39	1.05	0.86	1.37	0.42	0.26
Pb	0.00	2.45	5.25	0.00	1.99	0.00		2.04		0.00		2.29		0.46	0.43	0.00	0.00

◄ Table 1-4: Elemental analysis results expressed as weight percentages (wt.%), (Authors, 2025).

MB3

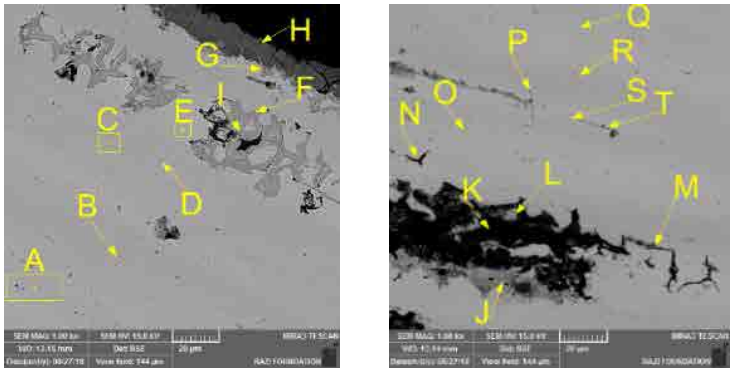


Fig. 11: (i), (Authors, 2025). ▶
Fig. 11: (j), (Authors, 2025). ▶▶

Table 1-5: Elemental analysis results expressed as weight percentages (wt.%), (Authors, 2025). ▶

MB3	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
C				3.02							64.50			52.04		55.50		44.72		
O						15.85	12.36	34.95	13.68	16.93	13.50									
S	0.67	10.95	0.62	1.18	0.18	0.43	0.28	0.57	5.42	0.84	0.43	1.02	17.25	0.37	10.34	1.50	1.34	0.20	1.39	18.19
Si								1.45												
Cl							1.86	0.60		0.73	0.87	0.86	1.04	0.03	0.23	0.23	0.31	0.18	0.36	0.41
Fe															3.39	0.12	0.13	0.13	0.23	1.23
Cu	85.41	83.42	88.10	85.52	84.45	73.45	71.88	56.86	47.57	68.54	16.00	86.87	76.40	42.92	29.78	55.15	86.42	49.42	84.11	77.41
Zn	0.89	0.62	0.62	0.62	0.65	0.62	0.95	0.42	0.52	0.55	0.60	0.67	0.62	0.36	0.61	0.39	0.39	0.41	0.54	0.47
Sn	12.51	5.01	9.14	5.61	12.05	8.65	6.91	25.69	27.65	10.60	4.02	9.54	2.68	4.29	5.67	4.25	11.42	4.13	10.85	2.28
Pb	0.53		1.52	0.00	2.66	1.00	1.37	1.62	5.36	1.81	0.50	1.04		0.00		2.87	0.00	0.81	2.53	

MB4

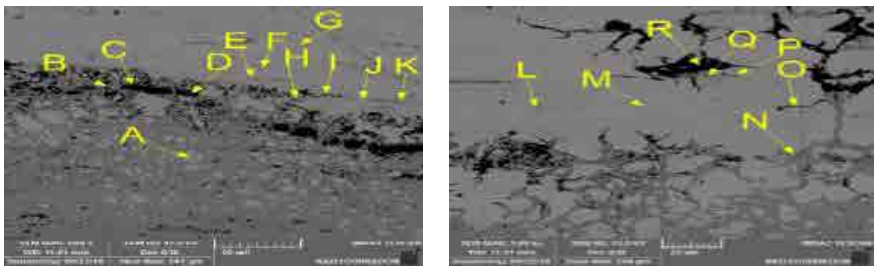
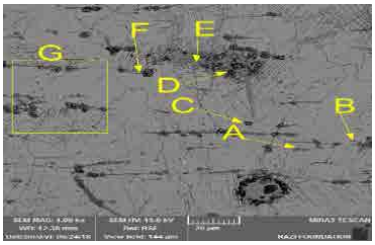


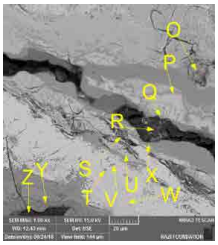
Fig. 11: (k), (Authors, 2025). ▶
Fig. 11: (l), (Authors, 2025). ▶▶

Table 1-6: Elemental analysis results expressed as weight percentages (wt.%). (Authors, 2025). ▶

MB4	A	D	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
Si	0.44	0.45	0.00	0.03														
S	0.83	2.13	0.00	0.06	13.24	1.28	1.31	0.86	3.15	12.84	15.10	5.74	13.18	1.96	8.40	1.05	8.89	0.84
C			45.73	56.75		47.33	29.88											37.13
O			1.34	4.61				16.36						16.50		10.50		7.42
Ca			0.08	0.06														
Cl				0.34				0.78	0.05									
Fe													2.22	0.34				
Cu	84.61	80.34	51.61	37.40	81.75	45.16	61.04	63.56	74.25	80.57	79.93	84.94	79.42	62.50	83.46	56.42	84.41	29.50
Zn	0.44	0.79	0.68	0.26		0.39	0.35	0.44	0.55	0.74	0.85	0.81	0.48	0.57	0.50	0.28	0.62	0.35
Sn	11.82	15.99	0.56	0.48	5.01	5.43	5.66	17.34	22.00	6.05	4.14	8.52	4.71	18.52	7.04	30.71	6.08	24.79
Pb	2.02	0.00	0.00	0.00		0.41	1.75	0.69	0.00					0.00		1.04		0.00

MB5





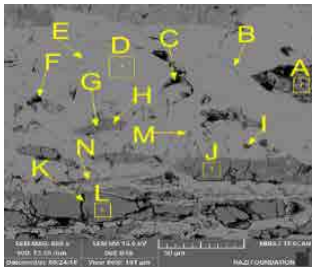
◄Fig. 11: (m), (Authors, 2025).
◄◄Fig. 11: (n), (Authors, 2025).

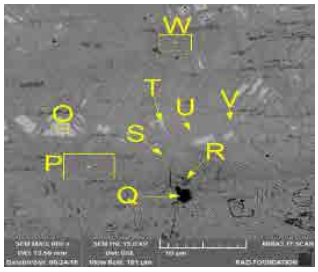
MB-5	A	A1	B	B1	C	C1	D	D1	E	E1	F	F1	G	H	I	J
C		24.07		28.04											29.85	
O		20.34	9.71	18.87	10.52	13.85	16.46	12.04	23.08					13.46	13.43	36.52
S	16.04	0.51		0.41	2.34		1.19		0.37	19.08	15.16	0.00	0.78	0.22	0.30	0.31
P	0.13	1.56	1.89	1.83	0.39		0.95		1.07		0.27		0.40	0.75	2.34	6.28
Si	0.00	1.56	0.45	0.91	0.27	0.29	0.58	0.05	0.35		0.11		0.24	0.19	1.55	1.08
Fe		0.28		0.31			1.01		0.95							
K																
Ca		1.23		1.22	2.02		0.00		0.00							
Cl		0.27		0.22												
Cu	79.34	8.78	63.50	12.93	77.26	84.43	48.36	86.61	33.07	76.67	77.36	0.00	80.23	81.25	3.53	13.12
Zn	0.30	0.37	0.54	0.44	0.67	0.64	0.55	0.84	0.33	0.86	0.74	0.00	0.52	0.57	0.48	0.46
Sn	3.99	40.83	20.28	34.83	3.18	0.79	29.02	0.46	35.81	3.39	6.36	0.00	16.10	1.50	55.03	39.59
Pb			3.44		3.35		2.11		2.93				1.75	2.07	1.49	2.64

	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
C			68.99		33.26			36.43	31.18							73.63
O	18.13	36.38	10.03		16.60	36.11	32.31	9.63	22.57	23.47	34.88	27.38	13.70	43.50	33.23	16.14
S	0.19	0.38	3.39	1.60	0.24	0.21	0.42	0.61	1.85	1.35	1.09	2.19		0.42	0.42	0.16
P	0.93	6.63	0.47	1.30	4.88	1.85	2.03	0.50	0.82	4.99	4.14	1.25		1.16	13.70	2.65
Si	0.31	1.27	0.19	0.44	0.62	0.64	0.97	0.14	0.29	0.60	0.96	0.07	0.68	0.31	0.20	0.07
Fe										0.17	0.52	0.11	0.13		0.13	0.21
K															1.48	0.00
Ca									0.35	1.40		0.11		0.40	4.88	0.25
Cl										1.95		5.28			4.37	0.16
Cu	75.85	10.07	13.88	70.23	12.23	38.26	33.28	11.05	35.88	65.21	22.03	62.64	83.98	39.13	38.56	5.30
Zn	0.63	0.42	0.66	0.42	0.41	0.36	0.50	20.01	0.33	0.55	0.43	0.58	0.61	0.43	0.60	1.03
Sn	2.64	42.10	2.59	24.30	30.15	21.14	29.07	0.78	6.74	0.32	34.40	0.34	0.93	12.52	0.24	0.39
Pb	1.30	2.75	0.00	1.81	1.62	1.43	1.42	0.85	0.00		1.55			1.93		

◄ Table 1-7: Elemental analysis results expressed as weight percentages (wt.%). (Authors, 2025).

MB6





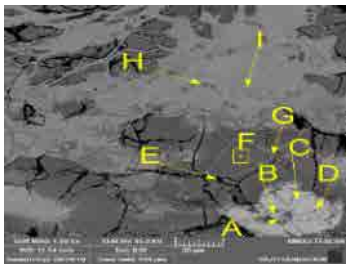
◄Fig. 11: (o), (Authors, 2025).
◄◄Fig. 11: (p), (Authors, 2025).

MB-6	A	A1	B	B1	C	C1	D	D1	E	E1	F	G	H	I	J	K
C					67.18						66.49	24.41				
O	32.73		10.94		6.29			40.70		46.82	5.36	25.37	38.47	11.55	37.02	34.22
S	0.64	0.10	0.00	14.45	0.02	0.81	0.23	0.36	0.25	0.36	0.11	2.32	0.35	0.00	0.49	0.55
Si	1.83	0.40	0.08	0.48	0.00	0.74	0.55	10.96	0.51	6.15	0.07	1.26	1.11	0.22	1.72	0.95
P	4.06	0.54	1.29	0.99	0.18	1.82	0.70	1.10	0.76	9.89	0.30	3.59	6.35	1.18	5.43	5.86
Ca										5.39						
Cu	11.65	79.00	84.30	72.82	6.23	59.56	93.88	41.31	93.22	29.86	26.78	14.86	11.54	83.25	12.53	13.80
Zn	0.22	0.50	0.72	062	0.10	0.74	0.49	0.36	0.61	0.40	0.35	0.34	0.42	0.54	0.37	0.59
Sn	46.82	17.26	1.21	11.14	0.02	36.32	1.36	3.39	1.83	1.16	0.24	28.34	37.54	1.33	39.31	42.29
Pb	2.05	2.21	1.46		0.00		2.80	1.61	2.72	1.97	0.30	0.00	4.22	1.93	3.31	1.75

MB-6	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
C						39.35				39.00	21.54				
O	39.44	14.04			23.43	12.79	23.52	28.30		12.21	15.91	24.26		23.57	14.44
S	0.31	0.00	17.96	1.83	0.97	0.35	0.78	0.32	0.18	0.06	0.80	0.30	17.63	0.51	10.02
Si	1.15	0.18			0.88	0.80	2.06	1.14	0.39	0.17	0.26	0.94		1.08	0.82
P	6.50	1.17					2.68	1.51	0.66	0.32	0.30	1.21		1.24	1.12
Ca															
Cu	11.66	81.65	82.04	81.91	48.52	12.16	18.29	29.98	81.64	37.79	45.87	43.81	76.16	46.88	61.20
Zn	0.43	0.57		0.46	0.69	0.60	0.39	0.49	0.58	0.31	0.30	0.39		0.51	0.47
Sn	37.87	0.82		15.81	23.75	32.39	50.32	35.93	13.84	8.71	13.28	26.53	6.21	24.43	12.05
Pb	2.64	1.58		0.00	1.77	1.55	1.56	2.32	2.71	1.41	1.75	2.35		1.79	0.00

◄ Table 1-8: Elemental analysis results expressed as weight percentages (wt.%). (Authors, 2025).

MB7



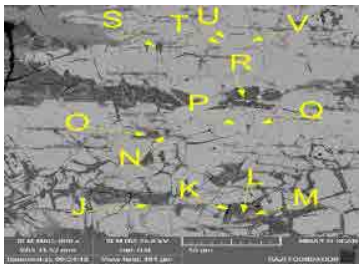


Fig. 11: (q), (Authors, 2025). ▶
Fig. 11: (r), (Authors, 2025). ▶▶

Table 1-9: Elemental analysis results expressed as weight percentages (wt.%), (Authors, 2025). ▶

MB-7	A	A1	B	B1	C	C1	D	D1	E	E1	F	G	H	I	J	K
C									35.36							
O		32.63		35.03	17.60		18.80	26.47	20.97		37.36					34.48
S	34.31	0.25	0.70	0.32	0.10	0.33	0.40	0.10	2.14	0.00	0.30	21.66	11.56	0.00	17.81	0.22
Si	0.37	1.93	0.22	2.45	0.67	0.92	0.15	2.26	0.60	0.43	1.36	0.37	0.73	0.47	0.32	1.02
P		3.57		3.99		1.60		0.99	2.90	0.42	5.81	0.59	1.04	1.68	0.63	7.10
Cl										6.23						
Cu	78.76	12.53	82.43	8.77	55.83	81.27	53.18	35.63	15.45	13.28	8.45	73.76	65.11	92.55	77.82	12.05
Zn	0.70	0.60	0.52	0.49	0.61	0.47	0.53	0.33	0.32	0.35	0.35	0.60	0.56	0.42	0.56	0.46
Sn	5.86	46.69	14.26	46.07	23.74	12.12	26.33	31.08	29.23	6.03	43.75	3.01	20.85	1.96	2.85	41.77
Pb		1.80	1.88	2.38	1.43	3.29	0.22	3.14	0.00	73.20	2.62			2.92		2.89

MB-7	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
C															
O	27.76	23.64	5.13	27.03				20.38		10.11					
S	0.74	0.37	16.23	0.62	0.74	0.56	0.65	0.82	0.60	0.44	0.73	0.66	0.38	0.31	0.14
Si	1.36	1.92	0.17	0.79	0.54	0.18	2.13	0.54	0.29	0.12	0.21	0.51	1.25	0.25	0.16
P	3.12	0.75	0.34	5.51	0.40	0.20	9.25	4.95	0.35	0.29	0.36	0.54	0.66	0.30	0.33
Cl															
Cu	31.15	43.15	75.86	25.42	79.43	79.86	22.45	34.71	81.24	67.15	81.42	79.71	64.70	82.20	82.08
Zn	0.34	0.36	0.65	0.43	0.74	0.73	0.56	0.51	0.44	0.51	0.47	0.52	0.55	0.46	0.52
Sn	33.58	27.05	1.63	38.35	16.32	16.51	60.98	35.59	14.69	19.16	15.29	16.31	30.29	14.76	15.06
Pb	1.97	2.78		1.86	2.04	1.96	3.98	2.69	2.38	2.22	1.52	2.14	2.18	1.75	1.66

Sample M-A-1. Inclusions, corrosion products, lead globules, pores, and cracks are visible in Figure 11a, b. The backscattered electron (BSE) images exhibit a range of gray, black, and white tonal contrasts (Fig. 11a, b). EDS point analyses identified the chemical composition of the different regions of the specimen (Table 1-1). Point analysis at locations A, B, I, and L indicate that the metallic matrix consists predominantly of copper. The tin content is very low, occurring only in trace amounts, which most likely reflects its natural presence in the original copper ore rather than intentional alloying. These points also exhibit consistently high copper concentrations, with only minor variations between them. Small amounts of zinc and lead were also detected and are interpreted as naturally occurring impurities derived from the original ore. Point analyses at locations C, J, and K, corresponding to the dark gray inclusions, revealed the presence of copper and sulfur as the principal elements. This elemental composition is consistent with sulfide inclusions, suggesting that sulfide copper ores may have been used during smelting (Fig. 11b). The black regions at points D, E, F, and G contain significant amounts of copper together with relatively high oxygen concentrations. The decrease in copper content accompanied by an increase in oxygen is indicative of corrosion processes affecting these

areas. Furthermore, chlorine was detected at points F and G, most likely reflecting the influence of the burial environment and its role in promoting corrosion. Trace amounts of zinc, tin, lead, and iron were also identified at these locations, which are likewise interpreted as natural impurities inherited from the original ore (Craddock, 1995: 243).

Sample M-A-4. Fine corrosion-induced cracks and inclusions are visible in Figures 11c and 11d. EDS analyses indicate that the principal elements detected at points A and F are carbon, oxygen, copper, and tin. The high carbon content, together with the marked depletion of copper and the presence of oxygen, indicates that active corrosion processes have occurred in these regions. Minor amounts of iron, zinc, sulfur, and phosphorus were also identified. Iron, zinc, and sulfur most likely originated as natural impurities in the original ore or were present as minor alloying constituents. The chemical compositions at points D, H, and I indicate that the metallic matrix is a bronze alloy. The high copper content accompanied by significant amounts of tin confirms the bronze composition of the alloy. Oxygen detected at point D may be associated with the initial stages of corrosion or surface alteration. Trace amounts of lead, iron, and zinc were also detected at these locations and are interpreted as impurities originating from the primary ore. The EDS analyses at points B, E, G, M, N, and P show a similar elemental composition, although with some variation in elemental concentrations. In these regions, the decrease in copper, accompanied by increased oxygen and tin contents, clearly reflects the effects of corrosion. Trace quantities of lead, iron, zinc, and sulfur were likewise identified and are attributed either to primary ore impurities or to the incorporation of foreign materials during the smelting process. The chemical composition at point L is comparable to that of the other regions, except that the tin concentration is relatively lower. The high copper content, together with the presence of oxygen, indicates the occurrence of surface corrosion in this area. The gray regions at points C, J, K, and O are characterized by high sulfur concentrations coupled with elevated copper contents. This elemental composition is most likely attributable to sulfide inclusions retained from the original copper ore or to incompletely reduced sulfide residues that became elongated within the metallic matrix during subsequent thermomechanical processing (Rostoker *et al.,* 1989: 69–87).

Sample M-B-1. Cracks, intergranular corrosion, and strain lines adjacent to corrosion cracks within the metallic matrix are visible in Figures 11e and 11f. EDS analyses of the black regions at points A, B, N, and O (Table 1-3) indicate similar chemical compositions. The principal

elements detected at these locations are copper, tin, and carbon. The high carbon content most likely derives from the epoxy mounting resin, carbon coating applied for SEM analysis, or carbonaceous contamination associated with corrosion products. Accordingly, the carbon signal should not be interpreted quantitatively or regarded as representative of the alloy composition. Oxygen was detected only in minor amounts, primarily at points A, B, and O. In addition, trace amounts of chlorine, sulfur, zinc, and lead were identified and are most likely attributable to impurities inherited from the original ore or introduced during metallurgical processing. Points C, G, H, I, J, and L also exhibit relatively uniform elemental compositions. The elevated oxygen and tin contents, accompanied by a decrease in copper, indicate advanced corrosion in these regions. This pattern may be attributed to the selective dissolution of copper and its migration into the surrounding environment, while the relative stability of tin under burial conditions results in its apparent enrichment within the alloy (Robbiola *et al.,* 1998: 2083–2111). At point C, a relatively high concentration of lead was detected. Minor amounts of chlorine, sulfur, and zinc were also present in these regions, most likely reflecting impurities derived from the original ore or introduced during metal extraction and smelting. Points D and M represent the primary metallic matrix of the specimen and exhibit high concentrations of copper and tin, confirming the bronze composition of the alloy. In contrast, points F and K contain significant concentrations of sulfur and copper, indicating the presence of sulfide inclusions within the alloy. The small amount of tin detected in these areas may reflect analysis across the interface between the sulfide inclusion and the surrounding metallic matrix. At point P, silver was identified as the dominant element, suggesting that it was retained as a natural impurity originating from the primary ore. Finally, point Q, characterized by a high lead content together with appreciable amounts of tin and copper, was identified as a lead globule. Such globules likely result from localized phase segregation during alloy solidification or represent remnants of the ancient smelting process (Scott, 1991: 23–24).

Sample M-B-2. Extensive corrosion, abundant porosity, and elongated inclusions are visible in Figures 11g and 11h. EDS point analyses of the black regions (points A, D, E, N, O, P, and Q) reveal high carbon contents accompanied by a marked depletion of copper in areas showing advanced corrosion of the metallic matrix. The elevated carbon signal is most likely attributable to the epoxy mounting resin, carbon coating applied for SEM examination, or carbonaceous contamination associated with the corrosion

products and should therefore not be interpreted quantitatively. At points A and E, elevated oxygen concentrations were also detected, further supporting the interpretation that oxidative corrosion processes played a major role in the deterioration of the metallic matrix. In contrast, analyses of points B and L, corresponding to the light-gray matrix, indicate that these regions consist predominantly of high-purity copper. Only trace amounts of tin were detected, indicating that the composition in these areas is consistent with a low-tin bronze. Points G, I, K, and M, which correspond to dark-gray inclusions, are characterized by high concentrations of sulfur and copper. This elemental association suggests the presence of copper sulfide inclusions, most likely retained following incomplete reduction of sulfide ores during smelting. Points H and J exhibit elevated concentrations of iron, oxygen, and copper, indicating advanced corrosion associated with iron-bearing phases. In particular, the high iron and oxygen contents, together with the depletion of copper, suggest ionic migration and secondary alteration processes within the burial environment. At point C, the coexistence of oxygen, sulfur, copper, and lead indicates a complex inclusion containing residual ore-derived phases. Point F, characterized by copper and oxygen, represents an area affected by oxidative copper corrosion, where the metallic surface has undergone direct oxidation. Overall, the SEM–EDS results demonstrate considerable variability in both the corrosion features and mineral inclusions within the specimen. These differences are attributable to the burial environment, the mineralogical characteristics of the original ore, and the efficiency of the ancient smelting process (Table 1-4).

Sample M-B-3. Advanced corrosion and numerous inclusions are evident in Figures 11i and 11j. EDS analyses of points A, C, E, L, Q, and S indicate that copper and tin are the predominant elements, confirming the bronze composition of the specimen. These regions contain high copper concentrations and moderate tin contents, consistent with compositions commonly reported for archaeological bronze alloys. Minor amounts of sulfur, zinc, and lead were also detected. These elements most likely originated as natural impurities in the primary ore or were incorporated into the metallic matrix during the smelting process. Points B, M, and T, which appear as elongated dark-gray inclusions, are characterized by relatively high concentrations of sulfur and copper. This elemental association is indicative of copper sulfide inclusions, suggesting that part of the sulfidic ore was incompletely reduced during smelting and therefore remained preserved within the alloy microstructure (Scott, 2002: 145–164). Trace

amounts of tin and zinc were also detected in these inclusions, reflecting either the original ore composition or the preferential stability of these elements within specific phases. Point analyses of D, K, N, P, and R reveal elevated carbon contents accompanied by marked depletion of copper and tin, indicating areas that have undergone significant corrosion. These regions were most likely altered by post-depositional chemical processes, resulting in the partial leaching of the principal metallic constituents from the alloy. A similar pattern is observed at points F, G, H, and J, where increased oxygen concentrations, together with copper depletion and relative enrichment in tin, suggest selective dissolution (decuprification) of copper and the consequent relative enrichment of tin during long-term burial. This corrosion mechanism has been widely documented in archaeological bronzes subjected to prolonged burial conditions. At point M, the coexistence of copper, tin, and a high sulfur concentration further support the presence of sulfide inclusions within the alloy. Iron was also detected at points D, P, Q, R, S, and T. Had the iron concentration been substantially higher, the original ore might have been identified as chalcopyrite ($CuFeS_2$). However, the relatively low iron concentrations observed in these regions are more reasonably interpreted as residual impurities inherited from the primary ore during the ancient smelting process (Bakhshandehfard, 2010: 151).

Sample M-B-4. The microstructure shown in Figures 11k and 11l exhibits intergranular corrosion, numerous microcracks, and fine porosity. EDS analyses of points A, B, and I revealed high concentrations of copper and tin, characteristic of bronze alloys and confirming the bronze composition of the specimen. In addition to these major constituents, trace amounts of sulfur, zinc, and lead were detected, which are interpreted as impurities inherited from the original ore or introduced during the smelting process. In contrast, points C, D, F, G, and R are characterized by elevated carbon contents and a pronounced depletion of copper, a compositional pattern consistent with corrosion. Significant amounts of tin were detected at points F, G, and R, whereas tin was present only in trace quantities at points C and D. Minor concentrations of calcium, chlorine, sulfur, silicon, and lead were also identified at these two locations. Since calcium, chlorine, and silicon are commonly associated with mineral phases, these elements were most likely incorporated into the analyzed material from the surrounding burial environment. Points E, J, K, L, M, O, and Q exhibit elemental associations of copper, tin, and sulfur, indicating the presence of sulfide inclusions within the matrix. The high copper concentrations,

together with moderate sulfur and tin contents and only trace levels of zinc (<1 wt.%), suggest a relatively high-purity bronze alloy containing residual sulfide inclusions inherited from the smelting process. At points H, N, and P, elevated oxygen concentrations accompanied by copper depletion and relative tin enrichment indicate the occurrence of oxidative corrosion and selective dissolution (decuprification) of copper. These corrosion features are consistent with prolonged interaction with the burial environment, particularly under chloride-rich conditions. The presence of chlorine at these locations suggests that chloride ions played an important role in accelerating the deterioration of the matrix. Overall, the results summarized in Table 1-6 demonstrate considerable variability in both the type and severity of corrosion throughout the specimen. They also provide evidence for the preservation of mineral inclusions originating from the primary ore, as well as chemical alterations resulting from long-term interaction with the burial environment.

Sample M-B-5. Extensive corrosion features and numerous microcracks are visible in Figures 11m and 11n. EDS analyses of points A, E1, and F reveal the presence of dark inclusions enriched in sulfur and copper. These regions correspond to copper sulfide inclusions, indicating that the sulfide ore was not completely reduced to metallic copper during the smelting process and consequently remained within the alloy as residual mineral phases. More specifically, these inclusions reflect the incomplete reduction of copper sulfides within ancient smelting furnaces. Appreciable amounts of tin were also detected at these locations, confirming that the object was manufactured from a bronze alloy. Minor quantities of zinc, silicon, and phosphorus were likewise identified. Points A1, B1, I, M, O, R, S, and Z exhibit similar elemental compositions. Compared with the metallic matrix, these regions are characterized by a marked depletion of copper accompanied by enrichment in carbon, oxygen, and, in most cases, tin. This compositional pattern is indicative of long-term corrosion processes under burial conditions. Such alterations are consistent with the selective dissolution (decuprification) of copper and its migration from the alloy, coupled with the relative enrichment and stabilization of tin in the form of tin oxides or residual metallic tin. This phenomenon has been widely described in the archaeometallurgical literature as secondary tin enrichment (Robbiola *et al.,* 1998). The occurrence of minor elements, including lead, zinc, phosphorus, sulfur, and silicon, further indicates the presence of primary ore-derived impurities retained within the alloy. Point Y exhibits a more complex elemental composition, including oxygen, phosphorus, calcium, chlorine, and copper. Some of these elements, particularly

phosphorus and calcium, were most likely introduced through prolonged interaction with burial soil and associated geochemical processes. The presence of chlorine at this location is particularly significant, as chloride ions are known to accelerate the corrosion of archaeological copper alloys, thereby contributing to the progressive structural deterioration of the artifact (Selwyn, 2006: 306–322).

Sample M-B-6. Corrosion features, microcracks, strain lines, and inclusions are clearly visible in Figures 11o and 11p. EDS analyses of points A, H, J, K, L, P, R, S, W, and Y (Table 1-8) identified oxygen, copper, and tin as the principal elements. The elevated oxygen contents, together with the depletion of copper and the relative enrichment of tin in several regions, are characteristic of oxidative corrosion and selective dissolution (decuprification) of copper during long-term burial. At points A1, C1, O, and T, the elemental composition is dominated by copper and tin, confirming that the artifact was manufactured from a tin bronze alloy. In contrast, points B1, N, and X exhibit elevated concentrations of sulfur and copper, indicating the presence of copper sulfide inclusions retained as residual ore-derived phases owing to the incomplete reduction of sulfidic copper ores during ancient smelting. Such inclusions are commonly observed in archaeological copper alloys and provide valuable evidence for reconstructing ancient metallurgical practices and identifying the nature of the raw materials used.

Sample M-B-7. Corroded regions associated with numerous microcracks are visible in Figures 11q and 11r. Points A, G, H, and J correspond to dark-gray copper sulfide inclusions. The high sulfur and copper concentrations detected at these locations indicate the preservation of residual copper sulfide inclusions within the alloy microstructure, reflecting incomplete reduction of sulfidic copper ores during smelting. EDS analyses of points A1, B1, C, D, D1, F, K, L, M, O, S, and U identified oxygen, copper, and tin as the principal elements. The elevated oxygen concentrations, accompanied by marked copper depletion and relative tin enrichment, are consistent with oxidative corrosion and selective dissolution (decuprification) of copper during prolonged burial. In contrast, points B, C1, P, Q, R, T, V, W, X, Y, and Z are dominated by copper and tin, confirming that the object was manufactured from a tin bronze alloy. Overall, the elemental distributions indicate that the specimen underwent extensive post-depositional alteration while retaining clear evidence of its original alloy composition, manufacturing technology, and residual ore-derived sulfide inclusions.

X-ray Diffraction (XRD)

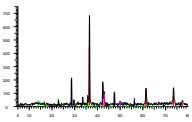
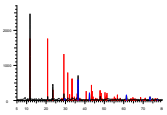
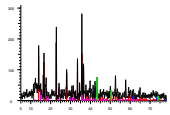
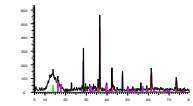
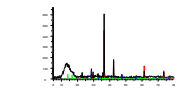
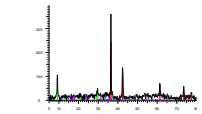
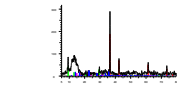
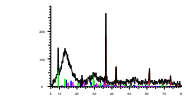
The XRD results obtained for the corrosion products of the investigated samples are summarized in Table 2. The corrosion products of sample M-A-1 could not be identified because the corrosion layers had been removed before analysis, precluding XRD characterization. XRD analysis revealed that sample M-A-4 contained the corrosion phases cuprite (Cu_2O), nantokite (CuCl), and brochantite ($Cu_4SO_4(OH)_6$). In sample M-B-1, the corrosion products and associated burial deposits were identified as cuprite and gypsum ($CaSO_4 \cdot 2H_2O$). Sample M-B-2 yielded brochantite, cuprite, and malachite ($Cu_2CO_3(OH)_2$), whereas samples M-B-3 and M-B-4 exhibited cuprite, nantokite, and brochantite as the principal corrosion phases. In samples M-B-5, M-B-6, and M-B-7, the identified corrosion products comprised cuprite, brochantite, and malachite. Cuprite, a red to reddish-orange copper(I) oxide (Cu_2O), is typically among the earliest corrosion products to form on archaeological copper alloys. It develops as a relatively compact inner layer directly on the metallic surface and acts as a partially protective barrier that retards further oxidation. By contrast, nantokite (CuCl) is a metastable copper(I) chloride whose presence is generally regarded as a diagnostic indicator of active chloride-induced corrosion, commonly referred to as bronze disease (Bakhshandehfard, 2010: 163). Malachite, a basic copper carbonate, is among the most common and stable corrosion products observed on archaeological bronzes recovered from burial environments (Scott, 2002: 102–108). Brochantite, a green basic copper sulfate, is another stable secondary corrosion mineral that commonly forms on copper alloys exposed to oxygenated, sulfate-bearing environments. Quantitative elemental characterization of samples M-B-5, M-B-6, and M-B-7 was limited because these specimens had undergone extensive corrosion, resulting in substantial alteration of the original metallic matrix.

This conclusion is supported by both the SEM–EDS and metallographic observations, which demonstrate advanced degradation and extensive replacement of the original alloy by corrosion products.

Comparative Review of Metallurgical Studies at Qalaichi Tepe

To date, three independent studies have investigated the metallic artifacts recovered from the Qalaichi archaeological site. Bahadari examined the iron artifacts, Soudagar investigated a collection of bronze and iron objects, and the present study focuses on a group of bronze artifacts.

Table 2: XRD identification of the corrosion products detected in the archaeological metal samples investigated in this study (Authors, 2025). ▼

Sample	XRD Pattern	Gypsum	Brochantite	Nantokite	Malachite	Tenorite	Cuprite
M-A-4		–	+	+	–	–	+
M-B-1		+	–	–	–	–	+
M-B-2		–	+	–	+	–	+
M-B-3		–	+	+	–	–	+
M-B-4		–	+	+	–	–	+
M-B-5		–	+	–	+	–	+
M-B-6		–	+	–	+	–	+
M-B-7		–	+	–	+	–	+

Collectively, the results of these investigations provide a comprehensive picture of metallurgical technology at Qalaichi, demonstrating both the advanced metallurgical skills of its craftsmen in working with different alloys and the methodological differences, analytical limitations, and data variations among the individual studies.

Iron Metallurgy at Qalaichi: Previous investigations indicate that ironworking at Qalaichi had reached a remarkably advanced technological level. Bahadari's study of six iron artifacts using SEM–EDS demonstrated that these objects were manufactured primarily from wrought iron containing very high iron contents (99.3–99.8 wt.%) with only minor amounts of carbon. Trace concentrations of silicon, phosphorus, sulfur, nickel, antimony, and chlorine were also detected, indicating the production of relatively pure iron with limited impurities. In contrast, Soudagar employed ICP–MS to analyze several iron artifacts and reported slightly different iron concentrations ranging from 99.71 to 99.84 wt.%. Similar trace elements, including silicon, phosphorus, sulfur, and chlorine, were identified; however, titanium and variable amounts of antimony were also detected. Although these findings are broadly consistent with those reported by Bahadari, they reveal differences in the concentrations of minor and trace elements, which may reflect variations in raw material sources, smelting practices, or analytical methodology. Although the primary focus of the present study is bronze metallurgy, the corrosion data obtained from both bronze and associated iron artifacts suggest that the occurrence of sulfur- and chlorine-bearing compounds is related not only to the original alloy composition but also to burial conditions and, potentially, to different stages of the ancient metallurgical production sequence.

Bronze Metallurgy at Qalaichi: Soudagar investigated a diverse assemblage of bronze artifacts, including horse harness fittings, bracelets, bronze plaques, decorative studs, and rods. Chemical analyses showed that most objects consisted of copper (91–98 wt.%) and tin (4–15 wt.%), together with minor impurities such as lead, arsenic, antimony, and nickel. Manufacturing techniques included both casting and hammering, while intergranular corrosion, surface deterioration, and green corrosion products, principally malachite and copper chlorides, were identified. The present study employed SEM–EDS to examine seven bronze artifacts and demonstrated that all were manufactured from tin bronze, containing approximately 79–96 wt.% copper and 4–22 wt.% tin. Several specimens contain copper sulfide inclusions, indicating that the smelting process was incomplete and that portions of the original sulfide ore were not fully reduced to metallic copper. Furthermore, many samples exhibit clear evidence of selective corrosion, characterized by copper dissolution (decuprification) accompanied by secondary tin enrichment, a corrosion mechanism widely recognized in archaeological bronze alloys. Taken together, the results of the present investigation and previous studies

indicate that bronze metallurgy at Qalaichi relied primarily on copper–tin alloys with variable tin contents, produced through a combination of casting and mechanical working techniques. The artifacts subsequently experienced complex post-depositional alteration processes, including selective corrosion and mineral transformation. These findings contribute to a more comprehensive understanding of both the metallurgical technology employed at Qalaichi and the long-term burial-induced changes affecting its archaeological bronze assemblage.

Corrosion and Deterioration: The results of previous investigations provide complementary insights into the post-burial deterioration processes affecting the metallic artifacts from Qalaichi. Although Bahadari's study did not specifically focus on corrosion mechanisms, the detection of trace amounts of chlorine and sulfur in several iron samples suggests that corrosive processes had occurred during burial. Soudagar documented green surface corrosion products, including malachite, atacamite, and copper chlorides, together with intergranular corrosion in numerous bronze artifacts. In addition, adhering soil deposits

Table 3: Comparative summary of previous and present studies on the metallurgy of the Qalaichi archaeological site (Authors, 2025). ▼

Research Aspect	Bahadari (Iron Artifacts)	Soudagar (Bronze and Iron Artifacts)	Present Study (Bronze Artifacts)
Iron metallurgy	High-purity wrought iron (99.0–99.8 wt.% Fe) with low carbon content; minor impurities including Si, P, S, Ni, Sb, and Cl.	High-purity iron (99.71–99.84 wt.% Fe) containing relatively higher levels of Cl, Cu, S, Ni, P, and Sb.	Limited direct evidence; indirect indications of sulfur- and chlorine-bearing compounds associated with corrosion and burial conditions.
Bronze metallurgy	Not investigated.	Bronze alloys containing 91–98 wt.% Cu and 4–15 wt.% Sn, with minor Sb, Pb, As, and Ni; manufacturing techniques included casting and hammering.	Tin bronze alloys containing 79–96 wt.% Cu and 4–22 wt.% Sn; presence of copper sulfide inclusions; evidence of selective corrosion (decuprification) and secondary tin enrichment.
Corrosion and deterioration	Indirect evidence of corrosion is inferred from trace amounts of chlorine and sulfur.	Green surface corrosion products, dark patina, and intergranular corrosion were observed.	Selective corrosion, microcracks, selective copper dissolution (decuprification), and copper sulfide inclusions identified through microstructural and SEM–EDS analyses.
Technological significance	Demonstrates advanced production of high-purity wrought iron.	Indicates a diverse bronze industry employing multiple manufacturing techniques.	Provides a more detailed understanding of metallurgical processes, including incomplete smelting, preservation of sulfide inclusions, and post-depositional corrosion mechanisms.

and dark patina layers were observed on several objects, indicating prolonged interaction with the burial environment. The present study, based on microstructural examination, SEM–EDS analysis, and XRD characterization, identified clear evidence of selective corrosion (decuprification), strain lines, microcracks, and copper sulfide inclusions preserved within the metallic matrix. The marked depletion of copper accompanied by the relative enrichment of tin in the corroded regions further confirms the occurrence of selective corrosion, demonstrating that the post-depositional alteration of these artifacts was largely governed by both the original alloy composition and the physicochemical conditions of the burial environment. Overall, the combined results of these studies indicate that the archaeological metals from Qalaichi underwent complex corrosion processes involving oxidation, chloride-induced degradation, and selective dissolution of copper, while preserving valuable metallurgical information regarding ancient manufacturing technology and the long-term effects of burial.

The synthesis of the three independent investigations demonstrates that metallurgical production at Qalaichi attained a notably high degree of technological sophistication in both ferrous metallurgy and copper-alloy production. Bahadari's research highlights the high quality of wrought-iron manufacture, indicating effective bloom refining and the production of relatively pure iron containing minimal impurities. Soudagar's study reveals the compositional diversity of bronze alloys and the application of multiple manufacturing techniques, including casting and mechanical working. Building on these earlier studies, the present investigation provides a more detailed reconstruction of ancient metallurgical practices through integrated SEM–EDS, metallographic, and XRD analyses, elucidating both alloy-production technology and the physicochemical processes responsible for post-depositional alteration. The results further demonstrate that the bronze artifacts were manufactured from tin-bronze alloys with variable tin contents and preserve microstructural evidence of incomplete smelting, including unreduced copper sulfide inclusions. In addition, characteristic corrosion phenomena, such as selective copper dissolution (decuprification), secondary tin enrichment, intergranular corrosion, and the formation of stable and metastable corrosion products, provide valuable information on the long-term interaction between alloy composition and the burial environment. These observations not only contribute to the reconstruction of ancient metallurgical practices but also enhance our

understanding of the diagenetic evolution of archaeological copper alloys. Despite the overall consistency among the three studies, several discrepancies remain, particularly concerning the concentrations of minor and trace elements and the interpretation of corrosion intensity and alteration mechanisms. Such differences may reflect variations in analytical methodology, sampling strategy, object selection, or intrinsic heterogeneity within the alloys themselves.

Consequently, a comprehensive reconstruction of metallurgical technology at Qalaichi requires further interdisciplinary research integrating archaeometallurgical, metallographic, mineralogical, and geochemical datasets. Taken together, these investigations constitute the most comprehensive assessment currently available of metallurgical technology at Qalaichi. Bahadari's work establishes the advanced technological level of wrought-iron production; Soudagar documents the compositional variability and manufacturing techniques of both iron and bronze artifacts; and the present study substantially expands current knowledge by providing detailed evidence concerning alloy microstructures, smelting efficiency, manufacturing technology, corrosion mechanisms, and post-depositional transformation processes. Collectively, these findings demonstrate that metallurgical production at Qalaichi was technologically sophisticated in both the manufacture of high-purity wrought iron and the production of tin-bronze alloys. Nevertheless, the observed inconsistencies in impurity distributions and corrosion characteristics indicate that further comparative investigations employing high-resolution analytical techniques, integrated with quantitative metallography and broader archaeometric approaches, are necessary to achieve a more definitive reconstruction of metallurgical production and technological practices at this important Iron Age center.

Conclusion

The archaeometallurgical and microstructural investigation of the metal artifacts recovered from the Qalaichi archaeological site provides a comprehensive assessment of metalworking technologies employed during the Mannaean period. The assemblage is dominated by tin-bronze alloys with variable tin contents, indicating that ancient metalworkers intentionally controlled alloy composition to optimize casting properties, mechanical performance, and long-term durability. Only two artifacts were identified as essentially pure copper, whereas the

remaining objects were manufactured from tin bronze. Such deliberate alloy selection reflects a sophisticated understanding of the relationship between alloy composition and the mechanical properties of copper alloys. Sample M-A-1 preserves clear evidence of a manufacturing sequence involving repeated cycles of cold working followed by annealing, ultimately producing a highly workable microstructure. This technological strategy combined strain hardening with recrystallization, thereby restoring ductility while maintaining adequate mechanical strength, and indicates an advanced knowledge of the thermal behaviour of copper alloys. Sample M-A-4, also manufactured from tin bronze, exhibits evidence of limited heat treatment together with moderate surface corrosion. Sample M-B-1 is characterized by intergranular cracking and corrosion accompanied by significant copper depletion and relative tin enrichment.

These features are consistent with selective phase corrosion, in which the copper-rich phase dissolved preferentially relative to the tin-rich phase. The occurrence of elongated inclusions and preserved strain lines further indicates repeated cycles of mechanical deformation and annealing, with a final annealing stage likely undertaken to reduce brittleness induced by extensive cold working. Sample M-B-3 exhibits an exceptionally fine-grained microstructure together with bent and fragmented annealing twins, indicating intensive mechanical deformation during the final stages of manufacture. Among the investigated artifacts, this specimen preserves the most complex thermomechanical history. The elongated sulfide inclusions observed within the metallic matrix likewise attest to prolonged mechanical working following casting. In sample M-B-4, although mechanical working was applied during the final stage of manufacture, the degree of microstructural deformation is relatively limited. This observation may indicate either a final stress-relief annealing treatment or comparatively mild cold working. These features suggest deliberate control of the balance between hardness and ductility during artifact production. Sample M-B-5 represents one of the most severely deteriorated artifacts in the assemblage. Manufactured from tin bronze, it exhibits extensive selective corrosion (decuprification), whereby preferential dissolution of the copper-rich phase has produced a highly porous and exfoliated microstructure. The advanced degradation has effectively produced a naturally etched microstructure, exposing internal metallographic features through corrosion. Similarly, sample M-B-6 displays advanced

corrosion associated with abundant copper sulfide inclusions. These inclusions most likely originated from incompletely reduced sulfide ores during smelting and subsequently acted as preferential sites for corrosion propagation.

Their presence, combined with extensive corrosion, contributed to severe microstructural degradation and the development of heterogeneous, mechanically weakened regions. Although sample M-B-7 was likewise manufactured from tin bronze, prolonged corrosion has extensively altered its original microstructure, obscuring many of the primary metallurgical features and complicat ing the interpretation of its manufacturing history. The X-ray diffraction (XRD) analyses further confirmed the presence of a diverse assemblage of corrosion minerals, including cuprite (Cu_2O), brochantite ($Cu_4SO_4(OH)_6$), nantokite (CuCl), malachite ($Cu_2CO_3(OH)_2$), and gypsum ($CaSO_4 \cdot 2H_2O$). These mineral assemblages reflect varying burial environments and corrosion pathways. The identification of nantokite indicates the involvement of chloride ions and suggests that at least some artifacts were subjected to chloride-induced corrosion associated with moist or saline burial conditions, potentially increasing their susceptibility to bronze disease. Overall, the archaeometallurgical and corrosion analyses demonstrate that Mannaean metalworkers possessed sophisticated knowledge of alloy production and thermomechanical processing. The intentional adjustment of alloy composition, repeated cycles of cold working and annealing, careful control of manufacturing temperatures, and selection of appropriate copper–tin alloy compositions collectively reflect a highly developed technological tradition. These practices reveal not only an advanced understanding of the mechanical behaviour of copper alloys but also considerable technical skill in the production of functional and durable metal artifacts. Furthermore, the integrated application of metallography, SEM–EDS, and XRD has enabled the reconstruction of both the original manufacturing technology and the long-term post-depositional alteration processes affecting these archaeological metals, thereby contributing to a more comprehensive understanding of Iron Age metallurgy in northwestern Iran.

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The contribution of all authors to the writing of the article has been equal.

Conflict of Interest

The Authors, while observing publication ethics in referencing, declare the absence of conflict of interest.

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فناوری ساخت و مکانیسم‌های خوردگی آثار فلزی باستانی تپه قلایچی

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چکیده

مانناییِ اقوامی بودند که در هزارهٔ اول پیش‌ازمیلاد در نواحی شمال‌غرب ایران زندگی می‌کردند. محوطهٔ قلایچی براساس کشفیات انجام‌شده از محوطه‌های مانناییِ در قرن هشتم و هفتم پیش‌ازمیلاد است. در این محوطه کاوش‌های غیرمجاز بسیاری صورت گرفته بود و پس از آن کاوش‌های روشمند توسط «اسماعیل یغمایی» و «بهمن کارگر» در این منطقه صورت گرفت. تعداد ۹ قطعهٔ فلزی حاصل از این محوطه طی کاوش‌های سال‌های ۱۳۸۱ تا ۱۳۸۳هـ.ش. به سرپرستی بهمن کارگر مربوط به هزارهٔ اول پیش‌ازمیلاد برای مطالعه انتخاب شده است که شامل دو گروه است؛ در گروه اول، یک دستبند و یک تکه شئ فلزی و در گروه دوم نیز هفت تکه شئ فلزی وجود دارد. هدف این پژوهش شناسایی دقیق آن‌ها از نظر ساختاری و فن‌شناسی و چگونگی ساخت و شناخت نوع و فرآیند خوردگی و محصولات خوردگی آن‌ها است. این یافته‌ها، باتوجه به موقعیت جغرافیایی و دورهٔ زمانی (هزارهٔ اول پیش‌ازمیلاد)، اهمیت فراوانی در بازسازی روندهای تکنولوژی، فرهنگی و اجتماعی جوامع عصر آهن در منطقه دارند. پرسش پژوهش شامل: ۱) روش ساخت از نظر ساختار و ساختمان چیست؟ ۲) محصولات خوردگی در این نمونه‌ها چیست و پایداری آن‌ها چگونه است؟ ۳) روند خوردگی و فرآیند اثرگذار محیطی بر این آثار چگونه است؟ به این‌منظور بررسی‌های میکروسکوپی و آنالیز دستگاهی XRD، SEM-EDX و متالوگرافی انجام شد. مطالعات ریزساختاری و SEM-EDX نشان‌داد، کار سرد، گرم و تابکاری بر روی نمونه‌ها انجام شده است. نتایج به‌دست‌آمده از آنالیز XRD فازهای خوردگی نمونه‌ها شامل: مالاکیت، نانتوکیت، کوپریت، بروکانتیت و پیپایت شناسایی شد. برای این‌منظور از بررسی‌های میکروسکوپی و آنالیز تکنیک ابزاری SEM-EDX و متالوگرافی استفاده شد. نتایج آزمایش‌ها نشان‌داد که تمام قطعات اشیاء به جز دو نمونه از آلیاژ مفرغ و دو نمونه از مس ساخته شده‌اند. به‌طورکلی می‌توان گفت مطالعات SEM-EDX انجام‌شده در بررسی ساختار و نحوهٔ ساخت نمونه‌ها نشان‌دهندهٔ شباهت آن‌هاست.

کلیدواژگان: تپه قلایچی، فرهنگ مانناییِ، فناوری ساخت، سازوکارهای خوردگی، SEM–EDS.

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Iron Age and Historical Period in Mazandaran: Classification and Typology of the Grave Goods of Shahneh Poshteh Cemetery, Babol

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Abstract

Regarding the Iron Age and historical periods of the Mazandaran district, no comprehensive chronological research based on grave goods has been conducted to date. Most studies have focused on pottery collections and have been based on archaeological surveys rather than excavations; consequently, the description, classification, and chronology of materials have often been influenced by cultural-historical approaches. In this context, two seasons of archaeological excavation and survey at the Shahneh Poshteh Cemetery, Babol, resulted in the discovery of a collection of grave goods, among which pottery vessels are the most prominent. The burial assemblage contains a diverse range of materials, including pottery, metal objects, weapons, ornaments, and bone and stone tools. At Shahneh Poshteh, a group of vessels with diverse forms and colors has been identified, representing a significant factor in establishing the relative chronology and cultural attribution of the cemetery to Iron Age I, II, III and IV (from the Achaemenid to the early Parthian periods), spanning from the late second millennium to the second half of the first millennium BC. Iron objects are rarely found at this cemetery, whereas bronze was extensively used for the production of weapons and ornaments. The present research seeks to address questions concerning the typology and classification of the objects, their historical and chronological relationships, and their stylistic and cultural interactions with sites of the same cultural horizon within Mazandaran and beyond, including the Gorgan Plain, Gilan, the Central Plateau, and western Iran. The site appears to occupy a significant position within the framework of the Mazandaran cultural sequence and shares similarities with several contemporary sites, including Gohar Tepe, Tepe Parija, Hotu, and Lafurak. Although it exhibits stylistic affinities with several prominent Iranian sites, such as Marlik, Ghaleh Kuti, Kaluraz, Qeytariyeh, Khurvin, MersinChal, and Sialk, it also demonstrates distinct cultural developments and locally specific pottery styles.

Keywords: Iron Age, Mazandaran, Shahneh Poshteh Cemetery, Grave Goods, Typology and Classification.

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Introduction

Following the major socio-cultural transformations of the Late Bronze Age across Iran, which resulted from a combination of diverse factors, new phenomena emerged in various regions of Iran, many of which were rooted in the events of the Late Bronze Age and the second millennium BC and ultimately formed the foundations of the Iron Age. The most important of these factors were the emergence of cemeteries, the cultural continuity of the black-gray burnished vessels alongside other pottery styles such as dark and light gray as well as red earthenware of the Iron Age in the northern half of Iran, the wider adoption of iron artifacts together with bronze objects, and the development of large regional polities. Meanwhile, especially in discussions of the relative dating of sites, the existence of cemeteries with no associated settlements and the expansion of gray pottery are closely related to each other and have received more attention due to their high abundance and considerable research potential. In fact, cemeteries have always been an important source for studying the cultural trends and archaeological developments in the Iranian Iron Age, and although fewer settlement sites have been found to date, cemeteries have played a significant role due to the broad set of analytical variables such as grave goods and funerary practices. One of the controversial topics of the Iron Age that has overshadowed studies of the initial processes and development of this period for several decades is the emergence of burnished gray ware, which still remains unresolved. Although other characteristics of the Iron Age pottery include the presence of painted buff and red-orange vessels, gray pottery is of particular importance for dating the beginning of the Iron Age, trans-regional interactions and homogeneity, as well as human migrations. (Hosseinzadeh Sadati *et al.,* 2019; Kambakhsh Fard, 1970; Burney, 1970; Ghirshman, 1939; Young, 1965).

Following extensive studies by archaeologists such as Young (1994), Dyson (1965; Dyson & Muscarella, 1989), Medvedskaya (1982), Muscarella (1974), Haerinck (1988; 1989; Haerinck & Overlaet, 2004b) and Vanden Berghe (1964, 1969), recently, new data have been obtained through the development of archaeological field studies that have shed new light on the study of the Iron Age. Archaeological excavations in the Tehran and Qazvin regions including the sites of Sagzabad (Fazeli Nashli *et al.,* 2011) and Pardis (Fazeli Nashli and Aghalari, 2015), the Kashan region including the Estrak-Joshaqan cemetery (Hosseinzadeh Sadati *et al.*, 2019), and the Qom region with the sites of Qoli Darvish (Sarlak, 2011), Shamshirgah, and Sarm (Fahimi, 2003), have shown that black gray pottery, possibly iron metallurgy (Fazeli Nashli *et al.,* 2022: 155) and even

the phenomenon of cemeteries independent of settlements were present in these regions much earlier than previously thought, and therefore their cultural connection with the Bronze Age gray pottery of northeastern Iran and especially the Iranian-speaking populations was further questioned. Apparently, the formation of the cemeteries of Estrak-Joshaqhan, Pardis, Qeytariyeh, Khurvin, Sarm and Sialk A dates back to ca. the 18th and 17th centuries BC and therefore the phenomenon of the cemetery together with the "Gray Pottery Culture" dates back several centuries earlier than previous dating and predates the Iron Age based on new absolute chronology (Hosseinzadeh Sadati *et al.,* 2019: 434). Meanwhile, Dyson had dated Hasanlu V to around 1500-1250 BC and to the beginning of the Iron Age, after which the Hasanlu IVC layer was placed around 1250 BC as Iron II. For many years, the Hasanlu stratigraphy served as the benchmark for all sites attributed to this period throughout Iran, but the Hasanlu revision project conducted by Michael Danti introduced serious changes to the Hasanlu cultural sequence so that Hasanlu V was placed as a continuation of the Late Bronze Age and Hasanlu IVC as Iron Age I (Danti, 2013a; Danti, 2013b).

There are also a large number of cemeteries and settlements attributed to the Iron Age in the Mazandaran region. According to studies, among the 350 known sites from the Paleolithic to the Iron Age, 15 sites have been dated to the Bronze Age and 252 sites to the Iron Age. Moreover, of the 252 Iron Age sites, information has been obtained from archaeological excavations for only about 20 sites, and the rest have been identified only in archaeological surveys (Heydari, 2016; Heydari *et al.,* 2021). Apparently, many Bronze Age sites in the region have been mistakenly identified as Iron Age sites due to the traditional archaeological approach (Safari, 2020). Finally, it can be said that the results of new excavations in Iranian Iron Age sites, especially the Shahneh Poshteh cemetery, can lead to a revision of views on the cultural trends of the Iron Age in Mazandaran and Iran. In the present study, an attempt is made to classify and group the collection of grave goods from 39 burials in this site to explain the position of Shahneh Poshteh within the framework of the Iron Age of Mazandaran and Iran and to examine the quantity and quality of the material remains of its burials.

Research Questions and Hypotheses: Based on the archaeological data obtained from two seasons of excavations and survey at the Shahneh Poshteh cemetery, including burial assemblages recovered from graves as well as other funerary characteristics, this study seeks to address several research questions concerning the classification and typology of grave goods, their chronological and morphological relationships and

the cultural interactions of the cemetery with contemporaneous sites at both regional and interregional scales. These comparisons encompass the sites within Mazandaran as well as neighboring regions, including the Gilan, the Gorgan Plain, Iranian Central Plateau and western Iran. It is hypothesized that while Shahneh Poshteh exhibits distinctive local cultural traditions and ceramic styles, its material culture conforms to the broader regional cultural sequence of Mazandaran. In particular, it demonstrates morphological affinities with sites such as Lafurak, Hotu Cave, Gohar Tappeh, and Pari Ja Tappeh. Furthermore, stylistic similarities can be observed between Shahneh Poshteh and several prominent Iron Age sites across Iran, including Marlik, Qaleh Kuti, Kaluraz, Qeytariyeh, Khurvin, Mersin Chal and Sialk cemeteries suggesting patterns of cultural interaction and shared material traditions.

Research Method: This study employs a descriptive-comparative approach based on the field data. Data concerning the funerary assemblages from the Shahneh Poshteh cemetery were compiled primarily from the preliminary excavation reports documenting the contents and characteristics of individual graves. Subsequently, the archaeological data were analyzed, classified and then interpreted through an extensive review of published literature, including archaeological reports and scholarly articles relating to contemporaneous sites across different regions of Iran. This comparative approach has provided a more comprehensive understanding of the cultural developments represented at Shahneh Poshteh, as well as the quantity, composition and qualitative characteristics of the grave goods associated with its human burials.

Theoretical Framework

One of the most significant variables in the study of the material cultures of past societies, particularly through the investigation of ancient human burials, is the analysis of the quantity and quality of grave goods associated with individual inhumations. Such funerary assemblages provide valuable information not only about the material culture deposited alongside the deceased but also about the ideological beliefs, ritual practices and mortuary traditions of the communities responsible for the burials. Among some scholars, grave goods have occasionally been regarded as possessing greater interpretive value than other burial variables, such as grave architecture, body position or burial orientation. This perspective stems from the fact that funerary assemblages constitute a unique source of archaeological and sociological information including the abundance and quality of associated artifacts, their relationship to the social status and rank of the deceased, the

existence of specific mortuary rituals and their comparison with the material culture of associated settlement sites, where such evidence is available. Despite the fundamental importance of grave goods in the history of archaeological thought, providing a satisfactory definition and interpretation of funerary assemblages has long remained a challenging issue. During the formative stages of archaeological research, although various assumptions were proposed regarding the reasons why objects were placed in graves, scholarly discussions focused primarily on identifying the types of artifacts recovered from burials. In recent decades, however, burial studies have increasingly shifted away from a purely object-centered approach, drawing instead upon theoretical perspectives derived from anthropology and related disciplines. Today, researchers examining the multiple possible functions and meanings of grave goods have frequently concluded that the archaeological record alone rarely provides sufficient evidence to determine which of the various motivations for including objects in burials is the most plausible (Table 1). As Fredrik Ekengren succinctly observes "How can we determine whether the objects deposited with the deceased constituted personal possessions, gifts, ritual equipment, or ceremonial objects?". While it is essential to consider the wide range of possible reasons and symbolic meanings underlying the deposition of artifacts in graves, reaching definitive conclusions on the basis of archaeological evidence alone is generally impossible (Cooper *et al.*, 2020: 136).

Table 1: Collection of comments and definitions about grave goods in graves (after: Cooper *et al.*, 2020: 137, Tab. 1). ▼

Grajetzki 2014	Härke 2014	Harding 2016
Containers for the dead	Equipment for the hereafter	Grave furnishings
Equipment for the journey to the afterlife	Inalienable property	Personal ornaments and dress fittings
Furnishings for houses in the afterlife	Potlatch	Indications of rank or status in society
'Helping hands' for the afterlife (e.g. servants)	Indicators of rank, status and identity	Funerary accessories
Funerary ritual leftovers	Metaphor	Residues from the funerary process
Guardians (for protection against the living)	Remains of the funeral feast	Tokens of esteem from kin, clients, etc.
Protective objects (used in life/for the afterlife)	Gifts to the deceased	Offerings to supernatural
Personal objects	Gifts to a deity	–
Objects preserving the dead's social identity	Disposal of polluted items	–
Messages (to the dead)	Protection of the living (and the dead?)	–
Models/miniaturized objects	Forgetting	–

The Shahneh Poshteh Cemetery

The site of Shahneh Poshteh, that covers an area of approximately 11 ha, is situated southwest of the town of Khoshrudpey in the Bandpey-e Gharbi District, approximately 21 km south of the city of Babol, Mazandaran Province (Fig. 1). This site, which comprises both cemetery and settlement components, is located on the northern foothills of the Central Alborz Mountains. Its geographical situation is indicative of the lifeways of the mobile pastoral communities that occupied the highlands of Mazandaran during the Iron Age. So far, Shahneh Poshteh has been investigated through two seasons of archaeological excavations and surveys. These field investigations resulted in the discovery and documentation of 39 well-preserved and archaeologically analyzable human skeletons, together with the detection of a small habitation area containing domestic architectural remains and a hearth. The cemetery was first subjected to limited archaeological excavation in 2018, concurrently with the nearby Tepe Qaleh Ben approximately 500 m to the north, leading to the identification of 11 human burials (Fazeli Nashli, 2018). A second excavation season conducted in 2020 which uncovered 28 additional human burials, as well as the later settlement area (Fig. 2), (Fazeli Nashli, 2019).

It should also be noted that excavations revealed evidence for 32 additional burials that had been completely destroyed, rendering them unsuitable for archaeological analysis. Consequently, detailed archaeological investigations were carried out on 39 excavated burials that distributed among 28 graves with diverse groups of funerary and ritual practices such as grave goods, grave structures and inhumation methods. These excavations yielded an important body of archaeological evidence that has significantly enhanced our understanding of the Iron Age cultural traditions of Mazandaran and more broadly the Iranian Plateau (Tahmasebifar *et al.,* 2026). With regard to the chronology of the site, comparative analyses of the funerary assemblages together with five radiocarbon (14C) dates obtained from human skeletal remains, demonstrate that the excavated burials share chronological and cultural affinities with Iron Age sites both within Mazandaran and across other regions of the Iranian Plateau. The chronological evidence indicates that 29 burials date back to the late second millennium BCE to the middle of the first millennium BCE, corresponding to Iron Age I–III, whereas the remaining 10 burials (all of them excavated from Trench 6 in close spatial association) belong to the Late Achaemenid–Early Parthian period (Iron Age IV). This chronological sequence suggests a degree of cultural continuity among the communities that occupied and utilized the Shahneh

Poshteh cemetery from the Iron Age into the subsequent historical period (Fazeli Nashli *et al.*, 2026).

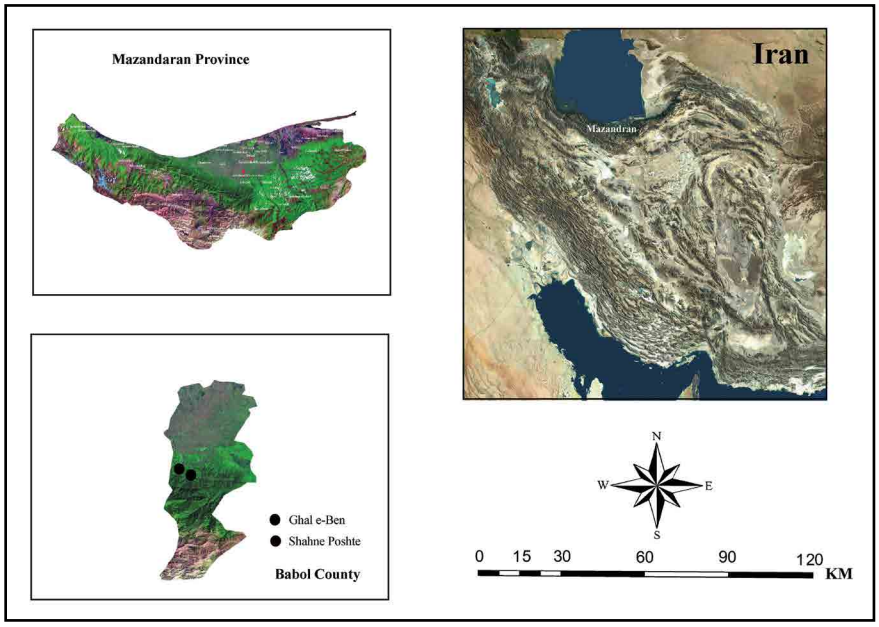


Fig. 1: Geographical location of Shahneh Poshteh Cemetery in Mazandaran Province (Authors, 2025). ▶



Fig. 2: Aerial view of the Shahneh Poshteh Cemetery (Authors, 2025). ▼

Grave Goods and Funerary Assemblages

The Iron Age cemetery of Shahneh Poshteh has yielded a remarkably rich and diverse assemblage of grave goods; of the 39 excavated burials, 27 inhumations (approximately 70%) contained funerary offerings. Based on sex estimations, these burials include males, females, and individuals of indeterminate sex, representing a broad range of age categories including infants, juveniles, adolescents, young adults, middle-aged adults and older adults. The quantity and composition of grave goods associated with each burial appear to vary according to the social and individual status of the deceased. The funerary assemblages comprise a diverse array of pottery and metal vessels, personal ornaments and jewelry, weapons and utilitarian implements. Each artifact category exhibits distinctive morphological and decorative characteristics that allow further typological subdivision.

1. Pottery Vessels

Earthenware vessels constitute the most abundant category of grave goods recovered from the Shahneh Poshteh cemetery. A total of 41 vessels were recorded and then classified into eight principal morphological types, including jugs, jars, bowls (spouted and pedestal bowls), tripod vessels, cups, milk-vase (shirmak), censers/strainers and cooking vessels. These earthenware vessels occur in a variety of surface colors such as gray, red, brown and orange.

1.1. Jugs

A total of 16 jugs were recovered from the funerary assemblages and based on surface color and morphological characteristics, can be divided into several groups. In terms of surface treatment, the assemblage includes five gray examples, two red examples, six orange red (brick-red) examples, one light gray example, one orange example, one brown example, and one grayish-brown specimen. Morphologically, the jugs can be classified into two principal groups, the first of which comprises three subtypes:

1- Globular or ovoid jugs with a tall concave neck, including: (a) examples with a vertical handle in gray, orange-red, orange, and brown (Fig. 3: 1–8); (b) examples with a curved (humped or nose-shaped) handle in red and orange-red (Fig. 3: 9–11); (c) a miniature gray jug lacking a handle, in gray (Fig. 3: 12).

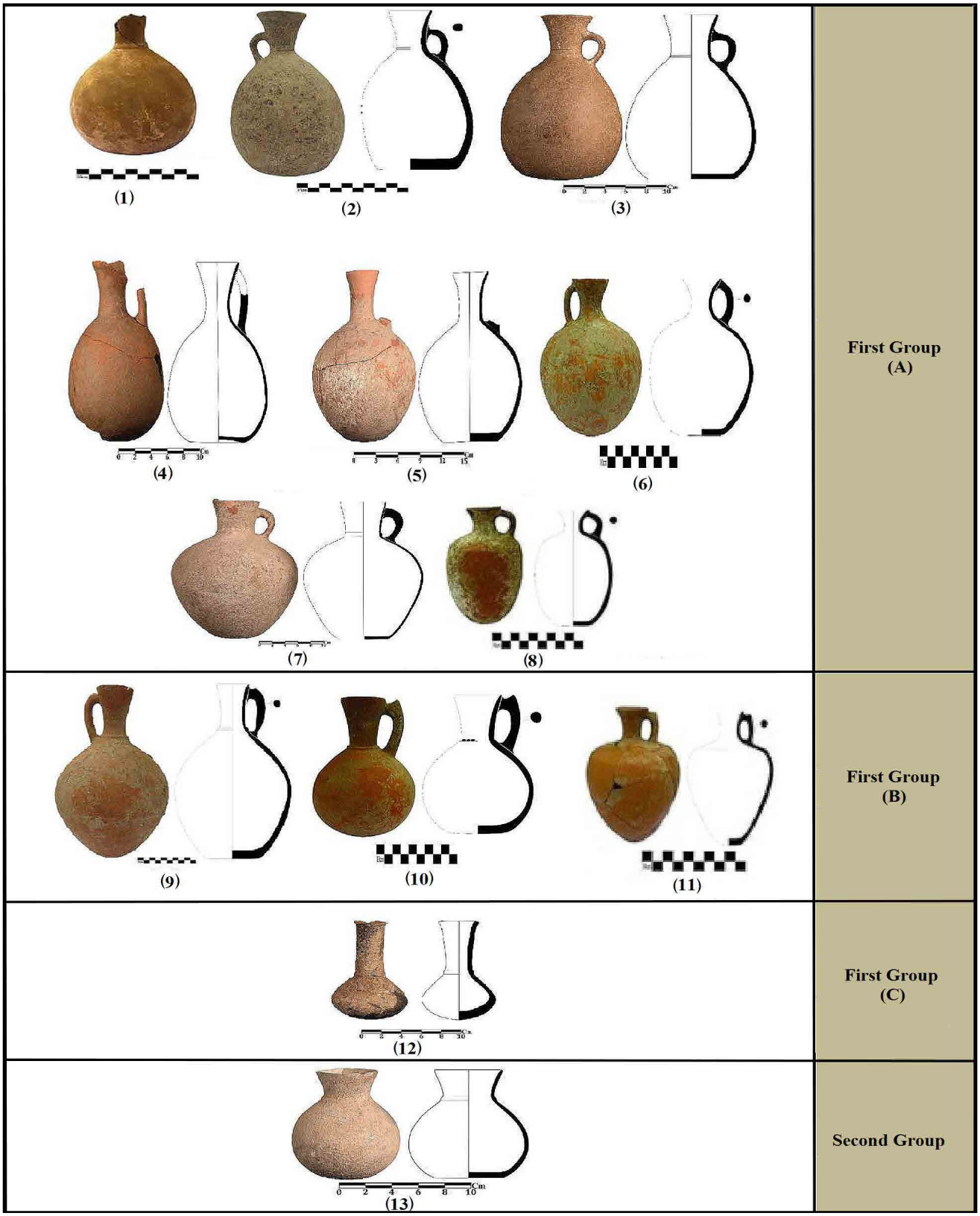
2- The second group comprises ovoid or egg-shaped vessels with a comparatively wide mouth (Fig. 3: 13).

Furthermore, the handles themselves may be divided into two principal forms: simple vertical oval handles and curved oval vertical (humped

or nose-shaped) handles. The former occurs on Jugs nos. 1–8, whereas the latter characterize Jugs nos. 9–11 (Fig. 3). It is noteworthy that this distinctive curved handle type featuring a raised projection attached near the rim is otherwise represented only on a small cup recovered from Burial no. 20 (Fig. 6). This observation suggests that the handle form remained in use over an extended chronological span, continuing into the Achaemenid–Parthian period. The curved handles are typically characterized by a pronounced hump-like projection positioned either at the midpoint of the handle or at its junction with the rim. Two principal decorative techniques occur on these jugs: the first consists of a raised horizontal band encircling the neck, while the second comprises an incised horizontal band. The raised bands are present on Jugs nos. 1, 2, 7, 9, 10, 12, and 13, whereas incised decoration occurs only on Jug 3 (Fig. 3). The raised bands are most frequently observed on gray wares, followed by orange-red vessels. In terms of dimensions, rim diameters range from 5 to 17 cm, while bottom diameters vary between 9 and 14 cm. Comparable jug forms have been reported from numerous Iron Age sites throughout Mazandaran and the Iranian Plateau, including Qaleh Kuti I (Fukai & Ikeda, 1971: Pl. XXXI: 7), Rudbar (Hakemi, 2017: 253, Pl. 370), Marlik (Negahban, 1996: Pl. 101: 505), Bouyeh (Jahani, 2011: 43, Fig. 21: 26), Kaluraz (Hakemi, 2017: 126, Pl. 175), Amlash (Azizi Kharanaghi & Mojezati, 2021: 119), Mersin Chal (Nemati, 2022: 127, Pl. 5), Lafurak (Abedini Araghi, 2017: 241, Fig. 6–4), Gandab (Sharifi-Hevelaei, 2007: 242, Fig. 2), Qeshlaq Cemetery (Negahban, 1996: Pl. 101: 503), Toul-e Talesh (Khalatbari, 2004a: 67, Pl. 19; 68, Pl. 24), Khurvin Cemetery (Kiani, 1979: 16), Tepe Kaboud'val (Aliabad-e Katoul), (Mir Mousavi & Nokandeh, 2017: 41, Pl. 4: 2–15), Posht-i Lam of Ziarat in Gorgan (Alaeddin, 2015: 161, Vol. 8–1), and Tepe Pardis (Fazeli Nashli & Aghalari, 2015: 168, Pl. 19: 2).

1.2. Jars

Jars constitute another major category of pottery vessels recovered from the Shahneh Poshteh cemetery. A total of 12 examples were identified among the funerary assemblages which, based on surface color and morphological characteristics, can be divided into several groups. In terms of surface treatment, the assemblage comprises three gray vessels (one of which is morphologically comparable to the cooking ware), five orange-red (brick-red) examples, one reddish-brown vessel and also three brown examples. Morphologically, the jars may be classified into three principal types, although several highly fragmented specimens could not be assigned to any specific category:



▲ Fig. 3: Typology of burial jugs in Shahneh Poshteh cemetery (Authors, 2025).

1- Globular to ovoid vessels with sharply defined shoulders, a tall cylindrical neck and a wide mouth, generally featuring a plain rim, although one example exhibits an everted rim and one vessel is pedestal-based, whereas the remaining examples lack a foot. This group occurs in gray, orange-red, and brown colors (Fig. 4: 1–4).

2- Globular jars with a very wide mouth and a markedly everted oblique rim (Fig. 4: 5).

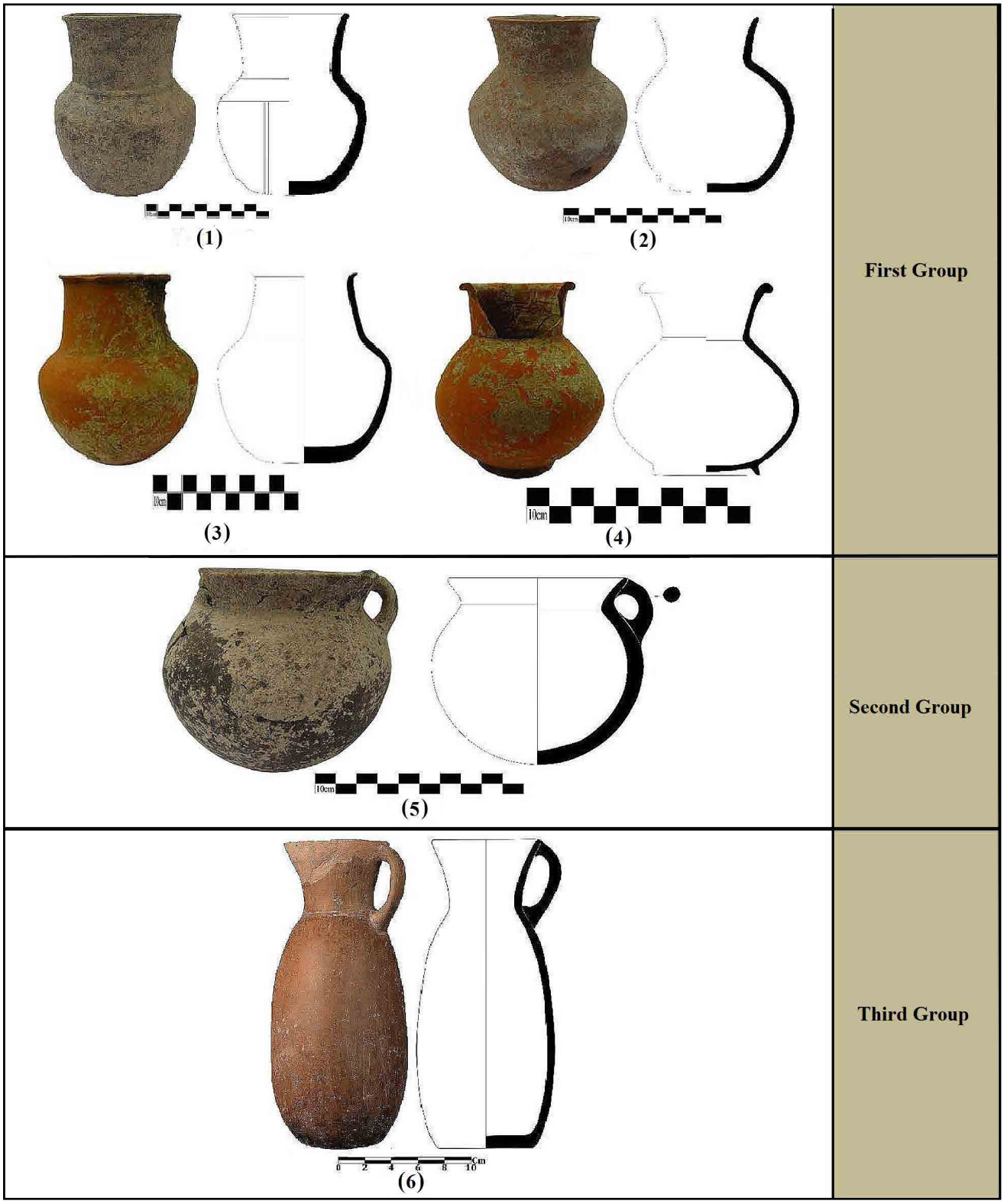
3- A tall cylindrical vessel with a single vertical handle, represented by a unique brown example (Fig. 4: 6).

Furthermore, two principal decorative techniques were identified on the jars. The first consists of raised bands, including a horizontal band encircling the neck and a vertical band extending down the vessel body. This decorative scheme is represented by only one gray vessel (Fig. 7: 1). The presence of the horizontal strip on the neck suggests that this decorative element was a common stylistic feature shared by both the jugs and jars of Shahneh Poshteh. The second decorative technique is burnished decoration that is represented by hatching motifs impressed onto the exterior surface of a fragmented jar. The occurrence of this decorative style indicates the continued use of burnished motifs into the late first millennium BCE (Iron Age IV, corresponding to the Late Achaemenid–Early Parthian period). Comparable jar forms from Shahneh Poshteh have been identified at numerous Iron Age sites in Mazandaran and across the Iranian Plateau. In particular, the vessels illustrated in Fig. 4: 1–4 exhibit close typological parallels with examples from the Rudbar region (Jahani, 2011: 43, Fig. 21: 17), Zarchal in Amlash (Azizi Kharanaghi & Mojezati, 2021: 105), Toul-e Talesh (Khalatbari, 2004a: 67, Fig. 20; 69, Fig. 27), Veskeh (Khalatbari, 2004b: 229, Fig. 24), Mian'rud (Ibid: 236, Fig. 51), Kaluraz (Tadahiko & Takuro, 2006: 11, Fig. 3: 35–36; 19, Fig. 11), and Hassani Mahale (Nishiaki *et al.*, 2006: 153, Pl. 74, Fig. 2).

1.3. Bowls

A total of five bowls were recovered from the burials; these vessels may be classified into two principal morphological types, while their surface treatment can be divided into five color groups: gray (one example), orange-red (brick-red; one example), brown (one example), brownish-orange (one example), and orange (one example). From a typological perspective, the bowls fall into two main categories: pedestal bowls (button-footed bowls) and spouted bowls (gutter-shaped bowls).

1- The first group (Fig. 5: 1–3) comprises footed/pedestal bowls with either globular or angular bodies supported on a short circular pedestal.



▲ Fig. 4: Typology of burial jars in Shahneh Poshteh cemetery (Authors, 2025).

These short pedestal bases correspond to what is commonly termed "button-footed" bases in the literature on the Iranian Iron Age. Comparable examples have been reported from several Iron Age sites, including Lafurak Cemetery (Abedini Araghi, 2017: Figs. 4–6, 4–7), Kaluraz (Tadahiko & Takuro, 2006: 21, Fig. 13), Mian'rud (Khalatbari, 2004b: 202, Pl. 15: 15), and Qaleh Kuti I (Nishiaki *et al.*, 2006: 25, Pl. 10: 1).

2- The second group consists of gray and orange spouted bowls (Fig. 5: 4), characterized by globular bodies fitted with a short gutter-shaped spout. These vessels occur in two variants: handleless vessels and others with a single vertical handle. Close parallels have been identified at Gohar Tepe (Piller & Mahfroozi, 2009: 10, Fig. 12), Parija (Rezaei-Nia *et al.*, 2021: 59, Pl. 3), Qaleh Kuti II (Fukai & Ikeda, 1971: Pl. XXVI: 7), Tandavin (Khalatbari, 2004c: 228, Pl. 8: 1, 3), Maryan (Ibid: 228, Pl. 8: 7, 10), and Qaleh Kuti I (Nishiaki *et al.*, 2006: 81, Pl. 38: 1–2). Among the entire bowl assemblage, only one footed bowl (Fig. 5: 2) bears decoration. The vessel is ornamented with a burnished lozenge motif arranged in a continuous and regular pattern around the shoulder. Similar burnished decorative motifs have been documented on bowls from Marlik Cemetery (Negahban, 1996:

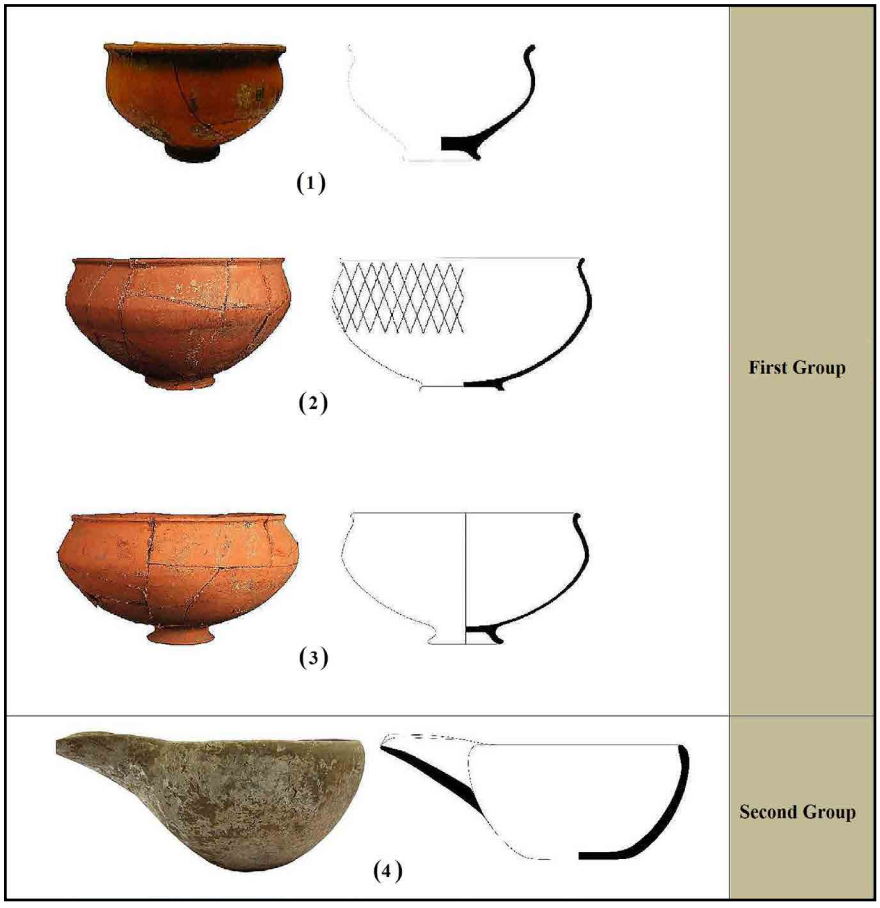


Fig. 5: Typology of burial bowls (Authors, 2025). ▶

Fig. 26: 585–856), Jeyran Tepe of Ozbaki (Majidzadeh, 2010a: 510, Pl. 272; 525, Pl. 303; Majidzadeh, 2010b: 139, Pl. 32: 2, 5, 7), and Sialk A Cemetery (Ghirshman, 1939: Pls. XXXIX: S453b; XLII: S503a). In terms of dimensions, the bowls exhibit a maximum rim diameter of 34 cm and a maximum base diameter of 13 cm.

1.4. Tripod Vessel

The tripod vessel represents one of the distinctive ceramic forms obtained from the Shahneh Poshteh. In previous studies, this type of vessel has occasionally been described as a pedestal bowl or even a fruit stand (Kambakhsh Fard, 2000: 226). Morphologically, it consists of a wide-mouthed bowl supported by three elongated legs which converge at their lower ends into a central stemmed base. Only one complete example of this vessel type was recovered during the excavations at Shahneh Poshteh. An additional fragmented specimen was identified during the surface survey of the cemetery, suggesting that this vessel form was relatively common at the site. The complete brown tripod vessel (Fig. 6) is distinguished by its elaborate burnished decoration: the interior and exterior of the bowl are ornamented with slightly curvilinear horizontal lines, while the stemmed pedestal is decorated with oblique hatched lines covering its entire surface. The vessel measures 23 cm in rim diameter, 13 cm in base diameter, 31 cm in total height and 11 cm in bowl depth. Comparable examples have been reported from several Iron Age sites, including Gandab Cemetery (Sharifi-Hevelaei, 2017: 57), Hotu Cave (Naqshineh, 2005: 77, Fig. 5: 11), Gohar Tepe (AG2IV-7), (Piller & Mahfroozi, 2009: 11, Fig. 14: 5a–c) and Lafurak (Abedini Araghi, 2017: 189, Fig. 4-3: 42), which are generally attributed to Iron Age II–III. Earlier parallels have also been identified at Qeytariyeh Cemetery (Kambakhsh Fard, 2000: 150, 227, Fig. A–C; Farokhnia, 2020: 123, Table 2) and Qareh Tepe of Sagzabad (Deh Pahlavan *et al.*, 2019: 385, Fig. 15). Collectively, these examples illustrate the long-term stylistic development of tripod vessels up to the Achaemenid–Parthian period, to which the Shahneh Poshteh specimen also belongs.

1.5. Cups

Two small cups were recovered from the Shahneh Poshteh cemetery assemblage. The cup no. 1 is a small brown vessel with a wide mouth and two vertical hump-backed (curved) handles attached near the rim. The vessel surface is heavily exfoliated, giving it a coarse appearance reminiscent of cooking ware. Nevertheless, owing to its distinctive

morphology and small dimensions (rim diameter: 6.5 cm; base diameter: 7 cm), it is more appropriately classified as a cup. Close parallels have been identified in Burial no. 31 of Sialk B Cemetery (Ghirshman, 1939: Pl. LXIII, S. 849) and Kaluraz (Hakemi, 2017: 106, Pl. 124). Moreover, the cup no. 2 is coated with a thick brown slip and is characterized by a single vertical handle and a comparatively closed narrow mouth, giving it a distinctive morphological appearance (Fig. 6: Nos. 1–2).

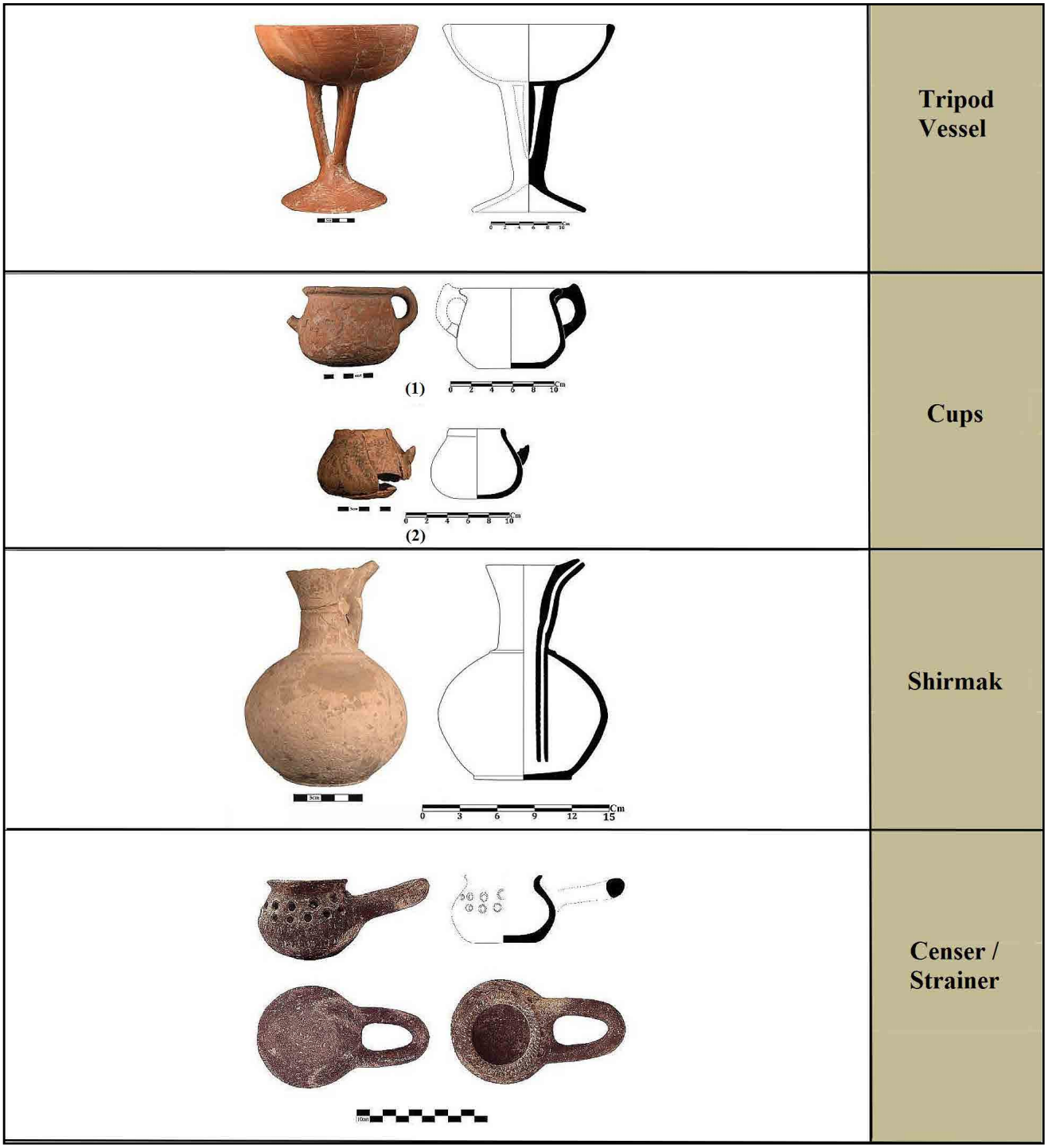
1.6. Shirmak (Milk-vase)

One of the most distinctive artifacts from Shahneh Poshteh is a type of bottle, the so-called shirmak, represented by a single example. This vessel type occupies a unique position not only within the Shahneh Poshteh assemblage but also among the pottery groups of the Iranian Iron Age in general. Since the discovery of the earliest examples at Sialk B Cemetery and especially at Qeytariyeh Cemetery, shirmaks have remained among the most characteristic categories of Iron Age grave goods. Indeed, the Persian designation shirmak (milk bottle) was first introduced by the excavator of the Qeytariyeh cemetery (Kambakhsh Fard, 2000: 185). The shirmak from Shahneh Poshteh (Fig. 6) was obtained from the burial of a child interred within a distinctive grave structure covered by large ceramic sherds. The combined occurrence of the shirmak and this unusual grave construction confers particular significance upon this burial. The vessel is light gray in color and consists of a globular body, a relatively short neck and a tubular spout resembling a reed or drinking tube. Comparable Iron Age shirmaks have been reported from Gohar Tepe (Piller & Mahfroozi, 2009: 12, Fig. 14: 4a–b; 14, Fig. 18), Tavar Cemetery in Sari (Fallah Kiapey, 2016: 37), Qeytariyeh (Kambakhsh Fard, 2000: 186; Farokhnia, 2020: 116–117, Table 1; 125, Table 2), Mian'rud in Talesh (Khalatbari, 2004b: 200, Pl. 14: 5) and Sialk B (Ghirshman, 1939: Pl. XVI: 2, 8). These vessels have generally been dated to the period spanning Iron Age I–III, indicating that shirmaks formed a characteristic component of funerary assemblages throughout much of the Iranian Iron Age.

1.7. Censer / Strainer

Among the typical ceramic vessels from the Shahneh Poshteh cemetery there is a small bowl/cup-like vessel characterized by numerous perforations on its body. This vessel may have functioned either as a

censer or a strainer based on its morphology and surface characteristics. It is also made of gray ware and consists of a small globular body; a long horizontal oval-shaped handle and numerous small perforations arranged in two parallel rows. Each perforation measures approximately 7 mm in diameter (Fig. 6).



▲ Fig. 6: Burial earthenware Groups including tripod vessel, cups, shirmak (milk-vase) and censer/strainer (Authors, 2025).

In addition, regularly arranged oblique incised lines appear on the rim, while similar incisions occur more sporadically across the body surface representing a form of engraved decoration. If this vessel is interpreted as a strainer/colander, its main difference from other well-known Iron Age strainers lies in the location of the perforations. In most Iron Age examples, perforations are concentrated on the middle and lower sections of the body, particularly toward the base. In contrast, the perforations on the Shahneh Poshteh specimen are positioned relatively higher on the upper half of the vessel. Furthermore, the soot traces visible on the body surface, and the relatively low firing quality are more suggestive of a censer-like function than of a utilitarian strainer. Morphologically, this vessel can be compared with several examples dating to Iron Age I–III, including specimens from Khurvin (Samadi, 1955: 142, No. 5), Shamshirgah (Fahimi, 2010: 181, Fig. 11), Marlik (Negahban, 1996: Pl. 116: 636) and Sialk B (Ghirshman, 1939: Pl. II, S570; Pl. LX, S651). Regarding its possible function as a censer, comparable examples are also known from Bronze Age contexts in northern Iran, such as Tepe Qaleh Kash in Amol (Amirkolaei, 2008: Pl. 11), Tureng Tepe (Olson & Thornton, 2019: 24, Fig. 21: e), Gohar Tepe (Piller & Mahfroozi, 2009: 7, Fig. 8: 5) and Shah Tepe (Arne, 1945: Pl. LV, Figs. 435–437). In addition, two Iron Age samples have been reported from the Gorgan Plain including Tepe Bazgir of Minoodasht (Abbasi, 2015: 108, No. 73: 19) and Tepe Sharif of Gorgan (Rezaei, 2018: 223, Pl. 5).

1.8. Cooking/ Kitchen Vessels

The final category of earthenware recovered from the funerary assemblage of Shahneh Poshteh consists of cooking vessels. These vessels are generally poorly preserved and were recovered in fragmentary condition due to their poor firing quality and functional characteristics. A total of three examples of this category were identified. Notably, all three vessels were placed at the feet of the deceased within the graves. In addition, another vessel, a dark gray to black jar from Burial no. 10, was also positioned near the feet of the deceased and exhibits considerable similarities to cooking vessels. Furthermore, the precise morphological forms of these vessels cannot be determined because of severe fragmentation and surface deterioration. However, they can generally be classified as wide-mouthed vessels, most likely representing a type of jar or small cooking pot.

2. Metal Vessels

Only one metal vessel has been recovered from Shahneh Poshteh: a bronze object. This artifact comprises several fragmented and non-restorable

pieces of a bronze vessel that was discovered beside the feet of the individual buried in Burial no. 23 and belonged to an adult male. Due to the fragmentary condition of the remains, it is not possible to determine its original form or function.

3. Personal Ornaments and Jewelry

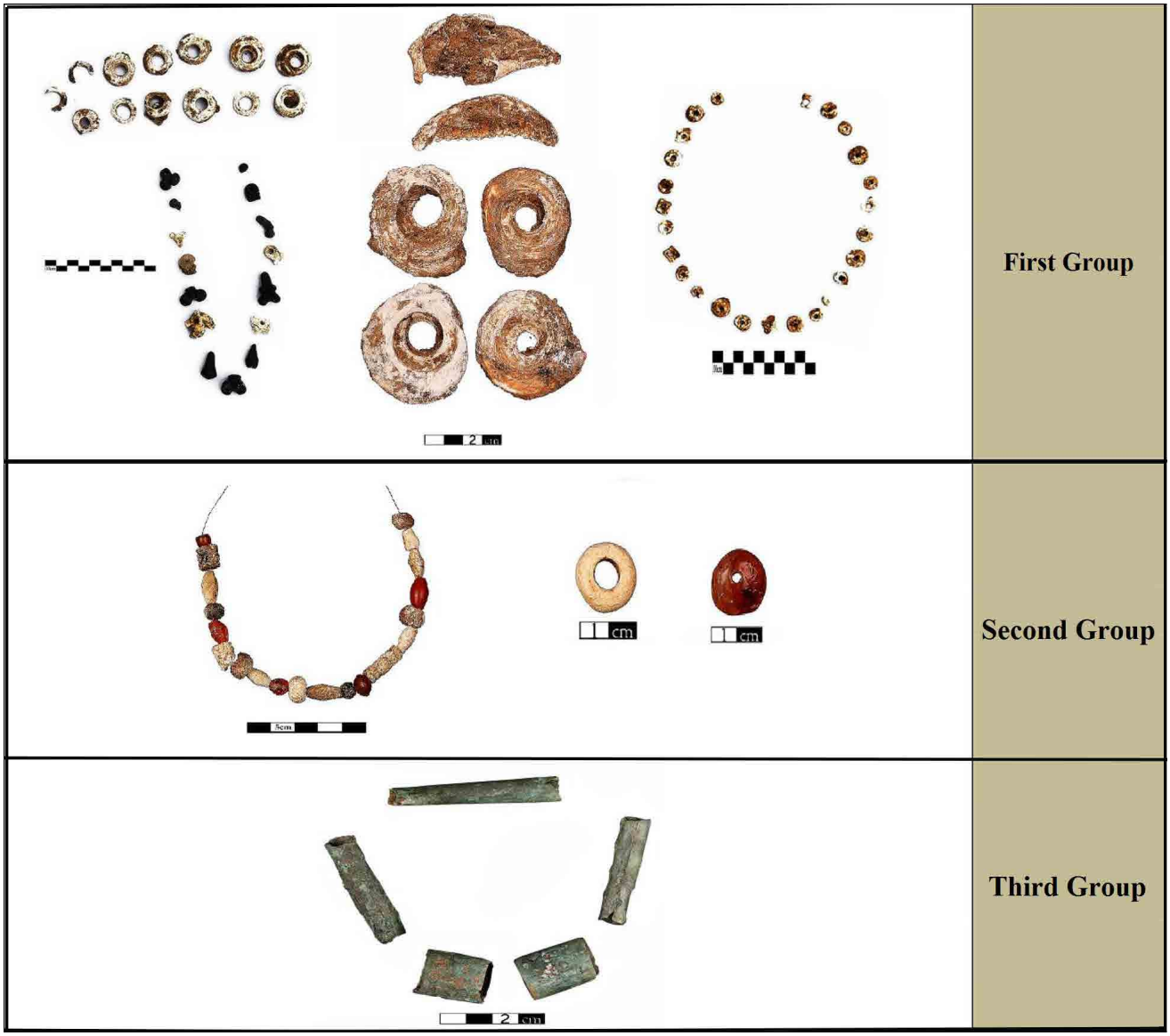
The second major category of the funerary assemblages of Shahneh Poshteh consists of personal ornaments and jewelry, which can be further divided into several subcategories. These ornaments include beads, bracelets, pins (and needles), earrings, and rings, each exhibiting its own distinctive morphological and functional characteristics. In general, ornaments and decorative objects recovered from archaeological contexts—whether funerary or settlement sites—provide significant insights into the social and economic status of individuals within their communities, as well as the extent of trade and cultural interactions between a site and other regions. Furthermore, jewelry frequently offers valuable information regarding the age and gender identities of the deceased with whom these objects were associated. The Shahneh Poshteh cemetery has yielded a considerable quantity of personal ornaments. Nevertheless, the assemblage does not occupy a particularly distinguished position compared with major Iron Age sites such as Marlik, Hasanlu, and Sialk in terms of both the quality and quantity of precious metal artifacts, particularly gold and silver objects, as well as highly elaborate decorative ornaments.

3.1. Beads

Beads, as one of the oldest forms of personal adornment used by humans, occupy a significant position among the funerary objects from Iron Age sites as well as from the Shahneh Poshteh cemetery. The bead assemblage from this cemetery comprises various materials and sizes; these objects were generally used in groups as necklaces, anklets, and possibly earrings. The materials represented include faience (glass paste), stone (and red carnelian), bronze, and shell, occasionally occurring together in composite ornaments. Among these categories, faience beads are by far the most abundant (Fig. 7: Group I). Faience beads include examples with circular, semi-circular, conical, possibly zoomorphic, and shell-shaped forms. Most specimens are black or white in color, while only two examples exhibit a yellowish-cream color. Faience beads have been recovered from numerous Iron Age sites in Iran including Marlik (Negahban, 1996: Pls. 71, 80: 341), Khanqah Gilavan Cemetery in Khalkhal (Rezalou & Ayremlou,

2018: 47, Fig. 1), Dinkha (Muscarella, 1974: 67) and Sialk B (Ghirshman, 1939: Pl. XXVII: 1, 11). Their widespread occurrence demonstrates the importance of faience as a decorative element, often used in combination with metal beads. The second category consists of stone beads, which can be divided into two groups: carnelian beads and beads made from other, less valuable stones. Carnelian beads were recovered from two burials and comprising a total of six oval-shaped examples (Fig. 7: Group II). Comparable specimens have been found at Marlik (Negahban, 1996: Pls. 61–67), Qareh Tepe of Sagzabad (Deh Pahlavan *et al.*, 2019: 390, Pl. 18), Sialk B Cemetery (Ghirshman, 1939: Pl. XXVII: 1), Jeyran Tepe of Ozbaki (Majidzadeh, 2010a: 528, Pl. 308) and Dinkha Tepe (Muscarella, 1974: 67). In addition to red carnelian, other less valuable stones were also used for decorative beads. This group consists of 13 white stone beads of various shapes and dimensions. Similar examples have been documented at Marlik (Negahban, 1996: Pl. 67: 260; 69: 277), Baba Jilan Cemetery (Hasanpour *et al.*, 2015: 184) and Qarah Tepe of Sagzabad (Deh Pahlavan *et al.*, 2019: 390, Pl. 18).

A particularly distinctive category within the Shahneh Poshteh bead assemblage is represented by bronze beads, which constitute one of the rare groups of metal ornaments from this cemetery. This group includes five cylindrical bronze beads found in the wealthy Burial no. 31. The beads were found together near the left ankle joint of the skeleton, suggesting that they were probably used as a decorative element for the foot or as an anklet. They vary in size and include both longer and shorter forms (Fig. 7: Group III). Comparable cylindrical metal beads have been reported from several Iron Age I–III contexts, including Marlik Cemetery (Negahban, 1996: Pls. 76–77), Hasanlu (Cifarelli, 2018: 54, Fig. 5), Baba Jilan Cemetery (Hasanpour *et al.*, 2015: 184), Khanqah Gilavan Cemetery (Rezalou & Ayremlou, 2018: 47, Fig. 1) and Qareh Tepe of Sagzabad (Deh Pahlavan *et al.*, 2019: 390, Pl. 18). Finally, shell beads may also represent part of the personal ornaments used at Shahneh Poshteh. Two shell fragments were discovered near the skull in Burial no. 38. However, their precise function as ornaments and funerary objects remains uncertain. Nevertheless, comparable examples from Sumbar I Cemetery (Khlopin, 1983: 170, Pl. XI: 5), Marlik Cemetery (Negahban, 1996: Pl. 74: 308; Pl. 75), Baba Jilan Cemetery (Hasanpour *et al.*, 2015: 184), Tepe Qaleh Kash of Qaemshahr (Silakhori, 2014: 159) and Tepe Qaleh Kash of Amol (Amirkolaei, 2012: 9) confirm the use of shell as a decorative material, particularly during Iron Age II and III.



▲ Fig. 7: A number of decorative glass, stone, and bronze beads from Shahneh Poshteh cemetery (Authors, 2025).

3.2. Pins and Needles

One of the most significant categories of personal ornaments used by the inhabitants of the Shahneh Poshteh community consists of bronze pins and needles. Due to their morphological and, in some cases, functional similarities, these artifacts are often classified within a single category, and in some archaeological contexts they have been used interchangeably in terms of terminology and interpretation (Fig. 8). The pins from Shahneh Poshteh can be divided into three principal morphological types represented by both complete and fragmented examples. In addition, a fourth category may be considered as needle/pin forms. The first group consists of simple wire pins, some of which possess relatively pointed ends. Overall, these objects are characterized by their plain appearance, medium to thin gauge

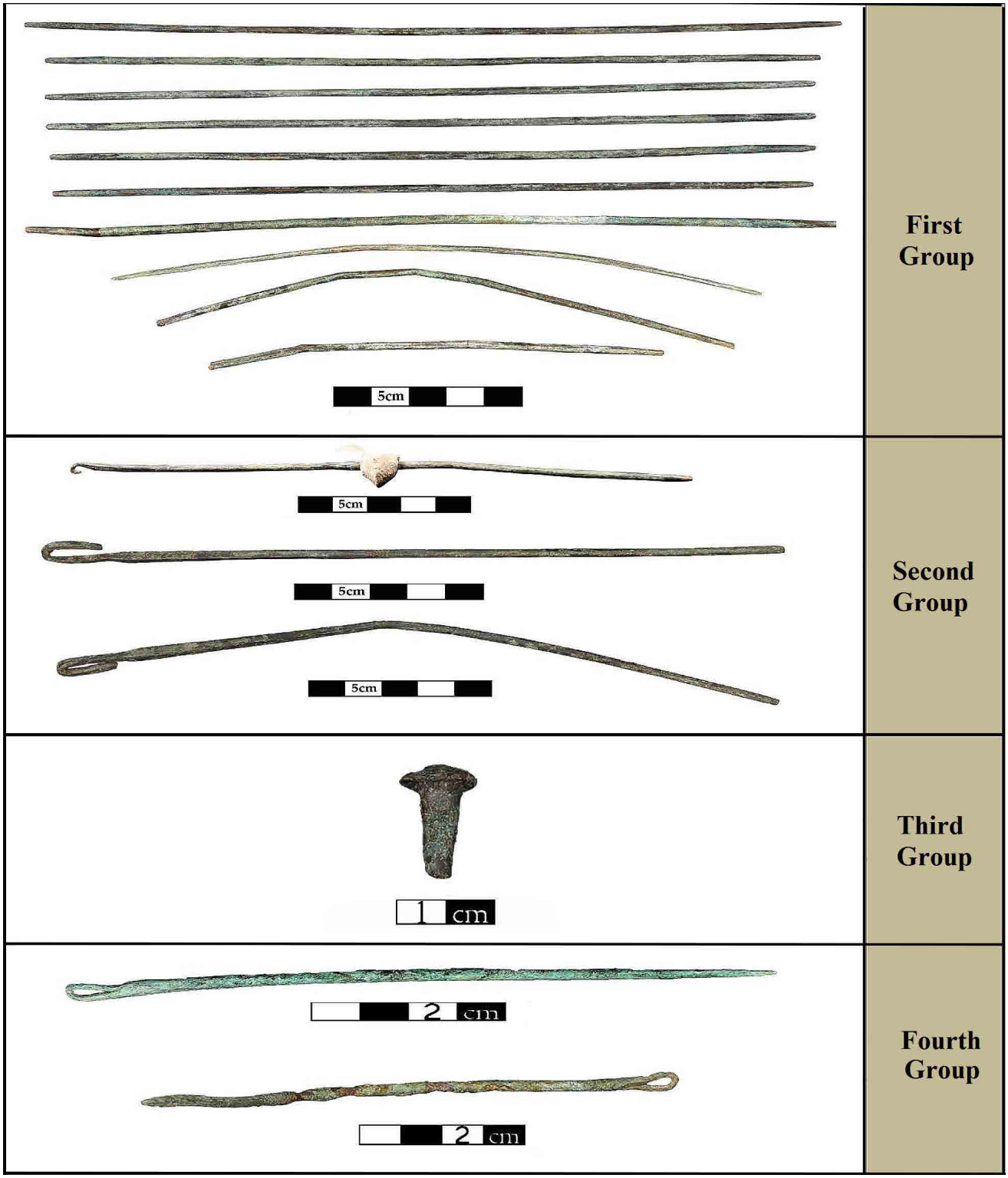
and lack of additional decorative elements. This category represents the most numerous groups of pins found at Shahneh Poshteh (Fig. 8: Group I). Although most Iron Age pins of Iran generally exhibit some form of decoration or morphological elaboration, the simple wire form appears to have been the most common type among the inhabitants of Shahneh Poshteh. Comparable examples of this plain form are relatively rare but have been documented at several archaeological sites. Similar pins have been recovered from numerous sites, including the Late Bronze Age–Early Iron Age I graves of Sumbar I Cemetery in southern Turkmenistan (Khlopin, 1983: 177, Pl. XVIII: 1–8; 170, Pl. XI: 8–9), Zardkhaneh Cemetery of Ahar (Kazempour *et al.*, 2017: 30, Fig. 27: 2–4) and Marlik Cemetery (Negahban, 1996: Pl. 138: 969, 970). Similar examples are also known from Iron Age I contexts at Qaleh Kuti I Cemetery (Fukai & Ikeda, 1971: Pl. XXXIII: 7), as well as from Iron Age II–III sites such as Sialk B (Ghirshman, 1939: Pl. L: S542), Surkh Dum-i-Luri (Schmidt, 1989: Pl. 158: n) and Haftavan Tepe (Burney, 1972: Pl. Vb). The maximum length of this pin type reaches approximately 19 cm, while their average thickness is about 0.2 cm.

The second group consists of wire pins (like Group I) with one end bent inward. However, unlike fully closed circular forms, the bent end does not form a complete and regular loop but rather represents a simple curvature at the terminal portion of the shaft (Fig. 8: Group II). It is noteworthy that one particularly distinctive specimen exists among the pins of this group, in which the pin is embedded in a white biconical bead, such that this bead clearly functioned as a decorative element for the pin. The dimensions of these pins are approximately 19.3 cm in length and 3 cm in diameter. Very few parallels are known for this unique type of decorated pin; comparable examples have been reported from the Late Bronze Age cemetery of Sumbar I (Khlopin, 1983: 177, Pl. XVIII: 9), where several pins with similar decorative features were found in burials. It should also be noted that another highly distinctive example of this object type, although belonging to a much earlier chronological period, was reported from a female burial of Tepe Hissar IIB (Schmidt, 1937: Pl. XXIX: H2171). Schmidt interpreted this artifact as a spindle whorl based on the presence of two spindle whorl-like objects attached to the pin (Ibid: 120). This raises an important question regarding the Shahneh Poshteh specimen: should it also be interpreted as a type of spindle whorl rather than a pin? The third group consists of a single sample with a conical body, one broken end, and one broad convex end resembling the end portion of a pin, button or even a peg (Fig. 8: Group III). Although it was recovered from the burial of an

adult male, the object is most probably a type of pin. The only example from Shahneh Poshteh was found in Burial no. 23 and measures approximately 2 cm in length and 1.5 cm in thickness. Comparable examples of this pin form have been identified at Sialk A Cemetery (Ghirshman, 1939: Pl. XLIV: S606c), Kaluraz (Hakemi, 2017: 183, Pl. 18), Marlik (Negahban, 1996: Pl. 94: 463) and Khatunban Cemetery (Haerinck *et al.*, 2004a: 156, Pl. 16: Kh.B7-9). Finally, the fourth group, which may be identified as needles, consists of needles with a simple wire body, one relatively pointed end and one perforated end, which was probably designed for the passage of thread or cord (Fig. 8: Group IV). Although these objects are sometimes classified as pins at other archaeological sites, and such an interpretation may be partially justified, in the present study, we prefer to categorize them as needles due to the pointed terminals observed on the Shahneh Poshteh examples. Only two specimens of this type were recovered from the Shahneh Poshteh cemetery. Their dimensions range from a maximum length of 10 cm to a minimum length of 7.1 cm, with thicknesses ranging from 1 to 2 mm. Similar pin/needle forms have been recovered from numerous Bronze Age sites and continued with little morphological change into the Iron Age and later periods. Consequently, they are not particularly suitable for relative chronological determination or comparative dating based solely on morphological analysis. The only notable variation concerns the pointed terminal, as some perforated-end pins lack a pointed tip. Comparable examples include Bronze Age needles from Shah Tepe (Arne, 1945: 298, 644a) and Tepe Hissar (Schmidt, 1937: Pl. LIII: H3141), as well as Iron Age examples from Marlik (Negahban, 1996: Pl. 138: 969, 970), Sialk A (Ghirshman, 1939: Pl. XLIII: S534c), Sialk B (Ibid: Pl. XXIX: 2), Kaluraz (Hakemi, 2017: 183, Pl. 18), Khatunban Cemetery (Haerinck *et al.*, 2004a: 159, Pl. 19: Kh.B-4) and Gilvan Cemetery (Rezalou & Ayremlou, 2016: 62, Fig. 26: 13).

3.3. Bracelet

Only one funerary bracelet has been recovered from the Shahneh Poshteh cemetery. This bronze artifact was discovered on the left wrist of the deceased in Burial no. 30 (Fig. 9). It has a simple oval-shaped wire body with open ends; its maximum and minimum diameters are 9.4 cm and 7.2 cm, respectively, and its thickness is approximately 0.4 cm. Morphologically, it belongs to the category of plain bracelets, as its surface is completely undecorated and lacks any engraved, incised, or applied decorative elements. Due to its simple morphology, this bracelet type has numerous parallels throughout different historical periods across Iran and therefore



▲ **Fig. 8: A number of pins and needles from Shahneh Pushte cemetery (Authors, 2025).**

cannot be regarded as a reliable artifact for relative chronological dating. Nevertheless, within the morphological context of Iron Age bracelets, the Shahneh Poshteh example can be compared with specimens from Marlik

(Negahban, 1996: Pl. 81: 348; 82: 355), Sialk B (Ghirshman, 1939: Pl. XXVIII: 13), Dinkha Tepe (Muscarella, 1974: 41, Fig. 6: 1014; 45, Fig. 11: 1038), Sialk A (Ghirshman, 1939: Pl. XLII: S502), Baba Jilan (Hasanpour *et al.*, 2015: 212, Pl. 21) and the Iron Age III cemetery of Lafurak (Abedini Araghi, 2017: 247, Fig. 6-16).

3.4. Earrings

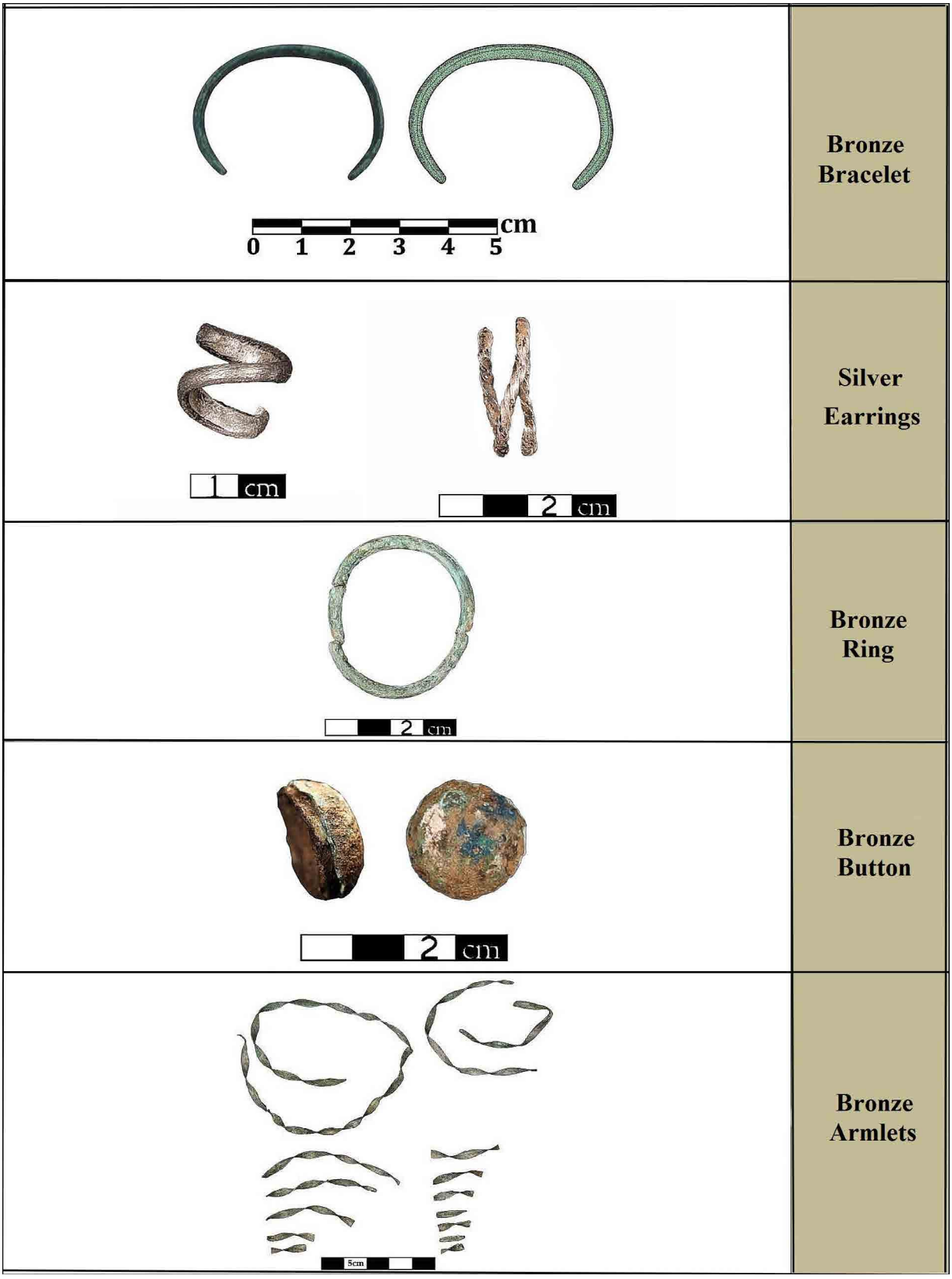
Within the assemblage of funerary objects from this site, only two silver earrings have been identified that are morphologically similar to one another and are characterized by a spiral polygonal form (Fig. 9). The earrings measure approximately 2 cm and 1.2 cm in diameter. Only a limited number of comparable examples are known from Iranian Iron Age sites, particularly during Iron Age II and III. Similar earrings or rings have been reported from Sialk B (Ghirshman, 1939: Pl. XCIV: 1715c), Nush-i Jan Tepe (Stronach, 1969: 17, Pl. IX: b–c), Marlik (Negahban, 1996: Pl. 86: 387), Kaluraz (Hakemi, 2017: 87, Pls. 63, 64; 88, Pl. 70; 89, Pls. 77 and 79) and Gilvan Cemetery (Rezalou & Ayremlou, 2016: 58, Fig. 20: 17).

3.5. Ring

Only a single bronze ring or decorative finger ring has been found at the Shahneh Poshteh site; it was discovered in Burial no. 27 and belonged to a child (Fig. 9). The ring is very simple in form and consists of a thin oval-shaped wire body without any decoration. Its dimensions include a thickness of less than 3 mm and a diameter of approximately 2–3 cm. This ring has limited chronological significance due to its simple morphology and cannot serve as a reliable dating object. Instead, it can be compared with undecorated simple rings known from the Bronze Age, Iron Age and later periods. Comparable Iron Age examples include rings from Marlik Cemetery (Negahban, 1996: Pl. 138: 969, 970), Sialk A Cemetery (Ghirshman, 1939: Pl. XLI: S500; Pl. XL: S465a), Sialk B Cemetery (Ibid: Pl. LIX: S645), Dinkha (Muscarella, 1974: 41, Fig. 6: 1014), and Zardkhaneh Cemetery (Kazempour *et al.*, 2017: 30, Fig. 27: 8–10).

3.6. Button

One of the distinctive and unique objects from the Shahneh Poshteh cemetery is a small circular bronze object discovered in Burial no. 27, which belonged to a child. Morphologically, this artifact resembles a button and may therefore be interpreted as a decorative element of clothing or a garment fastener (Fig. 9). Although only a single example of this object type has been recovered from Shahneh Poshteh, its morphological



▲ Fig. 9: Bronze ornaments including bracelet, earrings, ring, button and armlets (Authors, 2025).

characteristics correspond to several decorative buttons known from Iron Age sites in Iran. The object measures approximately 10 mm in length and 4 mm in width, and a portion of its body is broken. Since this funerary object was found near the vertebrae and chest area of the skeleton, it may have originally been attached to the individual's clothing as a decorative garment element. Comparable objects, generally interpreted as buttons and made from various materials including metal, faience, stone and bone, have been reported from several Iron Age sites, such as the Iron Age I and II cemetery of Marlik (Negahban, 1996: Pl. 92: 439), Dinkha Tepe (Muscarella, 1974: 42, Fig. 7: 616; 44), Gohar Tepe (Piller & Mahfroozi, 2009: 15, Fig. 20), the Iron Age III cemetery of Lafurak (Abedini Araghi, 2017: 152) and Baba Jilan Cemetery (Hasanpour *et al.*, 2015: 198, Pl. 7). The main basis for comparison among these objects is their distinctive circular morphology.

3.7. Armlets

Among the most valuable ornaments from the Shahneh Poshteh cemetery are bronze armlets recovered from the arms of the individual buried in Burial no. 31 (Fig. 9). These armlets are characterized by a thin sheet-like body with a highly spiral or twisted form and were found in both complete and fragmented conditions. It can be suggested that at least three armlets were originally present; based on their dimensions, two were broken and fragmented due to post-depositional damage. These armlets have no parallels elsewhere within the Shahneh Poshteh cemetery, making Burial no. 31 particularly significant and valuable. Furthermore, they represent a rare and distinctive type of ornament even among Iron Age sites of Mazandaran and Iran. Armlets, as decorative elements alongside forehead ornaments and bracelets, were already common during the Bronze Age, however, their use became more widespread during the Iron Age. Comparable examples including wire and sheet-metal forms used as armlets and bracelets have been documented especially in Iron Age cemeteries like Marlik Cemetery including forehead bands and hair ornaments (Negahban, 1996: Pl. 88: 397–407), as well as from Sialk B Cemetery (Ghirshman, 1939: Pl. XCIV: S1853).

4. Weapons

4.1. Daggers

Excavations at the graves of the Shahneh Poshteh cemetery yielded the discovery of five bronze daggers, which, notably, were found in both

male and female burials (Fig. 10). The overall form and morphology of all the daggers are highly similar, as they all possess an elongated triangular blade and body, differing mainly in the width and shape of the proximal section of the blade. More specifically, Daggers Nos. 1, 2 and 3 have a broader body, particularly in the proximal section of the blade, gradually narrowing to a triangular form and terminating in a sharp point. Among these examples, two daggers have a distinctly triangular blade shape, whereas the other two exhibit a more rounded and curved profile in the upper section of the blade. Daggers Nos. 4 and 5 are narrower in form. Except for the slightly expanded proximal part of the blade, their bodies are relatively straight and lack pronounced angular transitions. All five daggers possess a short tang at the end of the blade which served as the attachment point for the handle. This section was most likely covered with organic materials such as wood or leather. This interpretation is supported by the absence of rivet holes or other evidence indicating the attachment of an additional handle component. Therefore, the handles of these daggers were most likely simple organic constructions. Furthermore, all daggers display a raised central ridge running along the length of the blade, extending from the base to the pointed tip. One dagger is distinguished by having two parallel raised ridges on its surface, making it morphologically unique within the assemblage. In terms of dimensions, these daggers range from a maximum length of 45 cm to a minimum length of 17.3 cm, with widths ranging from 7 cm to 1 cm and an average thickness of approximately 1 cm. Overall, the Shahneh Poshteh daggers belong to the category of simple Iron Age daggers, differing from the well-known and distinctive Iron Age daggers with crescent-shaped handles. Morphologically, these daggers have numerous parallels extending from the Bronze Age to the Iron Age (from the 3rd to the 1st millennium BCE).

Their continued presence throughout this long chronological span with only minor morphological changes indicates a strong tradition of continuity in this weapon type. Regarding their placement within the graves, one dagger was deposited beside the hands and over the chest, two daggers (Nos. 2 and 4) were placed beside and below the feet, while the remaining two were positioned beside or above the abdomen and pelvic region. Interestingly, their placement does not appear to correspond directly with the biological sex of the deceased. Daggers were deposited in various locations within the graves of men, women and children, suggesting their funerary role was not exclusively

associated with male identity or warrior status. Comparable Iron Age examples include daggers from Iron Age I and II contexts, such as Marlik Cemetery (Negahban, 1996: Pl. 121: 727, 728, 733; Pl. 124: 786, 787, 792, 793, 796), Qaleh Kuti I (Fukai & Ikeda, 1971: Pl. XVIII), Sialk A Cemetery (Ghirshman, 1939: Pl. V: 1), Sialk B Cemetery (Ibid: Pl. XXVI: 1, 5, 6), Gohar Tepe (Ghasemi Gorji, 2017: 92, Fig. 4-21: 8), Tepe Qaleh Kash in Amol (Amirkolaei, 2012: 143), Aq Tepe in Gonbad-i Kavous (Malek Shahmirzadi & Nokandeh, 2000: 192, Pl. 1), Kaluraz (Hakemi, 2017: 159, Pl. 273; 177, Pl. 12), Fakhrabad Kurgan in Meshgin'shahr (Abdollahi *et al.*, 2024: 12, Fig. 6), Iron Age III Lafurak Cemetery (Abedini Araghi, 2017: 243, Fig. 6-8; 244, Fig. 6-10).

4.2. Spearhead

Only one spearhead has been reported from the Shahneh Poshteh cemetery, belonging to the burial of an adult female. This bronze spearhead is severely damaged and corroded, with dimensions of approximately 20 cm in length and 3 cm in width. Based on the excavated burials of this cemetery, the limited presence of only a single spearhead suggests that this type of weapon probably held less significance compared to daggers and arrowheads within the funerary practices of the Shahneh Poshteh community.

4.3. Arrowheads

The largest group of weapons from Shahneh Poshteh consists of bronze arrowheads, with a total of 21 examples recovered from five burials. Despite their numerical abundance, these objects display limited morphological variation and can be divided into two general types. Overall, the arrowheads belonging to these two groups are highly similar, with the primary differences relating to the size and proportions of the blade and tang. The first group includes 20 arrowheads; morphologically, these examples possess a relatively long tang with a raised projection at the junction between the tang and the blade. The blade itself is triangular, ending in a pointed or slightly hook-like tip and is characterized by a raised longitudinal ridge extending along the length of the blade. Among these examples, four arrowheads show slight morphological differences from the others. Their tangs are somewhat shorter, while their blades are more sharply triangular compared with the broader blades of the remaining specimens. The second group consists of only one arrowhead, distinguished by a tang shorter than its elongated triangular blade, in contrast to the first group where the tangs are relatively longer. Similar to

the first group, this arrowhead has a raised projection at the junction of the tang and blade. The blade is elongated and sharply triangular with a raised central ridge extending along its length (Fig. 10). In terms of dimensions, the arrowheads reach a maximum overall length of approximately 14 cm, a maximum width of 4 cm and a tang length of 7 cm. The elongated tangs of these arrowheads were designed to be inserted into long wooden handles, while the raised projection at the junction served to secure and stabilize the attachment between the metal head and the wooden handle. Comparable examples have been found at several Iron Age sites such as Marlik (Negahban, 1996: Pl. 126: 840, 841), Tandavin in Talesh (Khalatbari, 2004c: 233, Pl. 13: 11), Sialk B (Ghirshman, 1939: Pl. XCII: 12, 15, 21), Khurvin Cemetery (Vanden Berghe, 1964: 246) and Hasanlu IVB (Thornton & Pigott, 2011: 144, Fig. 6.5: HAS 74-437).

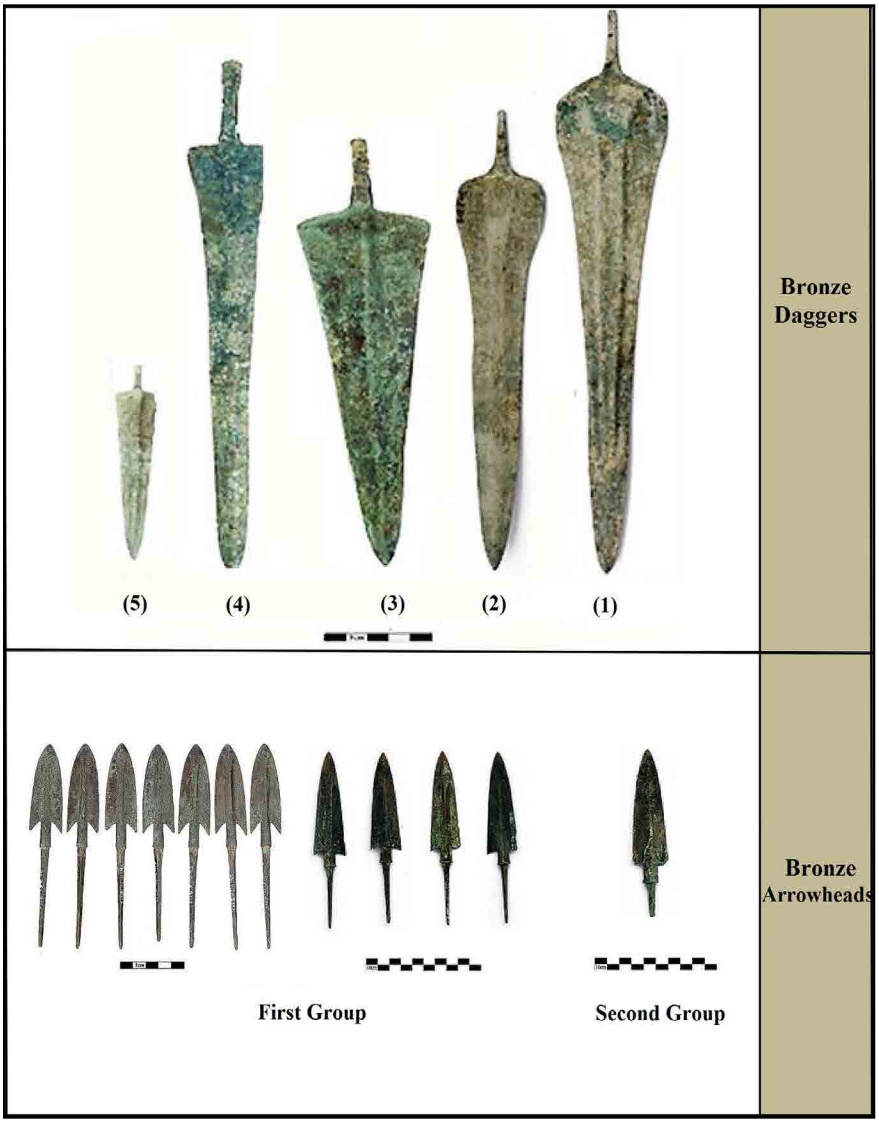


Fig. 10: Burial weapons including bronze daggers and arrowheads from Shahneh Poshteh cemetery (Authors, 2025). ▶

5. Tools

5.1. Spindle Whorls

Among the group of objects classified as tools from the Shahneh Poshteh cemetery, four spindle whorls have been recovered. These include examples made of clay, bone, and limestone. Morphologically, as with most spindle whorls from historical periods, they possess a biconical and circular to oval-shaped body (Fig. 11). The spindle whorls from Shahneh Poshteh lack any decorative elements. Since spindle whorls have generally undergone only minor morphological changes from the Neolithic period onward, the plain examples from Shahneh Poshteh have limited significance for comparative chronological studies. These spindle whorls range in size from 2.4 to 3.4 cm in diameter. As with other tools used in everyday activities, spindle whorls appear not to have been deposited in graves as purely funerary objects, but rather as personal belongings of the deceased that had been used during their lifetime and were subsequently placed in the burial after death. Therefore, spindle whorls are among the artifact categories that are commonly found in both settlement and funerary contexts.

5.2. Grinding Stone

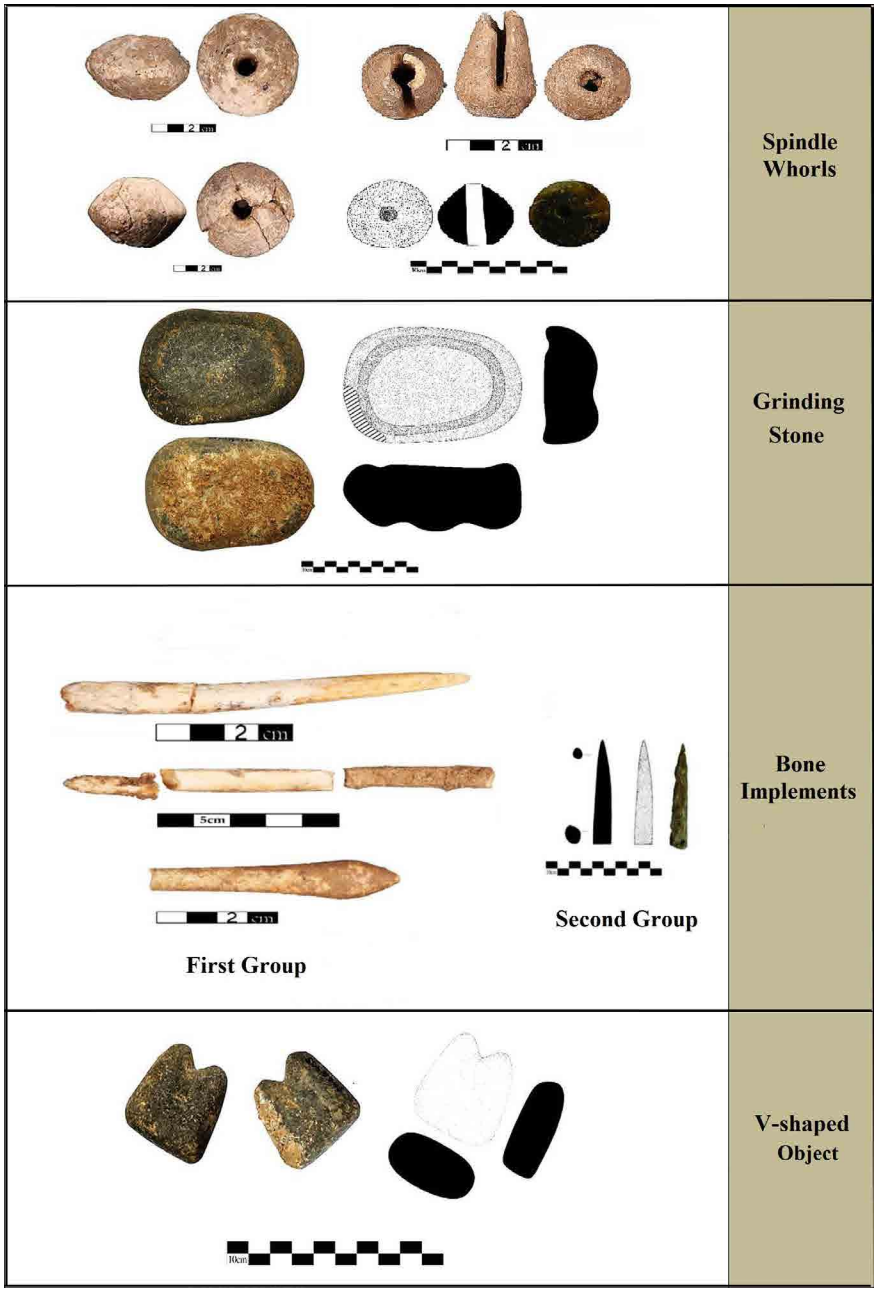
Another widely used tool in settlement contexts of the Iron Age, which is also frequently discovered in human burials, is the grinding stone. One example of this artifact was found in the Shahneh Poshteh cemetery (Fig. 11). Grinding stones have remained relatively unchanged in form from the Neolithic period onward due to their simple morphology and functional characteristics. Consequently, they generally hold limited value for comparative studies and relative chronological assessments. The Shahneh Poshteh grinding stone has an oval body with a concave inner surface and six small projections on its underside. A second noteworthy stone object was discovered in direct association with this grinding stone, supporting its interpretation as a tool used for pounding and grinding activities. Although a large number of grinding stones have so far been reported from Iron Age sites in Iran, their occurrence in funerary contexts is considerably less frequent than in settlement layers. Examples from settlement contexts in the Mazandaran region include the specimen from Tepe Qaleh Kash in Amol (Amirkolaei, 2012: 10) as well as the example from the Lafurak cemetery (Abedini Araghi, 2017: 152).

5.3. Awls and Knives

Among the tools and funerary objects discovered in the graves of the Shahneh Poshteh cemetery, several pointed implements, including knives and awls used for piercing and cutting, were identified. Bone tools played an important role among these artifacts, as demonstrated by their relatively high frequency in the burials. A total of six bone implements, particularly awls, have been recovered so far (Fig. 11) and, based on their morphology, can be divided into two groups. The first group consists of five specimens that, due to their slender, rod-like form, can be more accurately interpreted as awls or piercing implements. The single object belonging to the second group is somewhat distinct from the others, as it possesses a triangular pointed body resembling a knife, which differentiates it from the first group. In terms of dimensions, knife No. 2038 measures 11 cm in length and less than 2 cm in thickness, while the awls have a maximum length of 7 cm and a maximum thickness of 0.7 cm. It should also be noted that in one of the burials at this site, fragments of a severely deteriorated iron object were discovered that were probably related to a weapon or hunting implement, such as a dagger. However, accurate recovery and identification were impossible due to its extensive corrosion and fragmentation; therefore, it cannot be confidently assigned to the second group (knives), and its interpretation as a tool remains uncertain.

5.4. V-shaped Object

Among the objects recovered from the burials at Shahneh Poshteh, a highly distinctive stone artifact was discovered in the burial of an adult female. Due to its unusual form and morphology, its exact function cannot be determined with certainty. However, it is suggested that it may have functioned as a pounding implement, because it was found together with a grinding stone (Fig. 11). The body of this object is approximately cubic in shape, with a V-shaped opening and one side exhibiting a slight depression. Considering its material, unique morphology, and its association with the grinding stone, it is possible that this object represents a type of pestle or pounding tool used for grinding and processing plant materials. This interpretation is also consistent with the other tools discovered in association with this human burial.



◄ **Fig. 11: Burial various tools including spindle whorl, mortar, bone awl and V-shaped object from Shahneh Poshteh cemetery (Authors, 2025).**

6. Special Finds

Among the burial goods of the Shahneh Poshteh cemetery, several items can be considered special finds. One of the most significant objects is the remains of part of an animal jaw (probably belonging to a caprine species) placed beneath the feet of burial No. 20. This find is highly important and distinctive compared with the other burials at Shahneh Poshteh and was most likely part of a funerary offering. Since similar examples of placing animal parts (usually goat or sheep) as offerings within Iron Age burials are well documented, this particular funerary practice can be regarded as

one of the ritual traditions of this cultural period. Such practices continued in the southern Caspian region and Mazandaran from the Iron Age through the Achaemenid period and into the early Parthian period (Iron Age IV). Notably, evidence for this ritual practice has been identified at Bronze Age and Iron Age sites located in both the northern and southern regions of the Alborz Mountains, particularly in Mazandaran. These parallels include the remains of dogs and goats from Gohar Tepe (Ghasemi Gorji, 2017: 78, 87–89), animal remains from the Izgam Dasht cemetery in Ramsar (Khalatbari, 2018: 168), and animals such as horses or cattle from the Mehdi Chori cemetery in Deylaman (Jahani, 2014: 168, 175) and Tepe Pardis cemetery (Fazeli Nashli & Aghalari, 2015: 156, 160). These examples demonstrate the considerable antiquity of this practice and indicate its deep cultural roots within the southern Caspian basin and the Central Alborz region. Another highly important discovery from this site is an iron object fragment found on the skeleton of burial No. 4, representing the only confirmed iron artifact recovered from this cemetery. This object was in extremely poor condition and no recognizable morphological features remained; however, it was probably associated with a weapon or hunting implement, such as a dagger. Although this single iron artifact appears insignificant in comparison with the much larger number of bronze objects, it is highly valuable for understanding the development of Iron Age cultural processes in the region, the introduction of iron objects into burial assemblages, and the relative chronology of the site. Although iron metallurgy gradually began to appear among the cultures of western Asia during the late second millennium BCE (around 1300 BCE), its widespread and significant use occurred around 1000 BCE and the beginning of the first millennium BCE (Iron Age II). Consequently, alongside the long-established tradition of bronze production, iron gradually became a common metal among societies throughout the broader western Asian region (Bunimovitz & Lederman, 2012: 103) and in Iran, including key sites such as Hasanlu (Pigott, 1989: 71–74) and the cemeteries of Luristan (Pigott, 2004: 6).

In addition to this artifact, limited evidence of another metal object was found near the pelvic bones of collective burials Nos. 18 and 19, which belong to the Achaemenid–Parthian period. This object consisted of a fragment of slag-like metal material, measuring approximately 15 × 10 cm. The condition of this metal fragment was extremely fragile; large portions had become weathered, flaked, and detached. Due to its poor preservation, identifying the exact type of metal was highly difficult. Therefore, apart from the abundance of bronze objects and the presence of only two silver earrings, evidence for iron objects at this site remains limited to the

aforementioned iron fragment discovered in burial No. 4 and the possible metal fragment from the later collective burials. This scarcity may have resulted from several factors, probably the limited accessibility of iron resources for the Shahneh Poshteh community and the relative rarity of this important metal during the period.

Spatial Arrangement of Objects

The study of the arrangement and placement of funerary objects found in the burials at Shahneh Poshteh indicates that most objects did not follow a fixed or standardized spatial pattern according to their specific functions. Pottery vessels, weapons, and ornaments were placed in different areas around and upon the body of the deceased, without adhering to a clearly defined arrangement that could be interpreted as an established funerary tradition. However, two important observations should be emphasized. First, unlike other earthenware vessels, which were placed around the upper body, waist, face, and feet, jars were exclusively found around the skull, face, and upper body area. No jars were discovered near the feet or lower parts of the burials. Nevertheless, it can generally be suggested that there was no single standardized funerary placement pattern for ceramic vessels, and the entire burial space was utilized for their deposition. The second significant point concerns the placement of daggers, which were meaningfully positioned beside or above the pelvis and on the chest. This pattern suggests that daggers at Shahneh Poshteh may have been either attached to the waist of the deceased or placed in their hands over the chest after death.

Discussion and Analysis

One of the most common approaches for reconstructing the social structure of past societies is the application of data derived from ancient burials and their typological analysis. In this approach, archaeologists generally consider one or more funerary attributes, such as grave goods, the shape and dimensions of graves, or the location of cemeteries, and then evaluate the social status or rank of the individuals buried based on these criteria. However, the use of such evidence for studying the social structures of ancient societies also involves several challenges. One major issue is that the cultural materials recovered from a particular burial, along with the information related to social organization and the analysis of associated symbols, may have undergone transformations over time. Another problem is that what is observed within an archaeological grave may represent an idealized expression of an individual's social position rather

than an accurate reflection of their actual status in life (Dark, 2008: 111–112). Archaeologists generally identify the existence of social structures and hierarchical systems among past peoples and cultures through four major indicators, one of the most important being funerary practices and all related archaeological evidence (Askari Khanaghah & Kamali 2008: 225). Furthermore, architectural features, the size and depth of graves, and burial practices such as the manner and orientation of placing the deceased can also reflect funerary traditions and social customs (Parker Pearson, 1999: 5–6). In fact, it appears that no universal set of rules exists for the interpretation of burials and graves, as these practices are deeply influenced by the cultural distinctions of different periods. Therefore, the development of broader theoretical frameworks and general interpretive approaches remains necessary in the archaeology of death and burial (Fahlander & Oestigaard, 2008: 1). Consequently, researchers often tend to divide the contents of a grave assemblage into two broad categories: on the one hand, the body of the deceased, as the actual central element of the burial itself, and on the other hand, all countable objects that were either particularly influential in shaping burial ideology or were created as part of that ideological framework. This conceptual distinction between human remains and other objects and variables within a burial context, as well as the separation of their archaeological contexts, was established from the earliest stages of archaeological documentation, when these two categories were recorded and interpreted separately for analytical purposes (Miniaci, 2018: 1).

The majority of our information about the Iron Age, especially in Iran, comes from cemetery finds and the lives of the dead rather than from evidence of habitation and settlement areas. In other words, the archaeology of the Iron Age is largely associated with the archaeology of cemeteries, death, and burial practices; therefore, the study of the archaeology of death or archaeology of burial represents, to a great extent, the archaeology of this period itself (Fahlander & Oestigaard, 2008: 1). The grave goods from the Shahneh Poshteh cemetery also hold particular importance, having been recovered from 39 documented and archaeologically studyable burials. These objects include various categories, such as pottery, metal and stone ornaments, weapons, and metal and bone tools, which were placed in different areas of the graves, including beside the head and face, near the feet, and in front of or behind the body. The ceramic assemblage from Shahneh Poshteh encompasses a wide range of forms, including jugs, jars, spouted and footed bowls, cups, and a vessel possibly interpreted as an incense burner, produced in

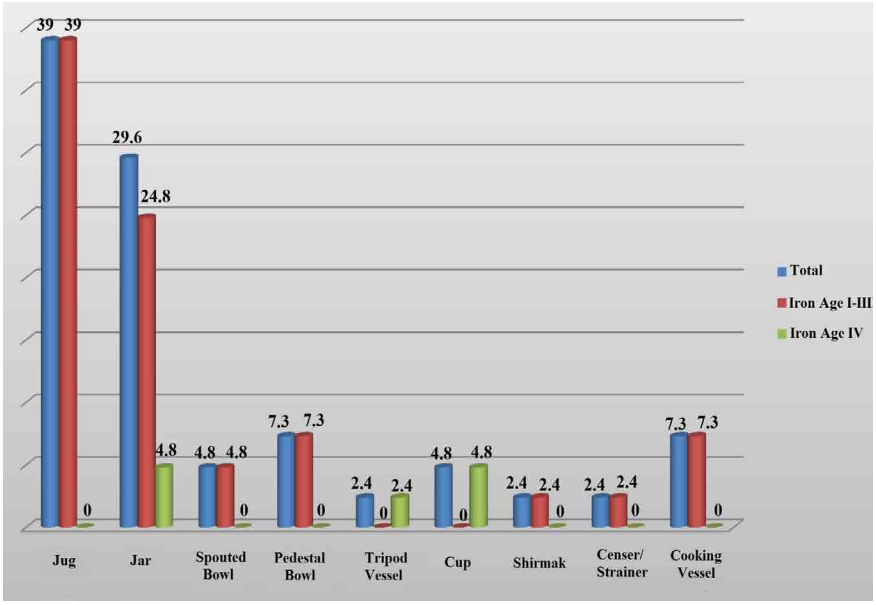
gray, red, brown, and orange-red (brick-red) colors. These vessels were deposited in the graves during different phases of the Iron Age, from the late second millennium to the second half of the first millennium BC. Studies of pottery recovered from excavated burials and surveys of the site indicate the dominance of various forms of orange-red and gray ware. These pottery groups have so far been identified at numerous intra-regional sites in Mazandaran and extra-regional sites dating to the late second and early first millennia BC. Although some of these examples differ morphologically from the pottery of Shahneh Poshteh, they all belong to the same chronological and cultural horizon (Roustaei & Koohi Gilvan, 2007: 71; Abedini Araghi, 2017: 233). Based on the limited, scattered studies of the Iron Age in Mazandaran, the ceramic assemblage of the Shahneh Poshteh cemetery can be compared with numerous sites in the Tajan River basin of Sari (Fallah Kiapey, 2016: 37–56), the Babol region (Dehestani Kolagar, 2012: 86–104), as well as the Chalus and Kelardasht regions (Heydarian, 2011: 118–154).

It can also be compared with excavated sites such as Qaleh Kash in Amol (Amirkolaei, 2009: 251; Amirkolaei, 2012: 141), Qaleh Kash in Qaemshahr (Abedini Araghi, 2017: 158), Huto Cave in Behshahr (Naqshineh, 2005: 69; Naqshineh *et al.*, 2013: 70), and Lafurak in Savadkuh (Abedini Araghi, 2017: 156), all attributed to Iron Ages I, II, and III. These comparisons demonstrate extensive cultural interactions throughout the Mazandaran region and the southern Caspian coastal area, manifested in both settlement sites and cemeteries. Overall, among the 39 excavated human burials in this cemetery, 41 complete and fragmented ceramic vessels were found, which can be examined from several perspectives. Of these 41 vessels, jugs constitute 16 items (39%), jars 12 (29.6%), bowls 5 items (12.1%), including two spouted bowls (4.8%) and three footed bowls (7.3%), kitchen vessels 3 items (7.5%), cups 2 items (4.8%), and three categories, tripod vessel, shirmak, and incense burner/strainer, each represented by a single example (2.4%). From another perspective, among the 41 pottery vessels, 36 belong to the Iron Age I–III burial group. These include 16 jugs (44.4% of the period assemblage and 39% of the total), 10 jars (27.7% of the period assemblage and 24.8% of the total), 5 bowls (12.1%), including 2 spouted (5.5% of the period and 4.8% of the total) and 3 footed examples (8.5% of the period and 7.3% of the total), 1 shirmak (2.7% of the period and 2.4% of the total), 1 incense burner/strainer (2.7% of the period assemblage and 2.4% of the total), and 3 cooking/kitchen vessels (8.5% of the period and 7.3% of the total). In addition, 5 vessels belong to burials dating from

the Achaemenid period to the early Parthian period (Iron Age IV). These consist of 2 jars (40% of the period and 4.8% of the total), 1 tripod vessel (20% of the period and 2.4% of the total), and 2 cups (40% of the period and 4.8% of the total), (Table 2; Fig. 12). Regarding surface colors, the pottery includes gray, light gray, red, orange-red, brownish-red, brown, grayish-brown, orange, and brownish-orange wares. Gray and orange-red vessels, both belonging to the Iron Age I–III phases, have the highest frequency, each represented by 11 vessels (30.5% of the period and 26.8% of the total). The brownish-red vessels belonging to Iron Age IV (20% of the period and 2.4% of the total), as well as grayish-brown and brownish-orange vessels from Iron Age I–III (each representing 2.7% of the period and 2.4% of the total), have the lowest frequency (Table 3; Fig. 13). Finally, decorative motifs and surface treatments on the pottery from this cemetery were produced through three main techniques. The first and most frequent group consists of 9 vessels decorated with horizontal raised bands. The second group includes one vessel decorated with horizontal incised bands or lines. The third group consists of one vessel decorated with checkerboard and hatching patterns created through burnishing techniques. These decorative styles were used throughout different phases from Iron Age I to Iron Age IV (Achaemenid period to the early Parthian period), (Table 4; Fig. 14).

Table 2. Frequency of pottery types from burials by vessel form (Authors, 2025). ▼

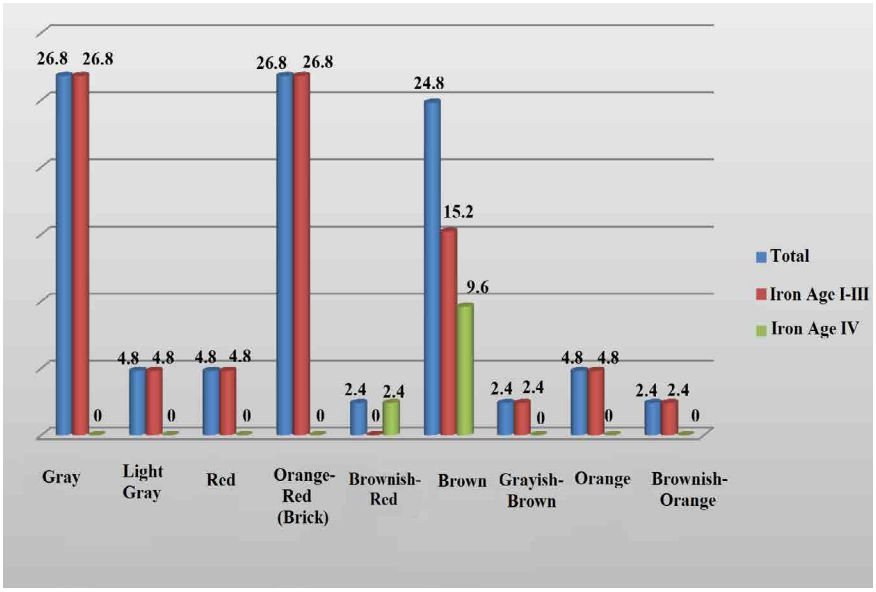
No.	Vessel Type	Period						Total of Periods	
		Iron I-III			Iron IV			Count	Percent
		Percent		Count	Percent		Count		
		of Total	of Period		of Total	of Period			
1	Jug	39%	44.4%	16	0	0	0	16	39%
2	Jar	24.8%	27.7%	10	4.8%	40%	2	12	29.6%
3	Bowl (Spouted / Pedestaled)	4.8% / 7.3% | 12.1%	5.5% / 8.5% | 14%	2 / 3 | 5	0	0	0	2 / 3 | 5	4.8% / 7.3%
4	Tripod Vessel	0	0	0	2.4%	20%	1	1	2.4%
5	Cup	0	0	0	4.8%	40%	2	2	4.8%
6	Shirmak	2.4%	2.7%	1	0	0	0	1	2.4%
7	censer/ strainer	2.4%	2.7%	1	0	0	0	1	2.4%
8	Cooking Vessel	7.3%	8.5%	3	0	0	0	3	7.3%
Total		88%	100%	36	12%	100%	5	41	100%



◄ **Fig. 12: Percentage abundance chart of burial's pottery types based on form (Authors, 2025).**

Table 3. Frequency of burial pottery types based on color (Authors, 2025). ▼

No.	Color Type	Period						Total of Periods	
		Iron I-III			Iron IV			Count	Percent
		Percent		Count	Percent		Count		
		of Total	of Period		of Total	of Period			
1	Gray	26.8%	30.5%	11	0	0	0	11	26.8%
2	Light Gray	4.8%	5.5%	2	0	0	0	2	4.8%
3	Red	4.8%	5.5%	2	0	0	0	2	4.8%
4	Orange-Red (Brick)	26.8%	30.5%	11	0	0	0	11	26.8%
5	Brownish-Red	0	0	0	2.4%	20%	1	1	2.4%
6	Brown	15.2%	17%	6	9.6%	80%	4	10	24.8%
7	Grayish-Brown	2.4%	2.7%	1	0	0	0	1	2.4%
8	Orange	4.8%	5.5%	2	0	0	0	2	4.8%
9	Brownish-Orange	2.4%	2.7%	1	0	0	0	1	2.4%
Total		**88%**	**100%**	**36**	**12%**	**100%**	**5**	**41**	**100%**



◄ **Fig. 13: Frequency distribution of pottery types from burials by surface color (Authors, 2025).**

Table 4. Frequency of decoration techniques on pottery vessels from burials (Authors, 2025). ▼

No.	Decoration Type	Period						Total of Periods	
		Iron I-III			Iron IV				
		Percent		Count	Percent		Count	Count	Percent
		of Total	of Period		of Total	of Period			
1	Raised	64%	75%	9	0	0	0	9	64%
2	Incised	14.5%	16.5%	2	0	0	0	2	14.5%
3	Burnished	7%	8.5%	1	14.5%	100%	2	3	21.5%
Total		**85.5%**	**100%**	**12**	**14.5%**	**100%**	**2**	**14**	**100%**

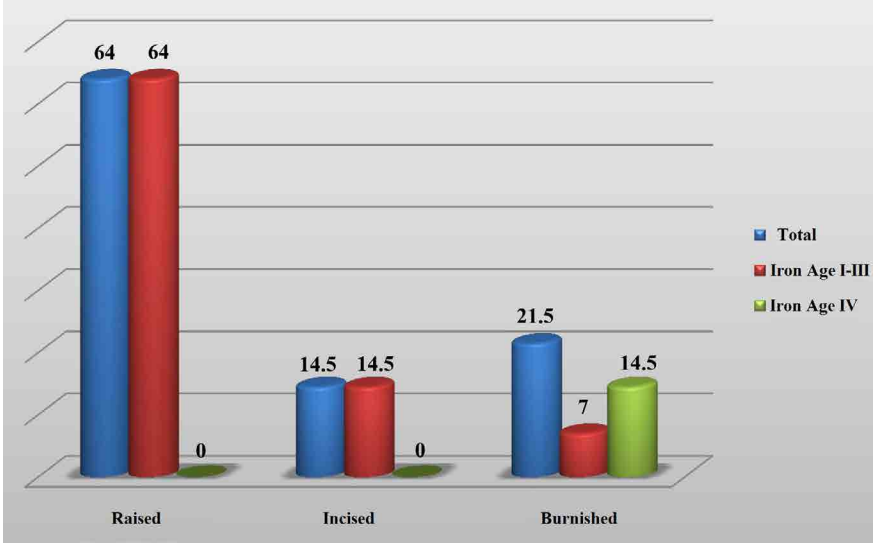


Fig. 14: Frequency distribution of decorative types on pottery vessels from burials (Authors, 2025). ▶

Alongside ceramic vessels, which represent the most important burial offerings in this cemetery, weapons, including bronze daggers, spearheads and arrowheads, constitute a significant portion of the grave goods and have been found in both male and female burials. The weapons from this site belong to the common types known from the Iranian Iron Age and do not display a high degree of morphological diversity. They mostly consist of simple leaf-shaped (oval) and triangular blades with a tang for attaching a wooden or cord-wrapped handle. The individuals buried in this cemetery were also accompanied by ornaments such as spiral silver earrings, bronze and silver pins, bracelets, and decorative beads made of faience, red carnelian and shell, which were used as necklaces, bracelets and anklets. It should be noted that pins were among the most important decorative objects used by the people of the Shahneh Poshteh community. From prehistoric times and particularly from the Bronze Age onward, pins were commonly used throughout the Near East and Central Asia for various purposes, including hair ornaments, clothing decoration, and, in their more developed forms, as implements or rods associated with cosmetic containers such as kohl applicators. The pins from Shahneh Poshteh can be divided into three main morphological groups: the first group consists of simple

wire pins, the second group includes pins with a conical body, a broken end, and a broad terminal part, and the third group consists of wire pins (similar to the first group) with one end bent inward. Among these objects, the wire implements with perforated ends can be classified as needles that had both decorative and practical functions. Regarding the function of these pins, several possibilities can be considered. The first type, due to its very simple form, was probably used for hair decoration and perhaps for fastening or arranging garments (or even burial shrouds). The second and third types, which possess bent or perforated ends, may have served similar purposes. Considering the absence of cosmetic vessels and kohl containers in the graves, they were probably not used as rods for cosmetic application. The fourth type, which can be interpreted as a needle, may have been used both as an ornament and as a sewing implement. Overall, it can be argued that the simple forms and lack of decoration of the pins and needles of Shahneh Poshteh, unlike the more distinctive Iron Age pins, provide limited information for chronological and cultural interpretations of this site. In addition, the bead assemblage recovered from Shahneh Poshteh appears to have had at least five different functions, based on their find locations within the burials. Many beads were found beneath the chin extending toward the chest, on the head, around the neck, and in front of the face, suggesting that they were used as necklaces or possibly as forehead ornaments. Furthermore, several faience beads were found together on the right side of the skull in Burial no. 31, which may indicate their use as earrings. In addition, 13 stone beads were scattered beside the right side of the pelvis in Burial no. 31 and may have functioned as part of a belt. Moreover, 5 bronze beads placed on the left ankle of Burial no. 31, along with a number of faience beads located on the pelvic bone, thigh, and around the left ankle of Burial no. 32, were probably used as leg ornaments or anklets. Regarding bead dimensions, they range from a maximum diameter of 2 cm to a minimum diameter of 1 cm. Finally, concerning the decoration and motifs on the beads, among all the decorative beads, only the faience examples display distinctive ornamental features. Some of these beads bear unclear animal-shaped motifs, while the more exceptional examples are decorated with geometric patterns consisting of wavy lines, which may represent a vegetal motif.

Conclusion

The data from the Shahneh Poshteh cemetery reveal a combination of similarities and differences in material culture when compared with extra-regional sites such as those in the Gorgan Plain, Gilan, the Central Plateau

and northwestern Iran. Regarding pottery vessels, the assemblage from this site, including forms such as jugs, jars, footed bowls, tripod vessels, and strainer/incense-burner, along with gray, orange-red and red wares, shows considerable affinities with sites in Gilan and the Central Plateau, and to a lesser extent with the Gorgan region. Likewise, based on weapons and ornaments, particularly faience, red carnelian, shell, and bronze beads, these groups have numerous parallels with Late Bronze Age sites such as Tepe Pardis, as well as Iron Age sites in Gilan including Marlik, Kaluraz, and Maryan and the Central Plateau sites such as Sialk, Tepe Ozbaki and Qeytariyeh. It appears that the Mazandaran region, as an elongated geographical region extending from east to west, was influenced by and connected with neighboring extra-regional cultures and such cultural interactions with surrounding lands were an unavoidable aspect of its historical development. Nevertheless, despite its proximity to the Gorgan Plain (associated with the ancient Dehistan culture) to the east, there appears to have been limited historical interaction between the archaeological sites of these two regions. Although some characteristic Dehistan cultural pottery forms such as horizontally handled spouted bowls are present in Mazandaran, these forms were widely distributed across large areas of Iran. Therefore, Gohar Tepe in the Behshahr region can be considered a boundary zone between the Iron Age cultural traditions of Mazandaran and those of Gorgan.

It should be noted that during the final stages of the Iron Age, particularly Iron Age III, considerable cultural uniformity emerged across extensive areas of Iran. Consequently, the burial assemblage of the Shahneh Poshteh cemetery, located in central Mazandaran, indicates extensive cultural interactions with western and southern regions of the Alborz Mountains, particularly with Gilan and the Central Plateau and, to a lesser extent, with northwestern Iran. These widespread connections probably reflect the existence of a relatively integrated cultural landscape (apart from the Gorgan region associated with the ancient Dehistan culture and the northeastern/Khorasan region associated with the Yaz culture). However, it should not be overlooked that the Alborz Mountains, as a natural geographical barrier, may have functioned as an internal cultural boundary for Iron Age sites within the Mazandaran region. Accordingly, certain ceramic forms such as tripod vessels (a form characteristic of Mazandaran and distinct from Central Plateau examples), a particular type of strainer/incense burner, and graves covered with pottery fragments may represent forms of internal cultural boundaries and frameworks within the broader cultural geography of Mazandaran, Gilan, and the Central Plateau. This type of cultural—

not necessarily geographical—framework and differentiation can also be considered for other regions, including the northeast, northwest, and even the Gorgan Plain (Dehistan culture). These areas possessed their own regional and extra-regional cultural characteristics and likely developed distinct cultural identities. Such cultural spheres may have been administered by regional centers featuring distinctive architectural remains including Tureng Tepe, Madau Tepe and Izat Kulli in the Gorgan–Dehistan region; Tepe Yam and Tepe Naderi in Khorasan; and Hasanlu and Dinkha in the Solduz and Oshnavieh plains in Iranian Azerbaijan.

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Authors' Contributions

The contributions of the authors to this article are as follows: the first, third and fourth authors each contributed 20%, while the second author contributed 40%.

Conflict of Interest

The authors declare that in accordance with publication ethics, all sources have been properly cited, and the content of this article has not been published in any other journal. The authors also state that there is no conflict of interest.

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عصر آهن و دورهٔ تاریخی در مازندران: طبقه‌بندی و گونه‌شناسی مجموعه گورآوندهای گورستان شهنه‌پشتهٔ بابل

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چکیده

در مطالعات عصر آهن مازندران تاکنون پژوهش جامعی در زمینهٔ گاهنگاری برپایهٔ اشیاء تدفینی صورت نپذیرفته است. بیشتر مطالعات بر روی مجموعه‌های سفالی و از طریق بررسی‌های باستان‌شناسی بوده و کمتر مبتنی‌بر داده‌های حاصل از کاوش هستند و پیامد آن، توصیف، طبقه‌بندی و تحلیل گاهنگاری اغلب متأثر از رویکردهای تاریخ فرهنگی بوده است. در این‌میان، دو فصل کاوش و بررسی باستان‌شناختی در گورستان شهنه‌پشتهٔ بابل منجر به یافتن مجموعه‌ای از اشیاء تدفینی گردید که شاخص‌ترین و فراوان‌ترین آن‌ها ظروف سفالی می‌باشد. گورآوندهای این محوطه دربردارندهٔ مجموعه‌ای از اشیاء متنوع ازجمله: سفالینه‌ها، اشیاء فلزی شامل: ظروف، جنگ‌افزارها و زیورآلات و همچنین ابزارآلات استخوانی و سنگی می‌باشند. از آنجایی‌که معمولاً سفالینه‌ها در بسیاری از گورستان‌ها از کمّیت بیشتری برخوردارند، در گورستان شهنه‌پشته نیز با مجموعه‌ای از ظروف سفالی روبه‌رو هستیم که دارای فرم‌ها و رنگ‌های مختلف بوده و عامل تعیین‌کننده‌ای در تبیین گاهنگاری نسبی و تعلق آن‌ها به عصر آهن III, II, I و IV/هخامنشی - اوایل اشکانی، یعنی اواخر هزارهٔ دوم تا نیمهٔ دوم هزارهٔ اول پیش‌ازمیلاد هستند؛ همچنین، فلز آهن به‌ندرت از این گورستان یافت‌شده و در مقابل از مفرغ به فراوانی در قالب جنگ‌افزارها و زیورآلات استفاده شده است. در پژوهش پیش‌رو تلاش می‌شود به پرسش‌هایی درمورد گونه‌شناسی و طبقه‌بندی مجموعهٔ اشیاء، ارتباطات تاریخی و گاهشناختی آن‌ها و برهم‌کنش‌های سبکی و فرهنگی این محوطه با محوطه‌های هم‌افقِ درون‌منطقه‌ای در مازندران و برون‌منطقه‌ای در جلگهٔ گرگان، گیلان، مرکز فلات و غرب ایران بررسی گردد. به‌نظر می‌رسد این محوطه در چارچوب توالی فرهنگی مازندران دارای همگونی‌هایی با برخی محوطه‌های هم‌زمان همچون: گوهرتپه، تپه پری‌جا، غار هوتو و لفورک است و در عین داشتن شباهت‌های سبک‌شناختی با تعدادی از محوطه‌های شاخص ایران، مانند: مارلیک، قلعه‌کوتی، کلورز، قیطریه، خوروین، مرسین‌چال و سیلک، اما دارای روندهای فرهنگی و برخی سبک‌های سفالی محلی خود می‌باشد.

کلیدواژگان: عصر آهن، مازندران، گورستان شهنه‌پشته، اشیاء تدفینی، گونه‌شناسی و طبقه‌بندی.

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Statistical Analysis of Settlement Patterns and Lifeways among Parthian-Period Communities in the Mountainous Highlands of Dehluran County Based on Archaeological Research

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Abstract

Dehluran County lies in an intermediate geographical zone between the southwestern highlands of the Zagros Mountains, the northwestern Khuzestan Plain, and eastern Mesopotamia. In current administrative terms, its northern uplands encompass the Sarab-e Meymeh and Zarrinabad districts and comprise a mountainous landscape formed by interconnected valleys of different sizes, with small intermountain plains occurring intermittently between the smaller and larger valley systems. The region is part of the Meymeh River watershed and, owing to its favourable geographical setting, has accommodated various human groups through successive phases of occupation, from the Paleolithic era to the present day. One of the main questions and objectives of this research is to investigate the character of the settlement patterns and the lifeways of Parthian-period communities in the mountainous highlands of Dehluran County, with special attention to statistical analyses carried out through geographic information system (GIS) methods. The study combines archaeological field survey, comprehensive library-based research, and the systematic preparation, comparison, and interpretation of GIS maps produced for the study area. Survey across roughly 1,355 km² documented 53 archaeological localities with Parthian-period cultural materials. These include 47 habitation sites, 2 cemeteries, 1 possible fortress, 1 rock relief, 1 rock shelter, and 1 tomb or subterranean structure. The spatial distribution of these localities and their overlay with GIS base maps demonstrate how natural factors influenced their formation, development, and decline. Communication routes, alongside environmental conditions, also played a fundamental role in determining the distribution of settlements during this historical period. Analysis of the full body of data generated through the different stages of research ultimately indicates the presence of a mobile society in the region during the Parthian period. This society depended mainly on pastoralism for subsistence, although agriculture was practised at certain times on intermontane plains possessing favourable environmental conditions.

Keywords: Dehluran, Mountain Highlands, Parthian Period, Settlement Pattern, Statistical Analysis (via ArcGIS).

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Introduction

The Parthian period represents a major cultural era in the broader field of Iranian archaeology. Lasting from 247 BCE to 224 CE, a total of 471 years, it extended across the whole territory of present-day Iran and into parts of neighbouring regions (Niknami *et al.*, 2006: 87). This considerable chronological and geographical extent, however, should not be understood as evidence that a wholly uniform cultural and social pattern prevailed throughout the entire area in either temporal or spatial terms (Haerinck, 1997: 124).

The changes that occurred during the Parthian period clearly differentiated it from earlier eras. Many prominent archaeologists therefore regard it as an important stage of cultural, economic, political, and social transformation in Iran (Mohammadifar, 2012: 124). Yet, despite the comparatively substantial body of research devoted to identifying this period and defining its main characteristics, fundamental questions about its cultural circumstances and its social, economic, political, settlement, subsistence, and other organisational frameworks remain unresolved and require further specialised investigation (Niknami *et al.*, 2006: 127).

The ethnic, cultural, political, and geographical diversity of the Parthian period has also made its cultural processes difficult to understand and, in many respects, obscure. Addressing these problems will require considerable time and a range of specialised research strategies, both now and in future archaeological investigations. Nevertheless, studies undertaken within clearly delimited regions can produce a more precise understanding and fuller awareness of the cultural details and processes associated with this phase of Iranian history. Such research has neither been conducted uniformly nor developed to the same extent across the broad geographical expanse of Iran. As a result, comprehensive analyses and general conclusions concerning the Parthian period throughout the country have frequently remained impossible or incomplete (Shanbehzadeh, 2023: 3).

Against this background, the mountainous highlands of Dehluran County, situated in the western hinterlands of the Central Zagros, form one of the principal intercultural regions considered in Iranian archaeology. The mountainous highlands of the Central Zagros border the area to the north and northeast, the Khuzestan Plain to the east and southeast, and the Mesopotamian plains of Iraq to the west and southwest. This geographical setting has repeatedly made the region a locus of cultural interaction during the prehistoric, historic, and Islamic periods. Nevertheless, despite

its importance, far less archaeological research has been undertaken in the highlands than in the plains of Dehluran (Sadeghi-Rad, 2023: 5). Knowledge concerning the character of settlement and the lifeways associated with it therefore remains limited, especially for the historical era and, more specifically, the Parthian period.

The mountainous hinterlands of the Zagros do not appear to have shared a single uniform cultural character. Although connected to one another, individual areas retained their own distinctive features and cultural traditions. Archaeological surveys and excavations throughout these regions generally trace the development, transformation, and chronology of nomadic and village-based communities from prehistory to the present. As already noted, northern Dehluran constituted a zone of cultural interaction between the prehistoric, historic, and Islamic cultures of the Central Zagros and those of the Khuzestan Plain and the Mesopotamian Plain. The cultural complexity of the Zagros has consistently been linked to the specific chronology of different regions, environmental changes, population fluctuations, technological specialisation, changes in settlement size, and cultural exchange. Examining these variables through analysis of the regional settlement pattern may make it possible to identify developed cultural formations, cultural communities, socially complex ranked societies, their lifeways, and other related characteristics (Sadeghi-Rad, 2023: 6).

The central research question is whether the study and analysis of Parthian-period archaeological localities identified through surveys of the mountainous highlands of Dehluran County can reveal one distinct settlement pattern or several settlement patterns. The study also asks whether analysis of the settlement patterns represented by Parthian sites in the Dehluran highlands can provide a clear account of subsistence practices, population fluctuations, and other related issues.

Accordingly, this study investigates the settlement pattern and lifeways of Parthian-period communities in the mountainous highlands of Dehluran County on the basis of archaeological research. Using evidence from regional survey, ecological studies, and statistical analyses derived from GIS data, it aims to clarify subsistence practices, identify the nature of the settlement patterns, and establish a clearer archaeological perspective on the Parthian period in this region within the wider historical and cultural development of Iran.

Research Background

The strategic position and favourable geographical setting of Dehluran,

especially the presence of its extensive plains, fostered a notable concentration of settlements associated with diverse cultural traditions over several millennia in this part of southwestern Iran. Dehluran therefore attracted the attention of archaeologists at approximately the same time as the earliest archaeological work in Khuzestan, which began in the early twentieth century (Nourollahi, 2006: 4–5). The French scholar Jacques de Morgan (Soraqi, 2008: 31), and subsequently Gautier and Lampre, were among the first researchers to investigate Dehluran archaeologically (Hole *et al.,* 1969: 8; Gautier & Lampre, 1905: 69; Vanden Berghe, 2008: 84–86). In relation to the historical periods, James Neely and Henry Wright surveyed the Dehluran Plain and neighbouring plains from 1968 to 1969 CE (1347 to 1348 SH), (Neely & Wright, 1994: 54). They also conducted more focused research on the historical periods, particularly the Elamite and Achaemenid eras (Wright & Neely, 2010: 214).

The first archaeological investigations in the Dehluran highlands, which form the study area, were undertaken by Louis Vanden Berghe. In 1972, as part of his continuing programme of research in the Pusht-i Kuh region, he conducted a survey of Dehluran. From 1971 to 1972, alongside his excavations at the Heklan Cemetery and the Dom Gar-e Parchineh Cemetery, he examined the surrounding area (Haerinck & Overlaet, 1996: 84). In addition to excavating the Heklan and Parchineh cemeteries, Vanden Berghe excavated part of the Chek Do Sa'ali structure, which belongs to the Sasanian period (Nourollahi, 2012: 7).

After the Iranian Revolution, specialists from the Cultural Heritage Organization made repeated visits to the Dehluran highlands and a small number of its archaeological remains. These visits, however, were unsystematic and conducted only on a case-by-case basis. Finally, from 2020 to 2021, Masoud Sadeghi-Rad surveyed the northern highlands of Dehluran, including both the study area and its surrounding landscape. His objectives were toDehluran andvious research, prepare the nomination dossier for inscribing the prehistoric cultural landscape of Dehluran on the UNESCO World Heritage List, evaluate the condition of archaeological remains in the mountainous highlands of northern Dehluran, and investigate interactions between the inhabitants of the highlands and plains during different periods (Sadeghi-Rad, 2023: 5).

Research Method and Study Area

This study is applied and developmental in its objectives and employs a descriptive–analytical method that is field based in character. The research

was conducted in three principal stages, each comprising several subsidiary steps.

The first stage consisted of fieldwork, which entailed a systematic pedestrian survey of the entire study area and the recording of all identified archaeological localities. The resulting observations were compiled in Excel as statistical data and subsequently integrated into a geodatabase within ArcGIS.

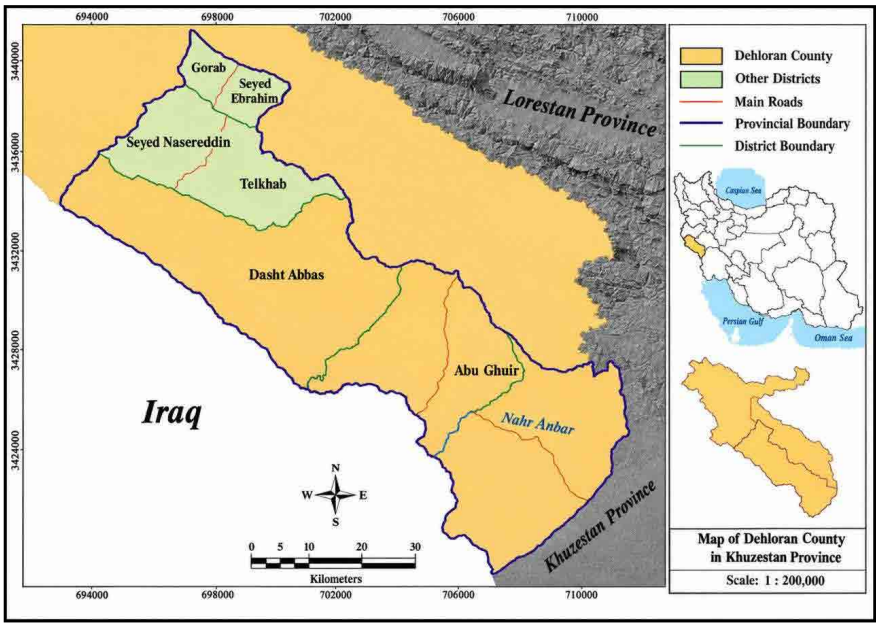
The second stage involved comprehensive library based research. This included the identification of relevant sources, a review of previous survey results and studies, the chronological classification of the recorded localities, and the collection of environmental and geographic information together with base maps and satellite imagery. All these materials were then incorporated into the GIS database.

In the third stage, the spatial data generated through the field investigation of the 53 Parthian period archaeological localities, already arranged chronologically, were compared with the information gathered from the library based studies. The site data were subsequently overlaid on base maps depicting geology, topography, climate, water resources, and vegetation, thereby enabling the research findings to be analysed.

The study area encompasses the mountainous northern portion of Dehluran County. It has a mean elevation of 1,268 m above sea level and extends from 32°50′ to 33°19′ N and 46°37′ to 47°17′ E. The area lies 55 km southeast of the city of Ilam in a straight line. Administratively, it includes Sarab e Meymeh District, comprising the rural districts of Gurab and Takhtan, and Zarrinabad District, comprising the rural districts of Seyyed Ebrahim and Seyyed Naser al Din. The total extent of the study area is approximately 1,355 km².

Physical Geography of Dehluran County

In geological terms, Dehluran lies at the westernmost extent of the Folded Zagros Zone. Limestone formations predominate in its northern and eastern sectors, while the Bakhtiari and Aghajari formations characterise the south and west. Quaternary deposits form most of the central areas (Aghanabati, 2004: 154). The county is crossed by the main active fault and several subsidiary faults (Dusti, 2015: 84). Much of Dehluran County forms part of a mountainous physiographic unit containing varied landforms, among them gorges, deep valleys, karstic features, and other comparable formations distributed across the landscape (Ahmadi, 1999: 45). Elevations throughout the county range from 46 to 2,490 m asl. The



◄**Fig. 1: The study area based on political-administrative divisions (Malekmohammadi & Sadeghi-Rad, 2023: 179).**

highest ground occurs in the north around the town of Meymeh, whereas the lowest elevations lie in the southern and western sectors, especially in the border regions (National Cartographic Center of Iran, 2008: 154).

The principal soil and land categories are badlands or highly dissected valley landscapes, Inceptisols, Entisols, Aridisols, and other types (Segourabravi, 2018: 83). Regarding vegetation cover, poor rangelands occupy most of the western half, moderate rangelands occur in the east, and sparse forests extend across parts of the northern county. High-quality steppe rangelands with tree cover form a belt through the northeastern and eastern sectors (Esmaeili, 2009: 76). Most of Dehluran County belongs to a hot and arid climatic zone, with semi-humid conditions occurring only in the northern highlands. The mean annual temperature in the region is 26.2°C, while mean annual precipitation amounts to approximately 271 mm (Ilam Provincial Meteorological Department, 2016: 52).

The perennial Meymeh and Duvayrij rivers constitute the principal surface water resources of Dehluran County. Both systems descend from the uplands onto the Dehluran Plain before continuing their courses into Iraq, and they have played a substantial role in shaping the alluvial architecture of the plain and sustaining continuous occupation within it. Through the erosion of sediment in the mountainous upper catchments and its progressive downstream deposition, the rivers have formed four aggradational sectors that constitute a critical subsistence base for the region's agropastoral communities. Groundwater represents an additional vital resource. The presence of 352 recorded mineral springs and an unquantified number of abstraction wells within the shallow aquifer system

indicates that the occupational viability of the county has depended on groundwater sources in conjunction with surface water (Ilam Water and Sewerage Department, 2016: 121).



Fig. 2: A view of the geographical setting of the region (Sarab-e Meymeh), (Shanbehzadeh 2023: 16). ▶

The Identified Parthian Period Archaeological Sites

The systematic pedestrian survey of the study area recorded a total of 53 archaeological localities yielding Parthian period cultural materials. The typological spectrum of these localities encompasses 47 habitation sites, two cemeteries, one probable fortress (?), one rock relief, one rock shelter, and one subterranean tomb. Of the 53 documented localities, 23 were founded de novo during the Parthian period, while 19 preserve evidence of cultural continuity into the succeeding period.

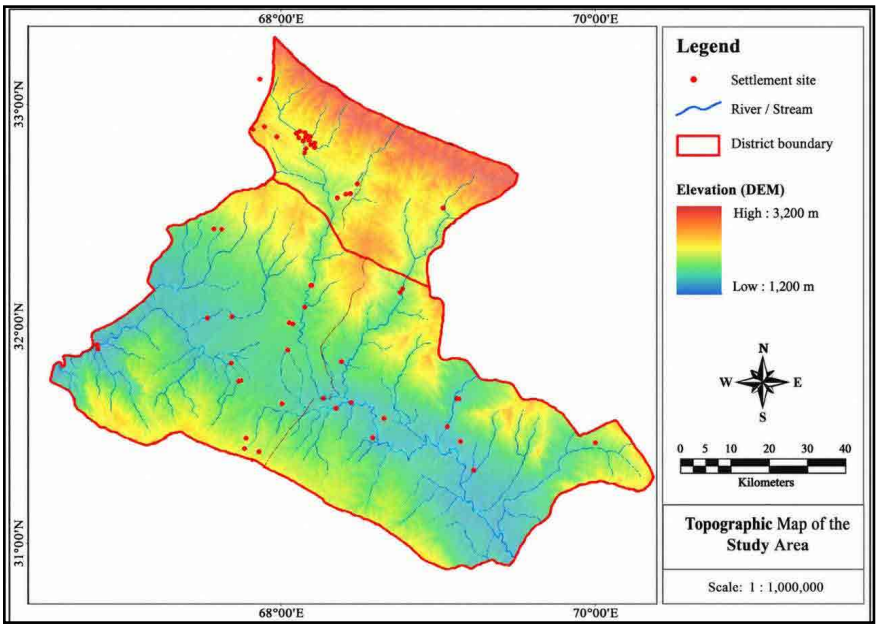


Fig. 3: Distribution of Parthian sites in the study area (Malekmohammadi & Sadeghi-Rad, 2023: 396). ▶

Environmental Factors Influencing the Formation of Parthian-Period Sites Based on Statistical GIS Analysis

From a geological perspective, the 53 identified archaeological localities are situated predominantly on limestone formations dating to the Cretaceous

Table 1: Technical characteristics of samples of Parthian potsherds recovered from the study area (Shanbehzadeh, 2023). ▼

1036-n.1	1035-n.4	1035-n.3	1035-n.2	1035-n.1	1033-n.2	1020-n.1	1014-n.7	1013-n.1	**Pottery No.**
Parthian	Parthian	Parthian	Parthian	Parthian	Parthian/Seleucid	Parthian	Parthian	Parthian	**Cultural Period**
Rim	Body	Body	Body	Rim	Rim	Rim	Rim	Rim	**Sherd Type**
Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar	Jar	**Vessel Form**
None	Incised	Incised	Incised	None	None	Relief	Stamped	None	**Decoration**
Light brown	Brownish red	Beige	Beige	Beige	Red	Orange	Brown	Brownish red	**Exterior Colour**
Brown	Brown	Brownish red	Red	Red	Light grey	Orange	Brown	Brownish red	**Core Colour**
Brownish red	Brownish red	Brownish red	Red	Brownish red	Red	Orange	Brown	Brownish red	**Interior Colour**
Gravel, sand, lime	Gravel, sand, lime	Gravel, sand, lime	Gravel, sand, lime	Gravel, sand	Gravel, sand	Gravel, sand	Gravel, sand, lime	Gravel, sand, lime	**Inclusions**
Wheel-made	Wheel-made	Wheel-made	Wheel-made	Wheel-made	Wheel-made	Wheel-made	Wheel-made	Wheel-made	**Technique**
Under-fired	Under-fired	Under-fired	Well-fired	Well-fired	Well-fired	Well-fired	Well-fired	Well-fired	**Firing**
Minab, Shushtar	Yazdegerd Castle	Yazdegerd Castle	Yazdegerd Castle	Yazdegerd Castle	Dehluran	Dehluran	Minab, Shushtar	Dehluran	**Comparanda (Site)**
Khosrowzadeh (2006, p. 229, fig. 44); Gibson (1999, p. 4, fig. 18)	Keall and Keall (1981, fig. 27-12)	Keall and Keall (1981, fig. 24-19)	Keall and Keall (1981, fig. 28-19)	Keall and Keall (1981, fig. 11-8)	Horshid (2015, p. 114, fig. 28, 7)	Horshid (2015, p. 64, fig. 14, 9); Boucharlat and Labrousse (1979, p. 34, fig. 8)	Khosrowzadeh (2006, p. 237, fig. 28, 6); Miroschedji (1987, p. 28, fig. 6)	Zeinivand (2015, p. 312, fig. 4-58, B)	**Reference**

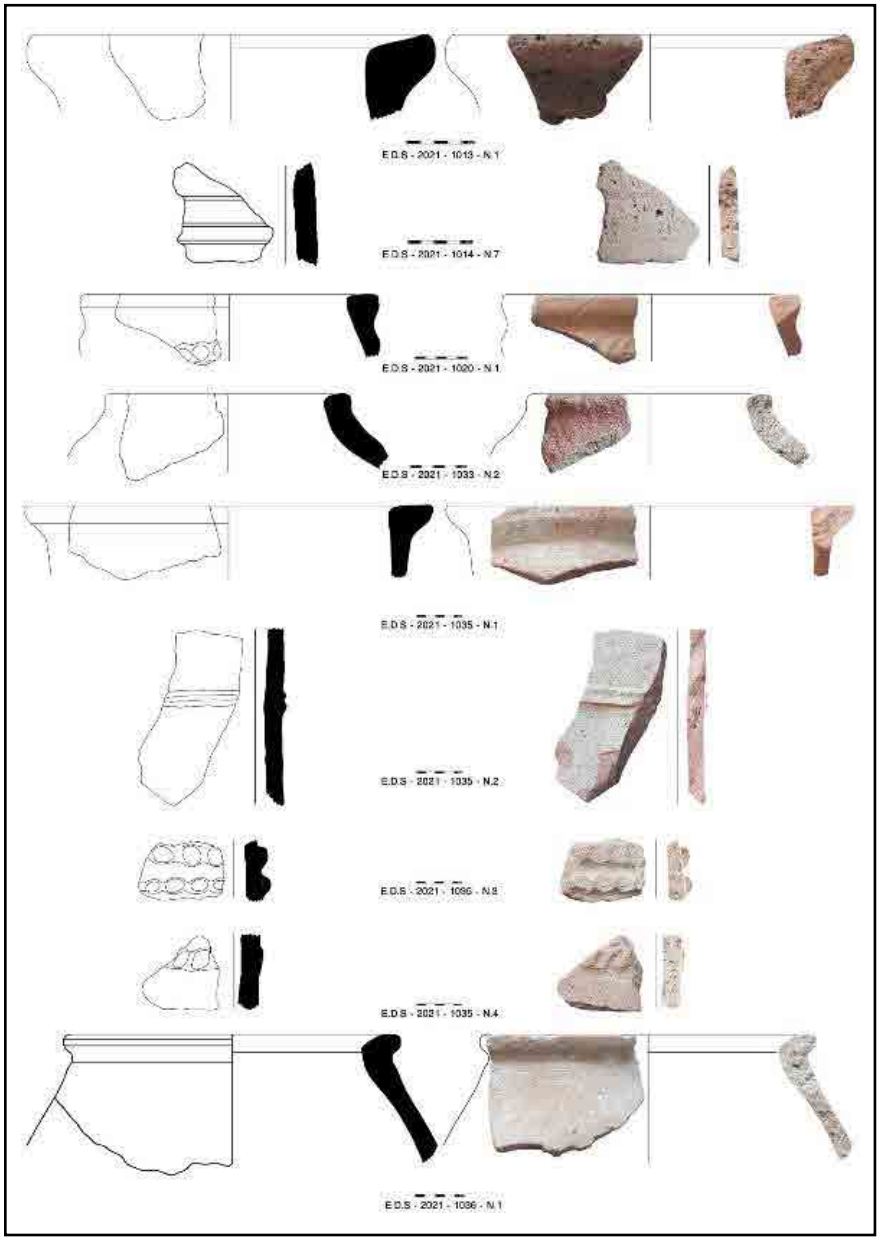


Fig. 4: Samples of Parthian pottery recovered from the study area (Shanbehzadeh, 2023). ▶

and Paleocene (3 sites), Miocene (48 sites), and Eocene and Oligocene (2 sites). Of these, Miocene formations cover approximately 75% of the study area. Several geological formations occur across the region, and the distribution of the identified sites extends over the Gachsaran Formation (40 sites), Asmari Formation (2 sites), Pabdeh Formation (4 sites), Aghajari Formation (6 sites), and Quaternary deposits (1 site). One of these geological formations occupies approximately 60% of the study area. Overlay analysis combining the archaeological site distribution with seismic hazard zoning layers shows that the region can be divided into two sectors: a northern sector characterised by high seismic risk, covering

40% of the study area, and a southern sector of moderate seismic risk, accounting for 60%. The identified localities are distributed almost evenly between these two sectors, with 27 sites in the high-risk zone and 26 in the moderate-risk zone. The principal fault and subsidiary faults occur in the southern part of the study area.

The study area ranges in elevation from 500 to 2,496 m above sea level. The 53 recorded sites are distributed almost equally between two elevation classes, each covering approximately 45% of the total area: 26 sites lie at 1,000–1,500 m, and 27 sites at 500–1,000 m. Slopes vary from 0 to 77 degrees. Most sites (31) occur on gentle slopes of 0–10°, a class that accounts for roughly half the area. Of the remaining sites, 13 are on slopes of 10–20°, six on 20–30°, two on 30–40°, and one on 40–50°. In addition, more than 40 sites are situated on slopes facing north northeast and south southwest.

Mountains dominate the landscape, covering 95% of the study area; the intermontane plain of Pahleh, confined to the central part of these highlands, makes up the remaining 5%. When classified by soil or land type, the region falls into two principal categories: mountains (85%) and hills (15%). Of the 53 recorded archaeological localities, 42 are situated in mountainous terrain and 11 on hills. The main soil and land classes consist of rocky outcrop/Inceptisol (no sites), rocky outcrop/Entisol (17 sites), badlands or highly dissected valley landscapes (34 sites), and Inceptisol (2 sites). Badlands and highly dissected valley landscapes account for roughly 75% of the entire area.

Erosion intensity is divided into four classes: very low (17 sites), low (9 sites), moderate (26 sites), and high (1 site), corresponding to 35%, 10%, 45%, and 5% of the study area, respectively. Climatically, the region is split into semi humid and semi arid zones; all 53 sites fall within the semi arid class, which extends across about 90% of the area. Mean annual temperature ranges from 6 to 18 °C and is grouped into two bands: 6–12 °C (22 sites) and 12–18 °C (31 sites); the warmer band covers approximately 70% of the region. Mean annual precipitation, spanning 50 to 500 mm, is similarly divided into two classes, 50–250 mm (26 sites) and 250–500 mm (27 sites), each occupying nearly half the area. Mean annual evaporation varies between 2,000 and 3,000 mm, with 31 sites in the 2,000–2,500 mm class and 22 sites in the 2,500–3,000 mm class; the lower evaporation class accounts for about 70% of the total area.

The study area lies within two sub basins: Dehluran (44 sites) and Daneh Tona or Cheshmeh Shahi (9 sites). The Dehluran sub basin covers roughly

70% of the region. The Meymeh River (44 sites) and the Timeh River (9 sites) are the principal watercourses, and the Meymeh basin likewise represents about 70% of the area.

Vegetation is classed into several types: mountainous, hilly, and alluvial fan rangelands (3 sites); irrigated agricultural land (no sites); high quality steppe rangelands, occasionally with scattered trees (42 sites); and vegetation associated with saline plains and sandy hills (8 sites). These categories occupy, respectively, under 5%, under 5%, 75%, and 25% of the study area. Land use classes include forest with moderate canopy cover (1 site), rangeland with moderate canopy cover (19 sites), rangeland with poor canopy cover (2 sites), rocky outcrop (1 site), dry farming (5 sites), and forest with sparse canopy cover (15 sites). Forest with sparse canopy cover accounts for approximately 45% of the area, rangeland with moderate canopy cover about 35%, and the remaining classes together for roughly 20%.

Settlement Patterns and Lifeways during the Parthian Period in the Dehluran Highlands

The long term trajectory of demographic growth and the attendant rise in the number of settlements, a pattern that began in prehistory and endured into the Islamic centuries, is clearly attested for the Parthian period as well. Surface traces of architecture were recorded at the great majority of the Parthian period sites identified across the study area. A substantial proportion of these remains can be assigned to ancient nomadic camps or seasonally occupied settlements and appear to capture the living conditions and adaptive strategies of the region's mobile communities during this time. Further evidence for the existence of seasonal settlement is supplied by the documented use of caves and rock shelters in the Parthian period. Although scatters of cultural material suggest that several Parthian period localities occasionally covered several hectares, the surface architectural footprint of none of these places, whether interpreted as permanent settlements or as seasonal ones, exceeds one hectare.

These settlement localities generally occurred on Miocene formations and the Gachsaran Formation, in areas of high and moderate seismic hazard, and between 5 and 35 km north of the region's main and subsidiary faults. Another consistent feature was their location at elevations from 500 to 1,500 m above sea level and on slopes ranging from 0 to 15 degrees. Their slope aspects broadly followed the regional topography, facing north, northeast, south, or southwest. The surrounding soils consisted primarily

of badlands or highly dissected valley landscapes and, in some cases, rocky outcrop/Entisols, while erosion intensity varied from very low to moderate. The region's semi-arid climate, with mean annual temperatures from 6 to 18°C, precipitation from 50 to 500 mm, and evaporation from 2,000 to 3,000 mm, made these lands unsuitable for agriculture. Even so, the presence of the Meymeh and Timeh rivers, high-quality steppe rangelands with occasional scattered trees, and, in some areas, vegetation characteristic of saline plains and sandy hills created favourable conditions for seasonal pastoralism. Rangelands with moderate canopy cover and forests with sparse canopy cover offered ideal environmental conditions for pastoral groups.

Taken together, the geographical features and environmental conditions of the study area, interpreted in conjunction with the available archaeological evidence as represented by the available surface archaeological record in the study area, support the view that Parthian communities inhabiting the northern Dehluran highlands generally relied on a pastoral subsistence strategy. The limited areas containing fertile and productive land were used for agriculture and probably for horticulture as well.

Roads and nomadic migration routes were another highly influential factor in the formation, development, continuity, and decline of archaeological sites in the region during this period. Because the inhabitants practised pastoral subsistence and remained mobile, roads and migration routes strongly shaped the spatial distribution of settlements. The dense landforms and the numerous, continuous valleys and ridges, which eventually lead towards the area's massive rock walls and deep valleys, created particular conditions for mobile groups. To move more easily across this terrain, these groups were necessarily compelled to follow long, level ridges or valley floors containing water, such as river courses and permanent water channels. This movement pattern among mobile groups in the Dehluran highlands is known locally as "maz o galar." In the local dialect, "maz" means an elongated ridge, whereas "galar" means a valley. On this basis, settlements were consequently established mainly along ridges or at the margins of valleys, in locations close to the routes used for movement (Sadeghi-Rad, 2023: 194).

Two of the 53 archaeological localities recorded for this period within the study area can be confidently identified as cemeteries. These burial grounds were typically sited along ancient communication routes and in the immediate vicinity of the principal settlements. The surface finds and associated evidence recovered from both cemeteries demonstrate unequivocally that jar burial was the funerary practice employed.

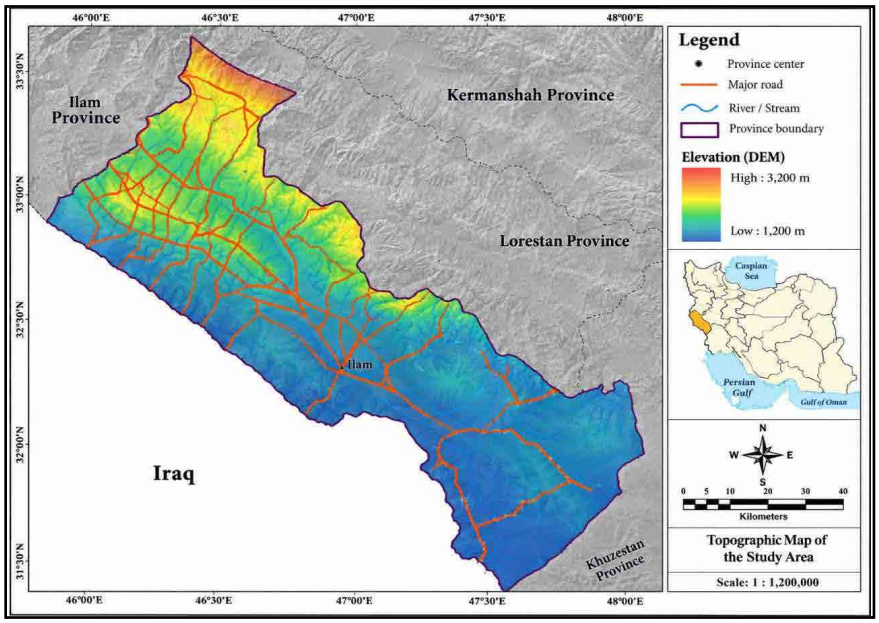


Fig. 5: Distribution and location of identified ancient migration routes in Dehluran County (Sadeghi-Rad, 2023a: 195). ▶



Fig. 6: A view of Parthian period jar burials to the east of Sarab-e Meymeh (Sadeghi-Rad, 2023: 863). ▶

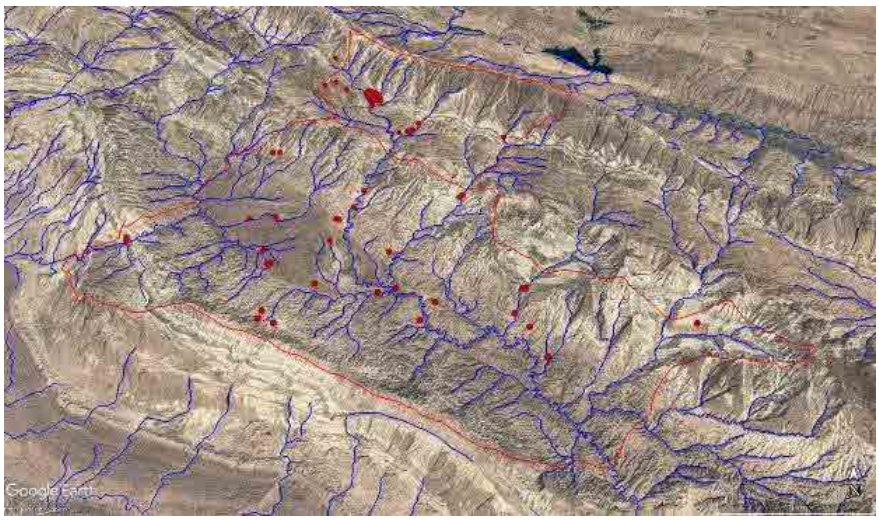
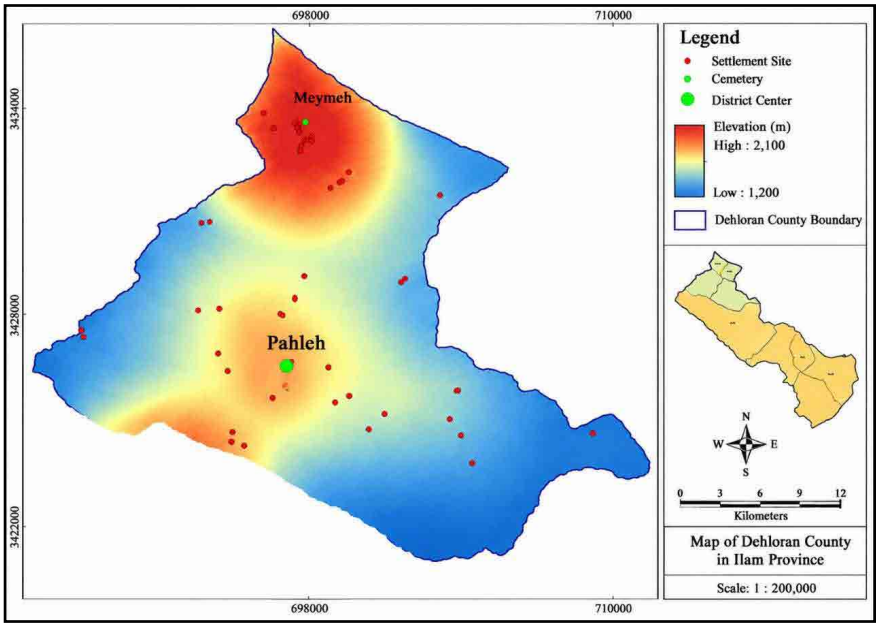


Fig. 7: Distribution of Parthian settlements in the study area along the river courses and ancient routes (Google Earth, 2022). ▶

The spatial distribution of the Parthian period archaeological localities reveals a linear settlement pattern aligned along the region's ancient routes; however, environmental variables and broader biophysical conditions also markedly influenced site density, concentrating occupation in certain sectors more heavily than in others. Analysis of the settlement evidence indicates that the Sarab e Meymeh intermontane plain, owing to its comparatively favourable geographical and environmental conditions, supported the highest site density. The area around the city of Pahleh ranked next in habitability, surpassing the remainder of the study area.



◀**Fig. 8: Distribution and density of Parthian period archaeological sites in the study area (Malekmohammadi & Sadeghi-Rad, 2023: 846).**

Conclusion

The archaeological survey of the mountainous highlands of Dehluran County, encompassing the Sarab e Meymeh and Zarrin Abad districts and covering an area of 1,355 km², recorded a total of 260 archaeological localities spanning the Paleolithic to the contemporary period. Among these, 53 produced evidence dating to the Parthian period. Knowledge of the Achaemenid and Seleucid periods in the region remains limited, and no specialised studies of their cultural materials have been undertaken; consequently, the relationship of these earlier periods to the Parthian settlement landscape is not yet understood. Nevertheless, analysis of the 53 documented Parthian period localities shows that 23 were first established during this period, while 19 display cultural continuity into the succeeding Sasanian era.

The Parthian period settlements are generally small, covering less than one hectare. The visible architectural remains consist of isolated, single

room structures with dry stone foundations and circular or rectangular plans, typically constructed without mortar. These features point to temporary, seasonally occupied settlements closely associated with a mobile pastoralist way of life. The physical setting of the settlements further reinforces their seasonal character. Sites are consistently located on foothills or on natural terraces cut into mountain slopes, a short distance from river courses and the traditional migration routes of the region. This pattern mirrors the present day practice in which local nomadic groups pitch their tents in the same locations, sometimes surrounding them with low stone walls. While the bulk of the archaeological evidence suggests that the population of the region during the Parthian period pursued a mobile lifestyle, the possibility that permanent settlements also existed cannot be dismissed; establishing their presence, however, would require targeted excavation.

The alignment of migration routes constitutes another major factor governing site distribution. Sixteen ancient migration or communication routes have been traced within the study area. These routes follow valley floors and run along mountain slopes, forming a transport network that linked different parts of the region to one another and to areas beyond. The most important of these is the Meymeh route, which parallels the Meymeh River and connects the mountain highlands to the southern lowlands. This route became the principal artery of the region as subsidiary and main roads progressively joined it. Almost all of the recorded Parthian period archaeological localities are situated along these migration routes and are aligned on a northwest to southeast axis.

During this period, the small intermontane plain of Sarab e Meymeh, which covers roughly 150 ha, functioned as the main focus of human activity within the study area. Its primacy reflects a combination of factors: a distinctive geographical position, plentiful water resources, fertile soils, and the convergence of ancient migration routes. Fifteen of the 53 identified localities are distributed across the plain at an average interval of approximately 400 m. A notable feature of their arrangement is the regularity with which they appear to divide the available space. The sites are positioned in such a way that the plain seems to have been equitably partitioned among its occupants, with each settlement holding a portion of the land. This interpretation gains weight from the observation that, until a few decades ago and to a lesser extent even today, ownership or usufruct of different sections of the Meymeh plain was held, collectively or periodically, by specific tribes or clans.

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Author Contribution

This research is derived from the first author's doctoral dissertation. The primary data collection, encompassing all observational and analytical components, was conducted by the first author under the direct supervision and mentorship of the second and third authors.

Conflict of Interest

In adherence to ethical publication standards, the authors affirm that there are no conflicts of interest, either personal or financial, that could have influenced the content or conclusions presented in this research.

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تحلیل آماری الگوی استقرار و شیوه های زیستی جوامع انسانی دورهٔ اشکانی در ارتفاعات کوهستانی شهرستان دهلران برمبنای پژوهش‌های باستان‌شناسی

عبدالمالک شنبه‌زاده[I]، غلامرضا کرمیان[II]، مجیدرضا رجبی[III]

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چکیده

شهرستان دهلران منطقه‌ای بینابینی در جنوب‌غرب ارتفاعات کوهستانی زاگرس، شمال‌غرب دشت خوزستان و شرق میان‌رودان است. ارتفاعات شمالی شهرستان که از نظر تقسیمات سیاسی شامل بخش‌های سراب میمه و زرین‌آباد است، را منطقه‌ای کوهستانی با دره‌های کوچک و بزرگ به‌هم پیوسته و گاهی دشت‌های کوچک میان‌کوهی فراگرفته است. این محدوده بخشی از حوضهٔ آبخیز رودخانهٔ میمه است که به‌علت شرایط مساعد جغرافیایی طی ادوار مختلف (دورهٔ پارینه‌سنگی تا دوران معاصر) سکونتگاه گروه‌های مختلف انسانی بوده است. چگونگی الگو یا الگوهای استقراری و شیوه‌های زیستی جوامع انسانی دورهٔ اشکانی در ارتفاعات کوهستانی شهرستان دهلران با تکیه‌بر تجزیه و تحلیل‌های آماری مستخرج از نرم‌افزار GIS، ازجمله مسائل و پرسش‌های اساسی این پژوهش است. درنتیجه بررسی‌های باستان‌شناسی محدودهٔ مطالعاتی که گستره‌ای به‌وسعت ۱۳۵۵ کیلومترمربع را دربر می‌گیرد، درمجموع ۵۳ مکان باستانی با یافته‌هایی فرهنگی از دورهٔ اشکانی شناسایی گردید که از نظر تنوع مکان‌های شناسایی‌شده شامل: ۴۷ محوطه، ۲ گورستان، ۱ قلعه (؟)، ۱ نقش صخره‌ای، ۱ پناهگاه صخره‌ای و ۱ دخمه (معماری زیرزمینی) است. پراکنش مکان‌های باستانی شناسایی‌شده و هم‌پوشانی آن‌ها با نقشه‌های پایه در نرم‌افزار GIS تأثیر عوامل طبیعی بر شکل‌گیری، توسعه و اضمحلال این مکان‌ها را به اثبات رسانید. علاوه‌بر عوامل محیطی، مسیرهای ارتباطی نیز نقش اساسی در چگونگی توزیع استقرارهای این دوره دارد. درنهایت، تجزیه و تحلیل داده‌های حاصل از پژوهش‌ها صورت‌گرفته منجر به اثبات جامعه‌ای کوچ‌رو با معیشتی متکی به دامپروری و گاهی کشاورزی (در دشت‌های میان‌کوهی با شرایط مساعد محیطی) را طی دورهٔ اشکانی و در این منطقه به اثبات رسانید. به‌نظر می‌رسد، پس‌کرانه‌های کوهستانی زاگرس از ویژگی‌های فرهنگی منظمی برخوردار نبوده و هرکدام در عین به‌هم پیوستگی، دارای ویژگی‌ها و فرهنگ‌های خاصی هستند. کاوش‌ها و بررسی‌های باستان‌شناسی در این مناطق عموماً بیانگر توسعه و تطور فرهنگی و گاهنگاری جامعهٔ کوچ‌رو و روستانشینی از پیش‌ازتاریخ تاکنون می‌باشد.

کلیدواژگان: دهلران، ارتفاعات کوهستانی، اشکانی، الگوی استقرار، تحلیل آماری (GIS).

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An Iconological Approach to Mythical Birds of the Sasanian Period: A Case Study of the Simurgh

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Abstract

Simurgh is a prominent mythical figure of Iran that has appeared in diverse visual and literary forms in Iranian art and culture from antiquity to the contemporary era. Erwin Panofsky introduced iconology as an approach to art-historical analysis, systematically progressing from the description of artistic phenomena to the interpretation of their underlying meanings. This method operates through three interconnected levels of meaning, corresponding to motif, theme, and intrinsic meaning. Accordingly, this article examines and interprets the symbolic meanings of Simurgh as a prominent figure in Iranian art through an iconological analysis of different historical periods, with particular attention to transformations in its form, iconographic attributes, and cultural significance, including the Sasanian and broader pre-Islamic eras, as well as the Ilkhanid and Safavid periods of Islamic Iran. The principal research question is as follows: How did the Simurgh motif change formally and semantically within the artistic and literary traditions of pre-Islamic and Islamic Iran, and to what extent was its development influenced by neighbouring civilizations? The corpus comprises selected artworks and material objects, including textiles, paintings, metalwork, leatherwork, and ceramics from Iran, ancient China, and ancient Egypt. Within this historical framework, the analysis considers pre-Islamic religious texts, mythological literature, particularly Ferdowsi's Shahnameh, and mystical writings, especially Suhrawardi's the Red Intellect, alongside the mythological traditions of ancient China and Egypt, thereby situating the material evidence within broader comparative religious, literary, and cultural contexts. The results indicate that, before the rise of Islam, Simurgh was conceived as a bird possessing supernatural powers, whose imagery signified the supremacy and dominion of cosmic forces over the terrestrial world. For instance, depictions of Simurgh on the garments of Sasanian rulers functioned as symbols of divine protection, conferred political and religious legitimacy upon the ruler, bestowed farr (royal glory), and, more broadly, embodied and transmitted royal authority.

Keywords: Iconology, Mythology, Simurgh, China, Egypt.

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Introduction

Iconology and iconography are methodological approaches in art history used to examine the content of images and their semiotic significance. Iconography involves the systematic collection, classification, and interpretation of information derived from individual works of art. Building on the findings of iconographic research; iconology investigates the broader systems of ideas and cultural values underlying images. Iconographic research in art history examines the references embedded in images, because images and visual symbols, like literary concepts, form part of a society's shared cultural framework. Interpreting images requires identifying the beliefs that generated particular discursive systems through which meanings were expressed in ancient societies. In mythological studies, iconography facilitates understanding of the relationship between word and image within the context of specific mythological beliefs. Accordingly, ancient literary sources associated with motifs represented in artworks acquire particular interpretive significance (Mokhtarian, 2012: 1). Symbolic concepts may appear within verbal, visual, or behavioral systems of symbolic communication. Although iconology primarily focuses on the content of images, its principal aim is to investigate the relationships among these elements within the broader symbolic system of culture (Rafi'far & Malek, 2013: 7). Drawing on this understanding of iconology, the present study examines the iconographic representation of the Simurgh in artworks produced during the Islamic period.

Research Questions and Hypotheses: The central research question of this paper can be framed as follows: How did the Simurgh motif change in formal and semantic terms across the art and literature of ancient and post-Islamic Iran, and to what degree was its development influenced by contact with other civilizations?

Accordingly, the main aim of this research is to identify and examine the shared characteristics of the Simurgh motif in Iranian art and mythology and, using an iconological framework, to compare them with similar symbolic representations of the same general type in neighbouring civilizations. Another objective is to understand why the Simurgh was chosen as a symbolic bird in Iranian mythology and to explain its wider semantic significance. The problem considered here involves tracing the origins of this visual conception of a supernatural creature and clarifying how it relates to other religious and artistic traditions. The research also seeks to explore the process by which the Simurgh symbol changed during the Sasanian Empire and was later transmitted into the Islamic period. Given the long history of the motif, its origins, classification, and historical

development must be traced carefully through literary and comparative research.

Moreover, because the visual features of the Simurgh theme in the Islamic era may have been drawn from the cultures of neighbouring regions, the comparative investigation is not geographically limited to Iran. The study therefore begins by considering the mythical creature known as the Simurgh through the myths and artistic traditions associated with this bird in Iran, Ancient China, and Ancient Egypt, together with its role in Islamic mythology and mysticism.

Research Method: This study takes a historical perspective and uses a descriptive-analytical method. The necessary body of data was gathered through documentary research and the careful examination of relevant library sources. The deeper meanings expressed by the images, at both formal and symbolic levels, were explored through Erwin Panofsky's iconological method, which moves through three stages: pre-iconographic description, iconographic analysis, and iconological interpretation.

The research samples comprise artistic productions, including textiles, paintings, metalwork, leather objects, and ceramics from Iran, ancient China, ancient Egypt, and post-Islamic Iran, selected for their representation of mythical birds. The historical analysis also draws on pre-Islamic religious texts, mythological literature, particularly Ferdowsi's Shahnameh, mystical writings, especially Suhrawardi's The Red Intellect, as well as the mythological traditions of China and ancient Egypt.

Among the surviving artworks, those whose compositions include a representation of the Simurgh were selected for this study. Accordingly, 19 works, including textiles, paintings, metal objects, leather bookbindings, and ceramics from Iran and China, were examined through an iconological reading of the Simurgh figure. These include five examples of Chinese ceramic art, one Egyptian painting, and 13 Iranian works covering ceramics, metalwork, textiles, leather bookbindings, and miniature paintings. Finally, all the visual, formal, and mythological characteristics identified across these artworks were carefully brought together and presented in a comparative table.

Literature Review

A considerable and diverse body of scholarship has explored the Simurgh myth and its imagery in literature and the visual arts. In his study Yashts (Pourdavoud: 1377/1998), Ebrahim Pourdavoud was the first scholar to examine the etymology of the term "Simurgh," connecting it with such terms as Saēna, Sanskrit, and Sīrang, while also relating it to the deity

Rashn, the Harvisptokhm Tree (Tree of All Seeds), and Mount Alborz, traditionally regarded as the dwelling place of the Simurgh. Drawing on evidence from Pahlavi texts such as the Bundahishn and Mēnōg ī Khrad, he also investigated the bird's close connection with medicine and healing (Pourdavoud, 1998: 573–577). In their study "A Symbolic Study of the Simurgh Image with Emphasis on Ferdowsi's Shahnameh and Attar's Mantiq al Tayr," Mohammad Khazaei and Farinaz Farbod (2003) presented a symbolic analysis of the Simurgh as perceived and depicted in art. By closely and systematically examining representations of the Simurgh in paintings and other surviving artworks, they concluded that, before the advent of Islam, the creature appeared chiefly in an abstract form. Using surviving Sasanian representations on metal objects, textiles, and rock reliefs, they compared the Simurgh with the Anqāʾ and then examined the similarities between the Anqāʾ and the Humā bird. Fariba Fouladianpour (2018), in her study Investigating the Evolution of the Simurgh with Reference to Sasanian and Safavid Decorative Arts, considered the Simurgh motif in decorative arts belonging to the Sasanian and Safavid periods. She concluded that the motif continued to exist in Sasanian mythological, epic, and religious texts, as well as in the long tradition of Islamic mysticism. In The Influence of the Islamic Simurgh on Islamic, Byzantine, and Christian Art, Alireza Taheri (2017) discussed the influence of the Sasanian Simurgh motif on both Islamic and Western artistic traditions. In his account, the motif began to circulate in the Sasanian period and continued after the empire's fall through cultural interaction, commercial contact, and exchanges of gifts with neighboring peoples and more distant countries.

In Hejazi's paper, The Mythological Recreation of the Simurgh and the Phoenix (2005), the Simurgh is presented as an embodiment of fire in Chinese mythology and as a figure with distinctly feminine attributes. Behjat Hejazi, in A Comparative Study of Mythical Birds in Iran and Neighboring Civilizations (Hejazi,2009: 125), maintains that before Islam the Simurgh held a prominent position in Iranian culture and featured in numerous myths. Parisa Alikhani maintain that Iranian mythology portrays the Simurgh as the king of birds, a being who has seen the world come to an end three times and possesses knowledge of all the sciences of his age. The Simurgh may therefore be understood as an embodiment of God (Alikhani, 2018: 61). A review of earlier relevant body of research indicates that most studies dealing with the concept of the Simurgh have followed either a comparative or a semiotic approach. In contrast, this paper uses an iconological approach to examine the symbolic Simurgh motif in

artistic and literary works, with particular attention to its religious and cultural dimensions. Finally, by interpreting the Simurgh iconologically and considering the cumulative effects of its cultural borrowings and transformations, this study aims to provide a renewed understanding of this mythical bird.

1. Iconology According to Erwin Panofsky

Iconology is a discipline that seeks to explain both the formal content of an image and the cultural meanings embedded within it through description, analysis, and interpretation, while likewise examining the artistic subject represented in the work by means of the same procedures. Aby Warburg pioneered iconology and first applied it to the study of nonreligious paintings (Nasri, 1391/2012: 10). His students later extended the range of his research, giving rise to what came to be known as the Warburg School. Erwin Panofsky (1892–1968), a German art historian and one of Warburg's students, applied iconology to the study of Renaissance and Christian art (Nasri, 1391/2012: 10). His method advanced from the description of artistic phenomena to their interpretation. In seeking to uncover hidden meanings, he considered the circumstances in which artworks were produced, including their historical, social, cultural, and political conditions, together with the religion, philosophy, and intellectual tendencies characteristic of a particular period, nation, or society. Panofsky understood images as symbolic structures in which visible forms are linked to the mental content they express. He described this relationship between visible form and intellectual meaning as a profound connection (Avazpour, 2016: 20). To disclose such hidden meanings, Panofsky proposed a three-stage method of analysis (Mirzaie& Kateb, 1404: 26).

A. Pre-iconographical Description

Pre-iconographical description forms the first stage, in which the image is described alongside its visible patterns and principal formal qualities. At this stage, the observer must examine the image carefully and divide it into the individual elements that constitute its composition. Panofsky designated these constituent elements as artistic motifs.

B. Iconographical Analysis

The second stage is iconographical analysis, which considers not only individual motifs but also images, stories, allegories, and broader themes. This level depends on prior knowledge of particular subjects and ideas

conveyed through written literature or maintained in oral tradition (Panofsky, 2017: 44). Its purpose is to recognize and comprehend the secondary, conventional meaning underlying an image through literary knowledge and established visual types.

C. Iconological Interpretation

The third and final stage comprises iconological interpretation, which Panofsky regarded as the central and actual purpose of iconology. Iconology is concerned with symbolism, especially the universal symbols found within images that collectively shape the culture and intellectual outlook of a country. It holds that meaning operates across several interconnected levels rather than occupying a single isolated layer (Ghani & Mehrabi, 2018: 7).

At this final stage, synthetic intuition and interpretive knowledge become especially important. This mode of interpretation demands knowledge of the fundamental intellectual dispositions that shape human thought, including the worldview of a particular society, as articulated through the relationship between artwork and culture. Only at this stage can the researcher achieve a high level of understanding of the image under consideration. Such understanding becomes possible only through historical research, when the researcher reconstructs the context in which the image was created and endowed with meaning. Accordingly, pre-iconography involves the visual examination of images and patterns in order to identify pure forms, including line, surface, volume, colour, and other natural forms. By contrast, iconography investigates visual representations produced within the culture from which the art object originated and analyzes their connections with concepts and themes conveyed through oral tradition and literature. Iconology, finally, interprets the symbolic meanings embedded in the art object and reveals the artwork's underlying significance.

This true meaning of the artwork can be grasped only through knowledge of the intellectual, philosophical, and religious structures of the nation that produced it. Recognizing these symbolic meanings represents the ultimate objective of iconological analysis (Taheri, 2017: 24).

2. The Simurgh in the Sasanian Period

2.1. The Ancient Origins of the Simurgh in Sasanian Iran

The Simurgh is an imaginary being that has held an enduring place in Iranian folklore since antiquity, and it appears in the Avesta as well as other religious writings dating from before Islam. The earliest surviving

Tab. 1: The list of common illustrations of Simurgh (Authors, 2023). ▼

Ancient Iran	Ancient China	Early Islamic Period	Islamic Painting (Miniature Tradition)
			
Gilt silver plate depicting the Simurgh, Sasanian period (2021, URL1).	Ceramic plate depicting the Simurgh, China, Ming dynasty, 14th to 17th century CE, Victoria and Albert Museum, Accession No. 102-1899 (2021, URL2).	Silk textile from Rayy, 5th century CE, Iran Museum of Archaeology and Islamic Art, Accession No. 22598 (Authors, 2025).	Leather binding of Navāʾī's *Dīvān*, decorated with the Simurgh, Herat School, 16th century CE, 10th century AH, Chester Beatty Collection, Accession No. MSS 948 (2021, URL8).
			
Copper plate depicting the Simurgh, Sasanian period, 3rd century CE (Dadvar & Barazandeh, 2012: 475).	Ceramic bowl depicting the Simurgh and a dragon, China, Ming dynasty, 14th to 17th century CE, Cleveland Museum of Art (2021, URL3).	Ceramic plate depicting a gazelle and the Simurgh, Ilkhanid period, 13th century CE, 7th century AH, Metropolitan Museum of Art, Accession No. 1970.27 (2025, URL6).	Depiction of the Simurgh, Safavid period, 16th century CE, 10th century AH, Arthur M. Sackler Collection, Accession No. 1986.196.1S (2021, URL10).
			
Brass tray depicting the Simurgh and the goddess Anahita, Sasanian period, 3rd century CE, Hermitage Museum, Accession No. S-217 (URL11).	Ceramic plate depicting the Simurgh, China, Ming dynasty, 14th to 17th century CE, National Museum of Iran (Nafisi, 2005: 46).	Eight-pointed star tile depicting the Simurgh, Takht-e Soleyman, Ilkhanid period, 13th century CE, 7th century AH, Metropolitan Museum of Art, Arthur M. Sackler Collection, Accession No. 1997.114.S (1404, URL5).	Simurgh and Zāl, from the *Shāhnāmeh* of Shah Tahmasp, Safavid School, 17th century CE, 11th century AH (Cary welch, 1967: 48).
			
Bronze plate depicting the Simurgh, 3rd century CE (Dadvar & Barazandeh, 2012: 474).	Ceramic plate depicting a gazelle, the Simurgh, and lotus blossoms, Ilkhanid period, 13th century CE, 7th century AH, Metropolitan Museum of Art (2021, URL4).	Ceramic plate depicting the Simurgh and a dragon, China, Ming dynasty, 14th to 17th century CE, Metropolitan Museum of Art, Accession No. 1981.368.2 (2025, URL9).	Simurgh and the Birth of Rustam, 17th century CE, 11th century AH, Chester Beatty Collection, Accession No. Per 277.3 (2025, URL11).
			
Illustration from the *Baysunghur Shāhnāmeh*, Golestan Palace Library, 16th century CE, 10th century AH (Authors, 2025).	Safavid blue and white ceramic plate, 17th century CE, 11th century AH, Victoria and Albert Museum, Accession No. 1876-2897 (2021, URL7).	Depiction of the Bennu bird, Ancient Egypt (Evans, 1996: 199).	—

Iranian records to mention the Simurgh derive from the Zoroastrian religious tradition. In the Avesta, the creature is known as Mərəγō Saēna (Mərəγō Saēnō), while Middle Persian (Pahlavi) sources call it Sēnmurw (Sēnmurv), terms signifying "the chief and lord of birds" and "the first created being" (Pourdavoud, 1998: 575–577).

Several scholars hold that the first element of Mərəγō Saēna means simply bird, whereas the second, after undergoing a series of phonetic changes in Pahlavi, developed into Sīn in Persian usage. The name should not be understood as thirty (si), but as a reference to the falcon (Chevalier, 2009: 710). Ancient Iranians believed that the material world emerged when the spiritual realm assumed physical form, with everything existing spiritually thereby acquiring a visible and material manifestation. In this religious conception, the Simurgh formed the material representation of Mithra (Mihr). The Simurgh can thus be read as the mythological and symbolic expression of this belief, while the falcon conveys the same idea concretely through a creature of the natural world. Carnoy considers the falcon to have been Mithra's sacred bird, noting its frequent appearance in surviving rock images of Mithra (Carnoy, 2004: 10). The bird was also closely connected with the sun. As king of all birds, it represented one of the major Ahuric deities, specifically the Sun or Heavenly Fire (Chevalier, 2009: 682). In classical times, this immortal mythological bird acted as an image of the sun and likewise appeared as a solar symbol in the Rig Veda. Birds similarly represented celestial objects in ancient Egyptian hieroglyphs. Archaeological evidence also shows that birds were associated with the sun throughout the Neolithic East (Golan, 1991: 99).

The Avestan and Pahlavi sources therefore allow the Simurgh to be understood as a representation of the sun and a symbol of khvarenah (farr[1], divine glory) within Zoroastrian tradition, whose ancient roots extend to Mithra and the religion of Mithraism[2].

2.2. The Representation of the Simurgh in Sasanian Art

Sasanian art reflects the religious philosophy of the Zoroastrian faith, within which supernatural powers consistently assume a prominent and recognizable place in visual representation. In this artistic tradition, the Simurgh appears as a mythical creature composed of the physical features of several different animals. It is commonly represented with the head and body of a dog, the claws of a lion, wolf, or dog, and the tail of a peacock (Taheri, 2009: 18). In certain examples, the Simurgh assumes the form of a dragon and peacock hybrid, with fire clearly emerging from its mouth.



▲ Fig. 1: Gilt silver plate depicting the Simurgh, Sasanian period, 3rd century CE, British Museum, Accession No. 124095 (2021, URL1).



▲ Fig. 2: Copper plate depicting the Simurgh, Sasanian period, 3rd century CE (Dadvar & Barazandeh, 2012: 475).



▲ Fig. 3: Brass tray depicting the Simurgh and the goddess Anahita, Sasanian period, 3rd century CE, State Hermitage Museum (URL11).

The motif appeared widely and repeatedly in Sasanian metalwork and textile production (Ghirshman, 1995: 219). Its earliest known depiction as a composite of lion and bird occurs in the rock carvings at Taq e Bostan (Hall, 2004: 145).

The eagle, distinguished particularly by its strength, symbolized Ahura Mazda, the Sun, and other celestial deities. Circular arrangements featuring birds occur frequently in several forms of Sasanian art. During the Sasanian period, the falcon was regarded as a divine being and depicted in a range of visual forms. It also occupied an important religious position within Zoroastrian belief. Although the Simurgh is absent from known examples of Sasanian pottery, it appears extensively in other artistic media, including metal vessels, textiles, and architectural decoration. Some studies have even proposed that the creature served as the emblem of the Sasanian Empire (Hosseini, 2014: 25). The earliest depiction of the Simurgh on coinage appears on coins issued during the reign of Bahram II (Riazi, 2002: 187). One of the best-preserved surviving examples of the Simurgh motif is a Sasanian bronze plaque carrying a distinct image of the creature (Fig. 1). Wings attached to a human or animal body conveyed divinity and protection bestowed by supernatural beings. This imagery derived from ancient Near Eastern representations of predatory birds, especially the falcon and the eagle (Hall, 2004: 30). Another important archaeological example is a bronze plate dating to the third century CE and displaying a prominent image of the Simurgh (Fig. 2).

Besides the Simurgh itself, another notable avian motif occurs on a brass tray now preserved in the Hermitage Museum. At the center of the tray, a large eagle-like bird stands with its wings fully spread, clasping the goddess Anahita in its claws (Fig. 3). A second object from the same period is a bronze plate that depicts the Simurgh in profile, with one foot set slightly in front of the other (Fig. 4).

The overall symbolic form of the Simurgh brings together the fundamental elements of the universe in both its conception and visual expression: its canine or leonine head and body signify the earth, its bird-like wings represent the sky, its scales evoke water, and, in some depictions, flames issue from its mouth. This purposeful combination of animal features thus seems to hold specific significance in relation to the classical elements of fire, air, water, and earth (Taheri, 2009: 18–19).

The visual study of Sasanian artworks suggests that the Simurgh held a distinctive position in Iranian society before the arrival of Islam. It was usually rendered abstractly as a mythical composite being assembled from

the features of several animals. In Zoroastrian belief, birds were intimately connected with Ahura Mazda, the supreme deity and manifestation of beneficent power. Birds likewise served as symbols of good fortune in Iranian culture before Islam. In the Avesta, farr, or the divine glory, is invariably represented as the Varəγna bird (Soltani Gard, 1993: 101).

Seen in this light, the Simurgh portrayed in the art of Iran before Islam was a composite creature placed within a circle, which signifies divine light or splendor and serves as an image of the sun. Often shown beside the lotus flower, the foremost vegetal symbol of Sasanian farr, the Simurgh also frequently occurs with circular motifs used to ornament royal garments, palace walls, and Sasanian jewelry.



▲ Fig. 4: Bronze plate depicting the Simurgh, 3rd century CE (Dadvar & Barazandeh, 2012: 474).

3. The Simurgh in Ancient China

3.1. The Fenghuang in Ancient Chinese Mythological Texts

Within the mythological traditions of China, the Fenghuang, or Chinese Phoenix, may be seen as the single creature most closely comparable to the Iranian Simurgh. It is recognized as one of the Four Sacred Creatures of Chinese mythology, alongside the dragon, qilin, and tortoise. In Chinese tradition, the Fenghuang is a sacred fire bird associated with immortality, prosperity, virtue, harmony, peace, righteousness, and imperial power. Unlike the phoenix of Western mythology, whose symbolism rests on death and rebirth through fire, the Fenghuang is chiefly associated with harmony. Ancient Chinese writings relate that the Fenghuang appeared in times of earthly prosperity, signifying that a virtuous and righteous ruler held authority over the realm. The Fenghuang represents the Empress, while the Dragon signifies the emperor, together embodying the cosmic principles of Yin and Yang, the complementary forces of heaven and earth (Daneshparvar, 1997: 691). In traditional Chinese belief, the Fenghuang could descend to earth only when the world was ruled with virtue. It may consequently be interpreted as a divine messenger from heaven.



▲ Fig. 5: Ceramic plate depicting the Simurgh, China, Ming Dynasty (14th–17th century CE), Victoria and Albert Museum, Accession No. 1899-102 (2021, URL2).

3.2. Representation of the Fenghuang in Chinese Art

In ancient Chinese art, the Simurgh is shown as a bird with a powerful body, a strong beak, and widely spread wings and tail, and it is usually depicted without legs. Its head is commonly rendered in the form of a pheasant or peacock. This iconography evolved over time and reached a more accomplished and mature form during the Ming dynasty, from 1368 to 1644 CE (Fig. 5). In this period, the Simurgh gradually relinquished much of its mythical grandeur and took on a more naturalistic appearance. One



▲ Fig. 6: Ceramic bowl depicting the Simurgh and a dragon, China, Ming Dynasty (14th–17th century CE), Cleveland Museum of Art (2021, URL3).



▲ Fig. 7: Ceramic plate depicting the Simurgh, China, Ming Dynasty (14th–17th century CE), National Museum of Iran (Nafisi, 2005: 46).



▲ Fig. 8: Ceramic plate depicting gazelles, the Simurgh, and lotus blossoms, Ilkhanid period, 13th century CE / 7th century AH, Metropolitan Museum of Art (2021, URL4).

notable example within Chinese ceramic production is a bowl decorated with the Simurgh and a dragon, made in China by Chinese artisans (Fig. 6).

Among the objects preserved in Iran that carry representations of the Simurgh but were fashioned by Chinese craftsmen, the motif occurs on a group of Chinese porcelains belonging to the Safavid period. Made in China, these vessels were presented to Iran as diplomatic gifts by the emperors of the Ming dynasty. Their clearly Chinese stylistic qualities, together with their design and production by Chinese artisans, distinguish them from contemporary objects made in Iran.

One representative example is a ceramic plate with a scalloped rim, currently preserved in the National Museum of Iran. Its interior shows the Simurgh flying toward the heavens against a field of lotus leaves and other floral motifs (Fig. 7). Another significant example is a ceramic plate with a central medallion containing two gazelles amid abundant blossoms, while four Simurghs circle the central composition along the vessel's rim. This arrangement illustrates a distinctive feature of Simurgh imagery in Iranian ceramic decoration.

4. The Bennu Bird: The Mythological Proto-type of the Simurgh in Ancient Egypt

4.1. Bennu in Ancient Egyptian Texts

Another prominent mythical bird is the Bennu, a sacred being that was worshipped and held in profound reverence in ancient Egypt. Mythical birds with closely comparable qualities appeared in several ancient civilizations under different names, including the Bennu of the Egyptians, the Fenghuang of the Chinese, and the Phoenix of the Greeks and Christians (Rahmani Mofrad, 2011: 139).

According to numerous historians, the Phoenix myth initially arose in ancient Egypt and subsequently passed into Greek, Roman, and later Christian civilizations. In Egyptian mythology, the Bennu bird signified both the rising sun and the first rays of sunlight striking the sacred pillar devoted to the sun. The bird consequently became one of the principals and most readily identifiable solar symbols within Egyptian religion. According to the Greek historian Herodotus3, the Bennu (Phoenix) appeared at the temple once every five hundred years and was then reborn from an egg produced from its own dead body (Evans, 1996: 199). Because the heron was understood as the earthly manifestation of the Bennu, the Egyptians revered this bird so deeply that historical accounts preserve an unusual military episode during the Persian invasion of Egypt under Cambyses. The

Persians reportedly positioned living herons before their advancing army. Reluctant to shoot at these sacred birds, the Egyptians thereby helped the Persians to secure military victory. For the Egyptians, the Bennu was thus a truly sacred and exceptionally rare bird. Only a very limited number of representations of the Bennu have survived. These images suggest that the wings and feathers of the Bennu were thought to be partly red and partly golden yellow in colour.

4.2. Representation of the Bennu in Ancient Egyptian Art

The Bennu was understood as the sacred fire bird of ancient Egypt. It was believed periodically to burn itself, experience rebirth, and then fly to the sacred city of Heliopolis, where it marked the beginning of a new year and a new cosmic period. This recurring process of regeneration first demanded the complete ending of its former existence. In this understanding, the Bennu simultaneously became its own child, parent, successor, nurse, and descendant.

Although it remained the same mythical being, destruction renewed its youth and vitality. It could therefore attain immortality through the repeated processes of self-destruction and ensuing renewal. One ancient Egyptian inscription states: "I am the Bennu, who makes myself exist, and burns incense for the goddess of resurrection." The Bennu was fundamentally a solar mythological figure in ancient Egyptian thought. In contrast to the conceptualized and composite Simurgh of Sasanian art, Egyptian artists portrayed the Bennu wholly naturalistically in the form of a blue heron (Fig. 9). The bird bore symbolic associations with absolute power, supremacy, victory, glory, nobility, and beauty. For this reason, the Egyptians did not associate the Bennu with small and insignificant birds such as sparrows and partridges, since these species functioned as prey rather than symbols of power.

Accordingly, in the surviving examples of ancient Egyptian painting, the Bennu appears as a realistically depicted heron standing majestically on its long legs and distinguished by its extended beak. This naturalistic portrayal differs sharply from the highly abstract and composite creature identified as the Simurgh in Sasanian painting (Fig. 9).



▲ **Fig. 9: Depiction of the Bennu bird, Ancient Egypt (Evans, 1996: 199).**

5. The Simurgh in the Islamic Period

5.1. The Simurgh in Mythological Texts of the Islamic Period (with Emphasis on Ferdowsi's Shahnameh)

Among the numerous myths associated with the Simurgh, Ferdowsi's

Shahnameh may confidently be considered one of the most important literary traditions. In this narrative, the Simurgh is a celestial bird whose nest lies on Mount Alborz. The bird rears an abandoned child named Zāl and becomes his protector. Across the entire heroic age, from the earliest episodes to the final events, the Simurgh functioned as a symbol of victory and success for Zāl and Rustam alike. For this reason, many scholars interpret the Simurgh as the totem of the Sakas and of the house of Rustam (Yahaghi, 1990: 211–213).

As the earlier analysis suggests, Rustam followed Mithraism, a religious tradition that predated Zoroastrianism, whereas Esfandiyār adhered to the Zoroastrian faith. The religious conflict between the heroes in the Shahnameh thus reflects the historical struggle between these two traditions. To understand the symbolic significance of the Simurgh in the Shahnameh, one must therefore consider the wider religious setting of the myth. The epic, in fact, presents two distinct manifestations of the Simurgh. The first is the benevolent (Ahuric) Simurgh, who saves and protects Zāl and supports Rustam throughout the full course of his life.

The second occurs in the seven exploits (Haft Khān) of Esfandiyār, where the Simurgh takes on a hostile role and becomes a demonic (Ahrimanic) creature. The contrasting religious identities of the two heroes may explain this apparent contradiction. Esfandiyār represents Zoroastrianism, whereas Rustam embodies an older Mithraic cult. As a result, divine beings that existed before the rise of Zoroastrianism came to be viewed as demons following the establishment of that religion. The Simurgh, understood in ancient Iranian religions as an incarnation of the sun god, accordingly, becomes a demonic creature in the legend of Esfandiyār.

5.2. Philosophical and Mystical Texts on the Simurgh in the Islamic Period (With Particular Emphasis on Suhrawardi's Aql-i Surkh or The Red Intellect)

In the sixth century AH, Shaykh Shihab al-Din Suhrawardi, in his treatise Aql-i Surkh (The Red Intellect), presents the Simurgh as a symbol of the sun in the sensible world (Pournamdarian, 1996: 201). Its true origin, however, does not lie within the sensible world. Rather, it rises from the supreme Orient of the divine realm (mashriq al-lahut5), the highest level of the divine world and the most elevated degree of light. Within this framework, the Simurgh may be understood as a symbol of the Active Intellect (al-ʿaql al-faʿʿāl6) and Gabriel (Jibril), who, in Peripatetic philosophy, function as intermediaries between the divine realm and humanity.

The nature of the Simurgh is light, while fire constitutes its nourishment. Fire, regarded as sacred in ancient Iranian belief, is transformed into pure light in Suhrawardi's Illuminationist philosophy (hikmat al-ishraq), which is founded upon the concept of light (nur). From this perspective, the sensible world (ʿalam al-hiss) and sensory pleasures are merely shadows of higher pleasures that transcend the senses, while these exalted pleasures themselves arise from their ultimate source: supreme light and beauty.

Within the luminous imaginal world (ʿalam al-mithal), extraordinary melodies and sounds arise that the ordinary imaginative faculty (quwwat al-khayal) cannot reproduce or imitate. A person freed from material attachments can hear and perceive these sounds and comes to recognize that the imaginative faculty has acquired the capacity to apprehend such realities. If individuals strengthen and discipline their souls through divinely-guided spiritual practices, they may follow the arc of ascent (qaws al-suʿud) and attain higher spiritual stations (Eskandar Pourkhorami & Shafiei, 2011: 23).

Like the human being, the Simurgh has appeared in different forms and manifestations over time, eventually combining avian and human attributes within its nature. It soars to great heights like a luminous winged bird, devises solutions with the wisdom of a learned person, and possesses a power exceeding ordinary human capacity, comparable to the deities of the Zoroastrian tradition (mazdayasna).

This mysterious being is both the focal point and embodiment of a range of spiritual powers. Nevertheless, it has no external or objective existence. For this reason, Sufi thought (tasawwuf) regards it as one of the most fitting symbols through which to express absolute Reality (al-haqiqa al-mutlaqa) and the Divine Essence (dhat al-ilahiyya). It may also elucidate the doctrine of the Unity of Being (wahdat al-wujud), one of the principal doctrines within certain traditions of Islamic mysticism, particularly theoretical mysticism (al-ʿirfan al-nazari), (Farnbagh Dadagi, 1990: 122).

Al-Hallaj's Kitab al-Tawasin also occupies a distinctive position in this context. On the one hand, it is regarded as one of the foundational texts of a form of mysticism cantered on the relationship between the human and the divine in the Islamic world (Vakili, 2023: 161). On the other hand, its symbolic system rests substantially upon avian imagery and meaning. In Kitab al-Tawasin, the Simurgh signifies the mysterious, hidden, and esoteric dimension of the sacred (al-batin).

Sanai of Ghazna was among the earliest poets to employ the Simurgh



▲ **Fig. 10: Silk textile from Rayy, National Museum of Iran, 5th century CE (Authors, 2025).**



▲ Fig. 11: Eight-pointed star tile depicting the Simurgh, Takht-e Soleyman, Ilkhanid period, 13th century CE / 7th century AH, Metropolitan Museum of Art, Arthur M. Sackler Collection, Accession No. S1997.114 (2025, URL5).



▲ Fig. 12: Ceramic plate depicting a gazelle and the Simurgh, Ilkhanid period, 13th century CE / 7th century AH, Metropolitan Museum of Art, Accession No. 1970.27 (2025, URL6).



▲ Fig. 13: Safavid blue-and-white ceramic plate, 17th century CE / 11th century AH, Victoria and Albert Museum, Accession No. 1876-2897 (2021, URL7).

as a mystical symbol. He also played a foundational role in establishing a network of mystical signs and symbols within the poetic language of Persian Dari (Farsi-ye Dari). In several of his poems, Sanai places the Simurgh alongside the philosopher's stone (al-iksir), presenting both as metaphors for an absent object of desire, an unattainable end, and a lost ideal in an age of decline.

The most important Persian text devoted to the Simurgh is Attar's Mantiq al-Tayr (The Conference of the Birds). This work initiated an extensive body of similar texts concerning the mystical journey of birds in search of the Simurgh. In this beautiful and contemplative poem, Attar presents the Simurgh as a symbol of God (Allah) and, at the same time, as a manifestation of divine love (ishq ilahi). At the end of the journey, it becomes clear that the Simurgh is not separate from the birds but is revealed through their unity and through fana', the annihilation of the self in love (Ibid: 11).

In sum, within the symbolic system of Iranian mysticism, both in ancient periods and after the advent of Islam, the Simurgh embodies wisdom, perfection, spiritual illumination, and the ultimate destination of the mystical path (tariqah), (Alamdari, 2008: 369).

5.3. Representation of the Simurgh in the Art of the Islamic Period

The Simurgh occupies a distinctive place in Islamic culture and mysticism and, within the doctrine of the unity of being (Waḥdat al Wujūd), is regarded as a symbol of Absolute Being. Following the conversion of the Iranians to Islam, many motifs inherited from the period before Islam continued to appear in Persian art and literature, either retaining their earlier meanings or acquiring new interpretations. Before the advent of Islam, Iranians were already familiar with spiritual and mystical concepts rooted in Zoroastrianism and earlier religious beliefs, and they did not abandon this intellectual and cultural heritage after embracing Islam. Iranian Islam consequently acquired a mystical, spiritual, and symbolic character in many of its expressions (Kiaei, 2002: 13).

During the early Ilkhanid period, representations of the Simurgh continued to resemble Sasanian examples closely. In these works, the Simurgh is portrayed as a composite creature with a doglike head and claws resembling those of a lion (Fig. 10). After the Ilkhanid period, however, the appearance of the Simurgh underwent significant changes in both form and colouring. Warm hues and intense shades of red became increasingly common in its representation, while its form grew

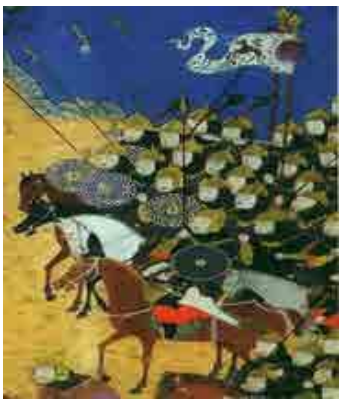
closer to Chinese models, particularly the Chinese dragon-phoenix (Fenghuang).

One of the most notable artistic examples from this period is an eight-pointed tile depicting the Simurgh, discovered during excavations at Takht-e Soleyman and now preserved in the Sackler Gallery of Art. The surface of the tile is decorated with underglaze painting and gilding (Fig. 11). Its background is azure blue, a colour that symbolizes purity and spiritual refinement in mystical thought and was also among the most highly valued colours in the design and execution of decorative motifs. The figure of the Simurgh is rendered in gilded golden yellow, a colour symbolizing light and expressing the exalted status of the Simurgh as the sovereign of all beings.

The tile's background is painted in lapis lazuli blue, a colour associated with purity in mystical thought and, in practical terms, counted among the most expensive pigments available to artists. The Simurgh is itself gilded, a treatment signifying light, royal majesty, and its elevated position as sovereign of all creatures. Another artistic group from the early Islamic period comprises Ilkhanid ceramic vessels bearing images of the Simurgh (Fig. 12).

After the Ilkhanid era, however, the Simurgh gradually receded from the decorative arts of Iran, for reasons that remain uncertain. Artists increasingly preferred floral and vegetal motifs, which were regarded as more closely aligned with the aesthetics of Islamic art (Ājand, 2001: 25). During the Safavid period, the Simurgh retained only a limited presence in the decorative arts. The motif occurs on a small group of blue and white porcelain objects, including pieces held by the Victoria and Albert Museum in London. These ceramics feature fantastic creatures, such as the Qilin6 and the Simurgh, accompanied by Chinese cloud motifs. Safavid representations of the Simurgh are distinguished by a tail divided into three branches. Several of the finest examples of this motif belong to the 10th and 11th centuries AH (sixteenth and seventeenth centuries CE). In the 12th century AH, the Simurgh motif began to fade from use (Dimand, 2004: 198), (Fig. 13).

Although the Simurgh is an ancient mythical being, it appeared in the tradition of Persian miniature painting only at a comparatively late date. Depictions of the Simurgh in illuminated manuscripts begin around the first half of the 9th century AH (fifteenth century CE). One prominent example appears in the celebrated Baysunghur Shāhnāmeh, where the Simurgh is represented on one of the battle standards (Fig. 14). Since artists



▲ Fig. 14: Illustration from the Baysunghur Shāhnāmeh, Golestan Palace Library, 16th century CE / 10th century AH (Authors, 2025).



▲ Fig. 15: The Simurgh and Zāl, Shāhnāmeh of Shah Tahmasp, Safavid School, 17th century CE / 11th century AH (Cary welch ,1967: 48).



▲ Fig. 16: Leather binding of Navā'ī's Dīvān decorated with the Simurgh, Herat School, 16th century CE / 10th century AH, Chester Beatty Collection, Accession No. MSS 948 (2021, URL8).



▲ Fig. 17: Ceramic plate depicting the Simurgh and a dragon, China, Ming Dynasty, 14th–17th century CE, Metropolitan Museum of Art, Accession No. 1981.368.2 (2025, URL9).



▲ Fig. 18: Simurgh motif, Safavid period, 16th century CE / 10th century AH, Arthur M. Sackler Collection, Accession No. 1986.S.196.1 (2021, URL10).



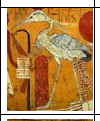
▲ Fig. 19: The Simurgh and the Birth of Rustam, 17th century CE / 11th century AH, Chester Beatty Collection, Accession No. Per 277.3 (2025, URL11).

generally worked within established traditional iconography, the basic form of the Simurgh changes little throughout Persian miniature painting. Variations among manuscripts concern mainly the refinement of details, style, colouring, and execution, rather than the creature's fundamental appearance (Fig. 15).

6. Representation of the Simurgh in the Islamic Period: Emphasis on the Influence of China and Ancient Iran

At the outset of the Islamic period, depictions of the Simurgh remained rooted in artistic traditions inherited from the Sasanian era. Over time, however, especially from the Seljuk and Ilkhanid periods onward, East Asian artistic influences entering Iran altered the creature's appearance and brought it progressively closer to the Chinese Fenghuang. Thereafter, the Simurgh was commonly depicted in the manner of a Chinese bird and, at times, as a dragon-like avian being (Taheri, 2009: 19–23), (Fig. 16). Comparison between Iranian representations and imported Chinese examples reveals the absence of legs as a distinctive feature. This detail may indicate that the bird was conceived as continually flying through the heavens. Visible legs appear only in Iranian representations from periods preceding and following the Ilkhanid era. In contrast, the Simurgh of pre-Islamic Iran bears eagle's talons. This evidence suggests that the legless form of the Simurgh derived from Chinese artistic models (Fig. 17).

The bird's head may be classified into several types based on actual birds, among them ducks, geese, pheasants, eagles, and parrots. The influence of the Chinese Fenghuang becomes especially clear in the form of the head when it is compared with examples from Iranian art before Islam. In Islamic art, the tail assumes particular importance within the image. Its wide and open structure symbolizes the universe and the cosmos. When set beside the Sasanian and Chinese versions of the bird, the tail of the Islamic Simurgh appears markedly Chinese in character. Symbolically, the Simurgh expresses the ideas of incorruptibility, immortality, and the dual spiritual nature of humankind. It is frequently shown within one or more decorative circles (Fig. 18). This circular arrangement signifies the universe, life, eternity, and the continuity of the cosmos. In this way, the Simurgh placed within a circle becomes an allegory of divinity and celestial power (Taheri, 2009: 19–23). Of all the media of Islamic art, Persian manuscript painting presents the greatest variety in images of the Simurgh. Miniature painters used a rich palette while depicting increasingly intricate anatomical forms of the bird. Persian miniature painting may therefore be considered the

Feature	Ancient Iran (Sasanian)		Ancient China (Fenghuang)		Islamic Iran		Ancient Egypt (Bennu)	
Tail		Long, peacocklike tail that broadens towards the tip		Four large ornamental feathers curving either upwards or downwards		Three to five large branches composed of numerous feathers		Naturalistically rendered heron tail
Head		Wolf or doglike head, elongated neck, and protruding tongue		Two hornlike feathers, a beard beneath the neck, and manelike plumage		Highly detailed head with an eaglelike beak, resembling that of a duck, goose, pheasant, eagle, or parrot		Long beak with two feathers extending behind the head
Body & Wings		Eaglelike wings		Scalelike plumage combining avian and draconic features		Large wings combining features of a dragon and a peacock		Wings folded naturally, as in waterbirds
Feet		Lionlike claws		No visible legs		Eagle or falcon talons		Long heron legs
Color		Bronze and copper tones		Red and golden dragon-like body		Wide range of warm and cool colours, with yellow and red predominating		Red and gold plumage
Composition		Usually enclosed within circular motifs		One or two birds surrounded by flowers and mythical creatures		Multiple flying Simurghs arranged around vessel rims or manuscript margins		Shown in profile, standing in a natural posture

◄Table 2: Pre-iconographical description. (Authors, 2025).

Category	Ancient Iran	Ancient China	Islamic Iran	Ancient Egypt
Name	Saēna, Sēnmurv	Fenghuang	Simurgh	Bennu
Representative Birds	Falcon, eagle	Red bird, swan	Falcon, eagle, Simurgh	Swan, heron
Dwelling Place	Tree of All Seeds; Mount Alborz	Remote celestial realms	Mount Alborz; Mount *Qāf* in mystical literature	The sacred tree at Heliopolis
Birth	Lays an egg every 300 years	Reborn after one thousand years	Reborn from its own ashes	Lives for one thousand years before self-immolation
Death	Self-immolation; immortality	Self-immolation	Self-immolation	Voluntary self-immolation
Visual Form	Composite mythical creature	Rooster's beak, swallow's face, snake's neck, fish's tail, and goose's breast	Eagle's beak, peacock's tail, and dragon's body	Naturalistic heron with red and golden wings
Mythological Meaning	Solar symbol; divine messenger; bearer of Farr	Sacred fire bird; immortality; harmony of Yin and Yang	Healing; wisdom; Gabriel; the Active Intellect; the Perfect Human; Divine Truth	Rising sun; rebirth; resurrection
Lifespan	Witnesses the destruction of the world three times	Sometimes immortal; sometimes said to live for 1,000 years	Lives for 1,700 years before self-immolation	1,000 years

◄Table 3: Iconographical Analysis (Authors, 2025).

Table 4: Iconological Interpretation (Authors, 2025). ▼

Formal Characteristics

Sasanian Simurgh				
	Neck	**Wings, Tail**	**Claws**	**Head**
Divine glory, abstract image, Mithra, Good fortune, representing the earthly manifestation of Mthra and sun.				

Islamic Simurgh				
	Neck	**Wings, Tail**	**Claws**	**Head**
Ahuric (divine) being, Realistic representation, Embodiment of the Perfect Human, Symbol of Gabriel (the Archangel), The Supreme Truth of God's Essence, The Active Intellect.				

most sophisticated artistic medium for representing the Simurgh in the Islamic period (Fig. 19).

Conclusion

Iconological Interpretation: In the art of Iran before Islam, the Simurgh appears as a mythical composite creature whose visual form combines anatomical features taken from several different animals. Its upraised wings, comparable to those of an eagle, express power, dignity, and singularity. Every surviving example examined in this study represents the Simurgh with two legs. The foreleg is extended horizontally and shown without movement, whereas the rear leg is raised slightly. Vegetal elements invariably accompany the Simurgh, most commonly the lotus, one of the most widely-used emblems of Sasanian khvarenah (divine glory) and an important sacred symbol of Mithraism before Zoroastrianism.

In addition, a further prominent feature is the circular frame that encloses the bird. The circle provides the underlying structural and compositional foundation of the motif and constitutes the visual element that first and most immediately captures the viewer's attention. Its presence reflects the relationship between the Simurgh and khvarenah, symbolised through the sun. Repeated representations of the Simurgh on royal clothing, palace ornament, and Sasanian jewellery further reinforce its association with divinity, royal authority, and sacred kingship. In Sasanian art, the Simurgh became a visual symbol of both the king's supremacy and the belief that the monarch exercised power under the protection and blessing of Ahura Mazda.

The first research question concerned visual correspondences between the Simurgh and mythological birds from neighbouring civilisations. The comparative analysis shows that the artistic representation of the Egyptian Bennu, in both form and overall appearance, differs completely from the representation of the Iranian Simurgh. Egyptian pictorial art renders the Bennu in a naturalistic manner. It possesses a long beak and legs, two feathers projecting behind the head, and the wings and body of a heron, which ancient Egyptians regarded as sacred. Its principal distinguishing feature is its colouration, dominated by red and golden yellow. In mythology, the Bennu is identified as the solar bird of the Egyptians. The Iranian Simurgh may accordingly be described as an entirely mythological creation, while the Egyptian Bennu assumes the form of a naturalistically-rendered bird. Nevertheless, despite these

formal differences, comparative mythology attributes nearly identical symbolic roles to both creatures. Each represents the sun, light, fire, divine life, and cosmic renewal.

The study also shows that the visual character of the Simurgh in Islamic art derives far more extensively from the Chinese Fenghuang than from its earlier Sasanian antecedent. Chinese art exerted a profound influence on the appearance of this mythical bird after the Mongol invasion, particularly during Ilkhanid rule. The eagle shaped Simurgh of Sasanian art gradually gave way to a form closely comparable to the Chinese Fenghuang. However, Iranian artists did not simply imitate or reproduce the Chinese model. They retained the mythical bird's general form while introducing several innovations drawn from Iranian artistic traditions and Islam. Among these were more detailed renderings of the head and face, greater diversity in the shapes of heads and tails, the placement of several Simurghs on a single vessel, and new arrangements, particularly birds shown flying around the rim of a ceramic plate.

As the motif continued to develop during the later Islamic centuries, representations of the bird acquired increasingly elaborate and carefully articulated anatomical details. The snake like tail associated with the Chinese Fenghuang was gradually replaced by a magnificent peacock tail spread widely open. This peacock tail signifies the vault of heaven. In addition, eye like markings on the feathers imply that the mythical bird possesses the ability to observe the entire universe and every event occurring within it. The authors understand this feature as an echo of Mithra in the Mihr Yasht, the deity with a thousand eyes and the eternal guardian of the Aryan land. Iranian paintings also gave the originally legless Chinese bird eagle talons or lion claws, both of which carry symbolic significance, since eagles govern the sky and lions rule the earth. The combination of eagle wings and lion claws thus expresses the Simurgh's sovereignty over the spiritual and terrestrial realms alike.

The palette used in depictions of the Simurgh also changed markedly throughout this extended process of visual and iconographic transformation. Artists replaced the bronze and copper tones typical of Sasanian painting with the yellow and red associated with the Chinese Fenghuang. As time passed, however, representations of the Islamic Simurgh employed an increasingly varied range of colours. European influence became especially apparent in the late Safavid period, when painters combined yellow and red with other colours, including green and blue.

Before Islam, the Simurgh embodied the sacred forces of Mithraism and the religious symbolism of traditions preceding Zoroastrianism. After the emergence of Islam, particularly in Suhrawardi's Philosophy of Illumination, it became the bird that abandons its earthly nest and flies towards Mount Qāf, the highest point of spiritual attainment. There it confronts the blazing sun and willingly accepts death, reduction to ashes, and eventual emergence from them. In ancient Iranian religion, turning towards the sun signified truth and righteousness. The Simurgh's immolation, its descent into the ashes, interpreted as the lowest point of the underworld, and its subsequent ascent signify the soul's movement towards spiritual perfection.

The second research question considered the influence of Islamic mystical literature, especially Suhrawardi's The Red Intellect, upon the semantic dimensions of Simurgh symbolism. The analysis shows that Suhrawardi's Philosophy of Illumination transforms the sacred fire of ancient Iranian religion into pure light. The Simurgh therefore emerges not as a material creature, but as a being composed entirely of light. In every historical period, whether before or after Islam, the Simurgh symbolises light, truth, love, fanāʾ, and the unity of the Creator with His creation.

In addition, the Avesta describes the Simurgh as a sacred creature blessed by Ahura Mazda, which bestows divine splendour (farr), prosperity, and the legitimacy of rule and authority upon monarchs and ordinary people alike. It is also presented as the guardian of concealed knowledge. Across every stage of Iranian civilisation, the Simurgh consequently remains a symbol of power, fertility, prosperity, kingship, sovereignty, divine protection, fidelity, guardianship, justice, eternity, wisdom, beauty, and victory.

Finally, the circle enclosing the Simurgh, among the most widely used compositional devices in Iranian art, embodies the perfect geometric form and recalls ideas of sanctity, divinity, immortality, eternity, and cosmic perfection. The placement of the Simurgh within a circular frame thus accentuates the creature's divine and auspicious nature. Its significance consequently exceeds the limits of pictorial symbolism, presenting the Simurgh as one of the most ancient mythological symbols of Iranian civilisation.

Endnotes

1. A divine gift in Iranian mythology acquired through the fulfilment of one's sacred duty (khwishkārī) and the attainment of spiritual perfection. See Bahar (2005).

2. The Iranian cult predating Zoroastrianism, centred on the worship of Mithra, the deity associated with the sun and covenant. See Razi (1964).

3. The earliest Greek historian, who lived during the fifth century BCE.

4. Lāhūt: the divine and spiritual realm, as opposed to Nāsūt, the earthly and material world. The Supreme Orient of Lāhūt metaphorically denotes illumination by the Light of Lights.

5. The tenth intellect within the hierarchy of emanated intellects in Islamic philosophy. It mediates the transmission of divine grace to created beings and brings human intellects and souls from potentiality into actuality. For a detailed discussion, see Sajjadi (2000, Vol. 1: 339 ff.).

6. The Qilin (Kylin), a mythical creature in Chinese mythology regarded as an auspicious omen. It is traditionally portrayed with a lion-like head and a single horn rising from its forehead (Mohammad Hassan, 2005: 64).

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رویکرد شمایل‌شناسی به پرندگان اساطیری ساسانی

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چکیده

یکی از نمونه‌های نقشمایه‌های اسطوره‌ای ایران، که پیشینهٔ حضور آن در هنر و تمدن ایرانی از دوران باستان تاکنون جلوه‌های گوناگونی داشته، پرندهٔ سیمرغ است. «اروین پانوفسکی» روش شمایل شناسی را در مطالعات هنری به‌کار گرفته و از توصیف پدیده‌های هنری به تفسیر روشمند آن‌ها می‌پردازد. این تفسیر از سه سطح دلالت‌پردازانهٔ نقشمایه، ماهیت و محتوا گذر می‌کند. بر این‌اساس این پژوهش بر آن است تا با روش شمایل‌شناسی به درک معنایی نقش نمادین سیمرغ در آثار هنری ایران در ادوار مختلف تاریخی؛ ساسانی، پیش از اسلام و ایلخانی و صفوی در دوران اسلامی، بپردازد. پرسش اصلی پژوهش در این گزاره خلاصه می‌شود که، نقشمایهٔ سیمرغ در متون مختلف هنری و ادبی ایران در ادوار مختلف ایران باستان و پس از اسلام چه دگردیسی‌های شکلی و معنایی داشته و میزان تأثیرپذیری آن از تمدن‌های همجوار چه میزان بوده است؟ پژوهش حاضر نگاهی تاریخی دارد و به شیوهٔ توصیفی-تحلیلی انجام شده است. جامعهٔ آماری تعدادی از آثار هنری (پارچه، نگاره، فلزکاری، چرم و سفال) ایران، چین باستان، مصر باستان می‌باشد؛ در خوانش تاریخی نیز متون دینی پیش از اسلام و متون اساطیری (شاهنامهٔ فردوسی) و عرفانی (عقل سرخ سهروردی)، در ایران دورهٔ اسلامی و اساطیر چین و مصر باستان موردنظر بوده‌اند. نتایج پژوهش آشکار می‌سازد؛ که تا قبل از ظهور اسلام سیمرغ پرنده‌ای است، دارای قدرت‌های مافوق طبیعی و تصویرش نشان اقتدار نیروهای کیهانی برامور دنیای خاکی است؛ به‌عنوان نمونه، بازنمود آن در لباس شاه ساسانی نشان‌دهندهٔ حمایت خدا از او و مشروعیت سیاسی و دینی وی، اعطای فر و به‌نوعی نمایش انتقال نمادین قدرت است. در دوران اسلامی سیمرغ راه‌یافته به آثار هنری و عرفانی فارسی؛ ازنظر بصری و فرمی با تأثیرپذیری از همتای چینی‌اش به سیمرغ چینی نزدیک می‌شود، از نظر اسطوره‌شناسی مانند سیمرغ اوستایی و بنو مصری نمایندهٔ خورشید، نور و حقیقت می‌گردد.

کلیدواژگان: شمایل‌شناسی، اسطوره، سیمرغ، چین، مصر.

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Formation and Spatial Distribution of Underground Troglodytic Architecture in Teymareh, Khomeyn, Iran

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Abstract

Northern Teymareh, a subregion of the historical Teymareh area, corresponds to present-day Khomeyn County in Iran's modern political geography. Previous archaeological surveys in this county have identified several underground troglodytic structures, including those of Tahyagh, Danian, Kandeh-ha, Farnaq, Robat Aghaj, Nazi, Choqa Gorg, and Ashnakhor. Archaeological excavations at the Tahyagh and Robat Aghaj sites indicate that these locations were utilized during the Middle Islamic period (particularly during the 12-13 centuries CE). Montazer Zohouri and Sharahi have proposed interpretations regarding the functions of Tahyagh and Robat Aghaj. However, despite the considerable number of identified underground troglodytic structures in Khomeyn County, no comprehensive analytical study has yet been conducted on the causes of their formation, functions, or distribution within this region. Accordingly, the present study seeks to answer the following questions: what is the spatial distribution of underground troglodytic structures in the Northern Teymareh region relative to the landscape, and what factors influenced their formation? The results indicate, first, that several contemporaneous settlement sites are adjacent to some of the underground troglodytic structures. Second, analysis of their spatial distribution in relation to landscape features -such as slope, elevation, rivers, and land use- suggests that they were excavated in locations suitable for irrigated agriculture. Therefore, these sites can be interpreted as part of an agrarian settlement system, in which communities primarily relied on agriculture and lived near their farmlands in the plains, while constructing underground structures for refuge and defensive purposes.

Keywords: Rock-cut Structure, Islamic Archaeology, Troglodytic Architectures, Middle Islamic Centuries.

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Introduction

Underground troglodytic structures are a form of architecture created through the digging of corridors and rooms in bedrock (Mohamadifar & Hemati Azandaryani, 2016: 97). Nevertheless, most of the underground troglodytic structures identified in Iran to date belong to the period from the first millennium BCE to the present. The earliest known examples of troglodytic structures are primarily funerary spaces (rock-cut tombs). Some first-millennium BCE rock-cut structures with burial functions include those of Gowijeh Qal'eh village (Sattarnejad *et al.*, 2021a: 113), two rock-cut tombs at Ismail Agha Fortress west of Urmia (Kleiss, 1986: 82), and the Sangar-e Maku rock-cut complex (Danişmaz, 2019: 123).

At the same time, rock-cut structures with multiple or uncertain functions have also been identified, such as the Sheytan-Abad of Miandoab and Darreh Khan sites along the Urmia–Oshnavieh axis (Van Hulsteyn, 1981: 121–123, 127–130) and the Bardeh Konteh site of Mahabad (Hejebri Nobari *et al.*, 2022: 47). It appears that this architectural tradition, which initially emerged with funerary functions, gradually developed to diverse residential, ritual, security and defensive, storage, livestock-keeping, and public uses (Sattarnejhad *et al.*, 2021b; Doostkafi *et al.*, 2023).

In later periods, particularly during the Islamic period, many of the rock-cut structures were carved. Notable examples include the Abazar complex of Nir (Ahmadi, 2000), Dash Hamami of Givi in Ardabil (Sattarnejhad *et al.*, 2018), Varjovi of Maragheh (Sattarnejhad *et al.*, 2021a), Qadamgah of Azarshahr (Sattarnejhad, 2020), the Kharaqan complexes of Qazvin (Maraqi & Parhizkari, 2018), Delik Dash of Mahneshan (Khosravi, 2018), Samen of Malayer and Arzanfud of Hamedan (Mohamadifar *et al.*, 2016), O'ee of Noush Abad, Kashan (Zera'at Kashani, 2015), Narin Qal'eh of Meybod (Nikzad & Ghafouri, 2018), and Meymand of Kerman (Azad, 2005a), (Fig 1).

The historical region of Teymareh, located in present-day Khomeyn County, also contains valuable underground troglodytic structures. The Robat Aghaj (Montazer Zohouri & Hosseinzadeh, 2018) and Tahyagh (Sharahi, 2021) complexes have previously been surveyed and excavated. The results of these excavations confirm the use of these sites during the Middle Islamic centuries, and researchers have proposed interpretations regarding their functions. However, despite the considerable number of identified underground spaces in Khomeyn County, no analytical study has yet examined their distribution and typology.

Accordingly, this paper explores two main objectives: 1) to investigate functions of underground troglodytic structures in Northern Teymareh

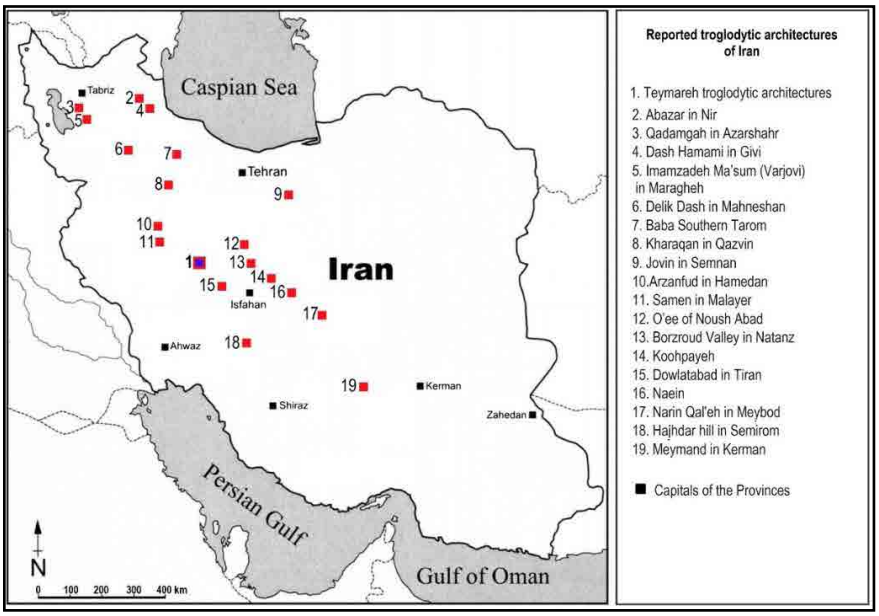


Fig. 1: Distribution of some reported troglodytic architectures in Iran (Second Author, 2026). ▶

based on archaeological evidence and landscape analysis, and 2) to examine the spatial distribution of these spaces in relation to landscape features and influencing factors. The authors seek to answer the following question: how is the spatial distribution of underground troglodytic structures in Northern Teymareh related to the regional landscape, and what factors contributed to their establishment?

Research Method

Primary data used in this study were collected through fieldwork and documentary research, including the GIS data. In the first stage, the results of previous archaeological surveys in Khomeyn County were reviewed, followed by surveys of the underground troglodytic structures in the region and their systematic documentation.

The dataset includes all identified underground troglodytic structures in the historical region of Northern Teymareh within present-day Khomeyn County, comprising eight sites: Tahyagh, Robat Aghaj, Kandeh-ha, Danian, Choqa Garg, Ashnakhor, Farnaq, and Nazi. Among these, documentation of the internal space of the Choqa Gorg, Ashnakhor, and Danian complexes was not possible due to lack of access. Only their locations, geographical features, and surrounding remains were recorded for use in spatial and landscape analyses. The internal spaces of the Nazi complex were documented partially because some areas were accessible while others were blocked. In contrast, the internal spaces of the four complexes of Farnaq, Tahyagh, Kandeh-ha, and Robat Aghaj were fully documented.

Following field surveys and documentation of accessible spaces, the spatial data were processed in ArcGIS. Various maps were produced to provide data for geographical analyses. Based on this process, archaeological evidence from the excavated sites of Tahyagh and Robat Aghaj was analyzed and compared with other subsurface complexes in Northern Teymareh in terms of location, architectural features, and cultural materials, leading to interpretations regarding the causes of formation and functions of these structures. In addition, using ArcGIS outputs and considering factors such as access to resources, arable lands and pastures, the locations of historical urban and rural settlements, security conditions, and historical events, the relationship between the underground troglodytic spaces and the landscape was examined.

Literature Review

Studies on rock-cut and underground troglodytic architecture in Iran and beyond have attracted scholarly attention for many years. However, the underground troglodytic structures of Northern Teymareh have received relatively little attention. Mohamadifar and Hemmati Azandaryani (2016) examined Iranian rock-cut complexes in terms of definition, formation factors, and typology. They concluded that the creation of rock-cut or troglodytic architecture depends on multiple factors, including climatic and geographical conditions, defensive and security concerns, durability and permanence, and religious motivations.

Sattarnejhad *et al.*, (2021b) classified the rock-cut complexes of Maragheh County into residential, ritual, protective, and public types and analyzed the factors influencing their formation. In another study (2021a), they examined the nature and function of the so-called Imamzadeh Ma'sum (Varjovi) complex in Maragheh and identified its primary function as a Buddhist temple and its secondary function as an Ilkhanid Khānqāh[1]. In a further publication (2018), they introduced and analyzed the Dash Hamami complex. Moreover, Sattarnejhad (2020) identified the Qadamgah of Azarshahr as a rock-cut shrine or Khānqāh dating to the Middle Islamic centuries and rejected earlier interpretations linking it to Mithraism.

Mahnaz Ashrafi (2011) divided Iranian rock-cut complexes into horizontal and vertical types. According to her findings, the natural geological context, the initial mode of access (vertical or horizontal), and spatial functions are fundamental factors shaping rock-cut complexes and determining their typological diversity. Dooskafi *et al.*, (2023) analyzed the distribution patterns of troglodytic architectures in

Isfahan Province using ArcGIS. By studying 19 prominent examples and classifying them into "residential" and "defensive-ritual" categories, they concluded that environmental factors dominate the distribution of residential complexes, whereas cultural factors play a primary role in defensive and ritual complexes. Sarokhani (2015) studied the O'ee complex of Noush Abad and described the remains and spaces identified through archaeological excavations. Shekari-Niri (2000) identified the rock-cut villages near Nair, Ardabil as pre-Islamic military fortresses. In another work (2006) he examined Mithraic temple architecture and discussed the construction of such temples as rock-cut structures in remote mountainous areas. Azad *et al.*, (2018) investigated the rock-cut complexes of Naein and introduced examples located in residential spaces, mosques, and mills.

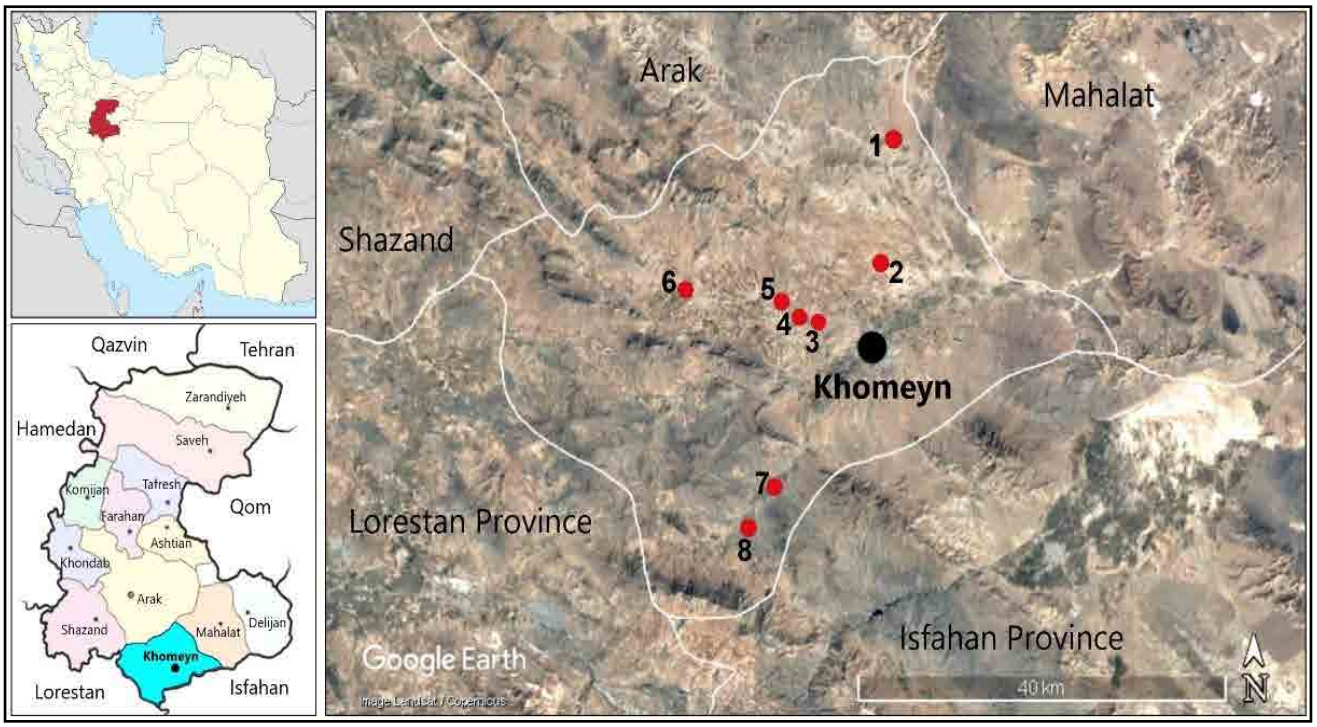
The rock-cut complexes of Northern Teymareh, as the geographical focus of the present study, have been addressed in only a limited number of previous works. Seyed Mehdi Mousavinia (2011) introduced one of the oldest complexes in the region, known as Qiz Qal'ehsi, and attributed it to the Sasanian period. However, according to the present authors' investigations, this site is not an underground complex but was excavated into a rock face at an elevation of approximately 1,000 m above the surrounding lands and functioned as a water reservoir. Therefore, it was excluded from this study.

The Robat Aghaj complex, located in the village of the same name in Khomeyn County, was excavated in 2016 by Majid Montazer Zohouri. Sołtysiak *et al.*, (2017) published a plan of this underground troglodytic architecture and analyzed the human bone remains from the site. The Tahyagh complex was excavated in 2014 by Esmaeil Sharahi, who later published the results in a book entitled "Tahyagh Troglodytic" (Sharahi, 2021), describing its architectural spaces and cultural materials. The excavated bone remains from Tahyagh were also published by Sołtysiak and Sharahi (2017). These remains include both animal and human bones. The human remains consist of two relatively complete skeletons and fragments belonging to at least three other individuals. The evidence suggests that these individuals sought refuge in Tahyagh during the Mongol invasion. Then, their bodies were left within the underground spaces following a possible massacre (Sołtysiak and Sharahi, 2017).

Consequently, among the eight underground troglodytic architectures examined in this study, only Robat Aghaj and Tahyagh have previously been the subject of detailed scholarly research.

Archaeological Study of the Underground Troglodytic Structures in Northern Teymareh

During archaeological field surveys conducted by the first author in April 2023 in the Northern Teymareh region, six underground troglodytic structures were identified, in addition to the previously known sites of Tahyagh and Robat Aghaj. In total, eight complexes were investigated: Robat Aghaj, Nazi, Danian, Tahyagh, Kandeh-ha, Choqa Gorg, Farnaq, and Ashnakhor (Fig. 2 and Table 1).



▲ **Fig. 2: Location of underground troglodytic architectures in northern Teymareh in Khomeyn, Markazi Province; 1) Robat-Aghaj, 2) Nazi, 3) Danian, 4) Tahyagh, 5) Kendeh-ha, 6) Choqa Gorg, 7) Farnaq, 8) Ashnakhor (Authors, 2023)**

The internal space of Robat Aghaj, Tahyagh, Kandeh-ha, and Farnaq were fully documented, while those of the Nazi were partially recorded. Due to blocked entrances and the lack of archaeological excavations, the internal space of Danian, Choqa Gorg, and Ashnakhor could not be surveyed or mapped, and documentation focused solely on their locations and surrounding features. Consequently, these three complexes were analyzed only in terms of spatial distribution and landscape relations.

Three complexes, Tahyagh, Kandeh-ha, and Choqa Gorg, were created in conglomerate formations. The geological context of Tahyagh also includes soft marl layers. Robat Aghaj was excavated in a sandy hill undergoing conglomeration. Thus, four complexes were created in predominantly conglomeratic contexts. The Nazi and Danian complexes were excavated in clayish substrates, while Ashnakhor and Farnaq were formed in sandstone deposits.

From a geomorphological perspective, Robat Aghaj, Nazi, Tahyagh, Kandeh-ha, and Choqa Gorg were carved into natural hills; in contrast, Danian, Farnaq, and Ashnakhor were formed within the present-day village on relatively flat terrain.

The Robat Aghaj complex consists of two corridors, one running north–south with a length of 90 m and another running east–west with a length of 20 m (Fig. 3). Eight rooms were excavated along the north–south corridor and three along the east–west corridor. Except for one cruciform room, the others are square or rectangular with varying dimensions (Montazer Zohouri & Hosseinzadeh, 2018), (Fig. 4). The presence of wooden fragments, hinges, and metal fittings indicates that most rooms originally had wooden doors secured with internal wooden bolts. Ventilation shafts along the corridors facilitated air circulation (Fig. 5). However, erosion and rainfall have caused soil, stones, and surface materials to collapse into the complex, blocking the shafts and much of the corridors.



Fig. 3: Corridors of the Robat Aghaj complex (First Author, 2023). ▶

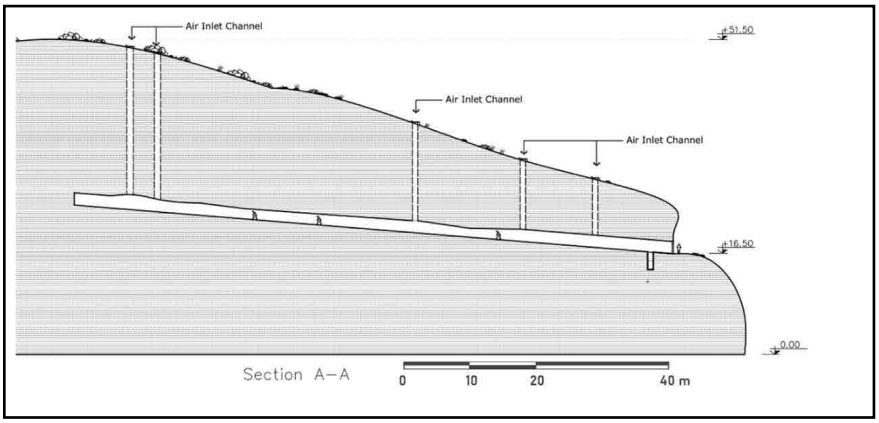
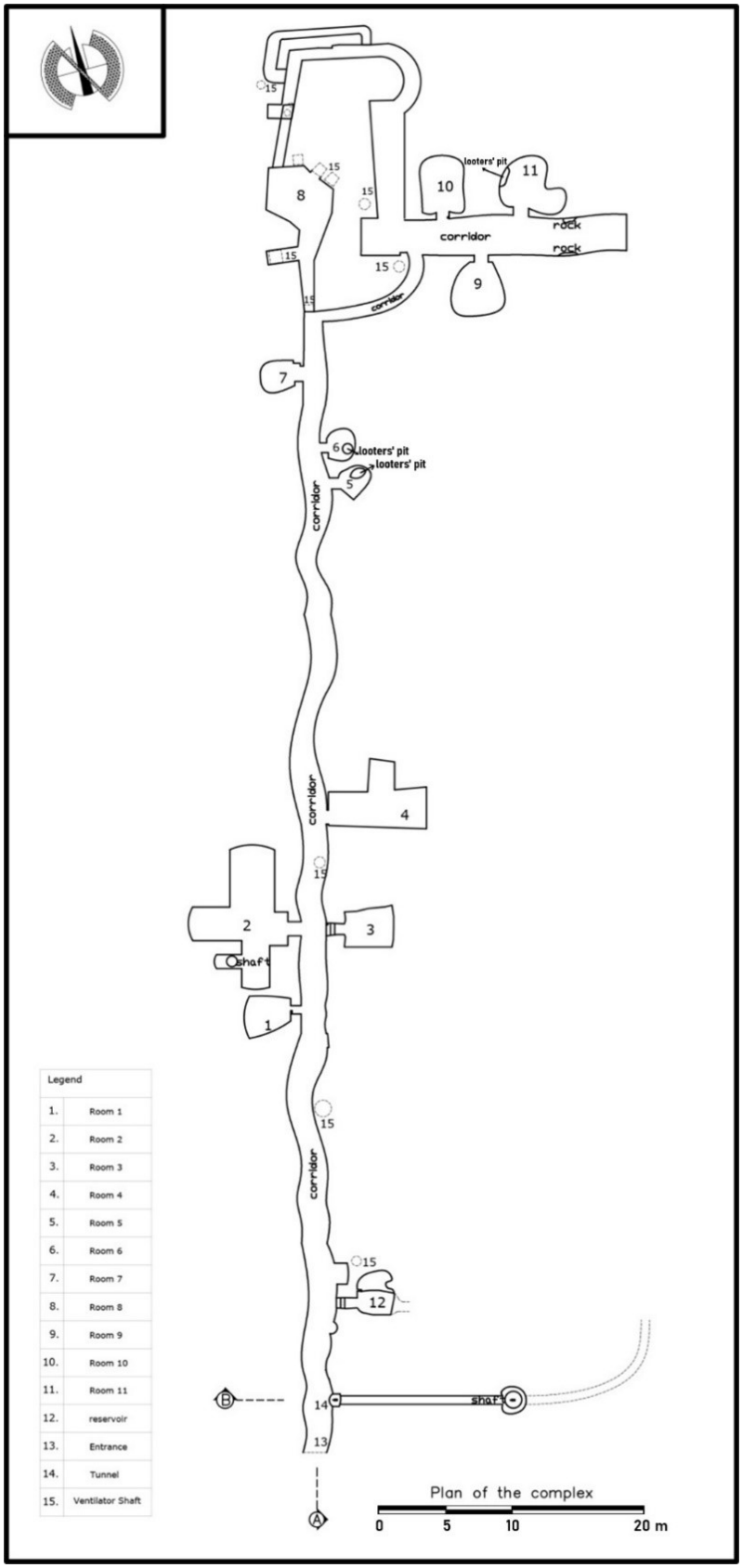


Fig. 5: Section of the Robat Aghaj complex and the location of its ventilation shafts (Montzar Zohouri, 2016: 251). ▶



◄ **Fig. 4: Plan of the Robat Aghaj's structures (Montazer Zohouri & Hosseinzadeh, 2018: 377).**

Although Robat Aghaj does not exhibit a funerary character, human bone remains were found in two rooms, providing some bioarcheological data. A skull discovered in the center of Room 1 was identified, based on cranial morphology and dental wear, as belonging most likely to an adult female. Bone porosity suggests a metabolic disease, possibly osteoporosis, rickets, or scurvy. High frequency of dental caries, especially on molars, indicates an abrasive diet rich in fermentable carbohydrates, likely common in the region (Sołtysiak *et al.*, 2017). Based on the cultural materials of Robat Aghaj, especially ceramic fragments, its chronology dates to the 12th and 13th centuries CE (Figs. 6, 7). These cultural materials are comparable to samples of Kashan (Fehervari, 2009; Grube, 2005; Yazdani *et al.*, 2016), Samen in Malayer (Hemmati Azandaryani *et al.*, 2017).

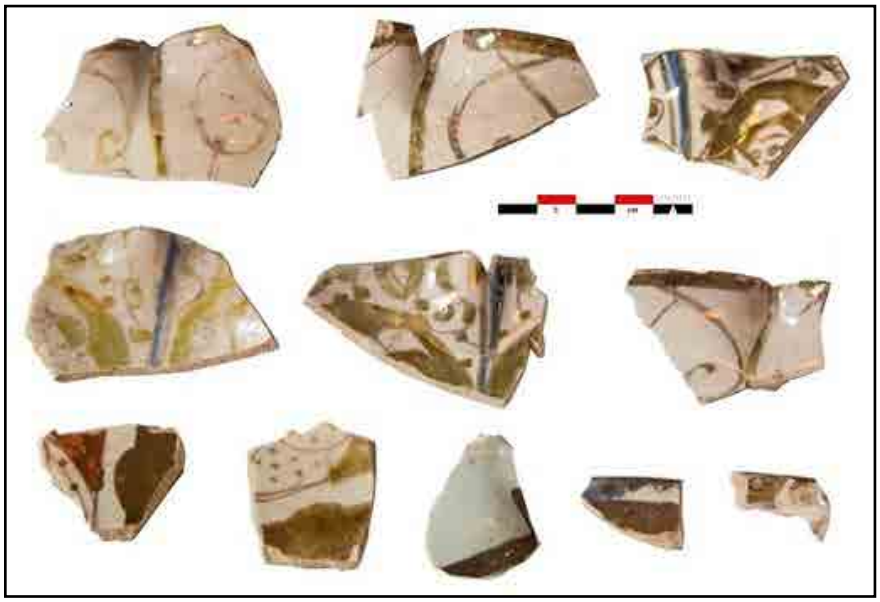


Fig. 6: Lusterware fragments from the Robat Aghaj complex, 12-13th centuries CE (Nikbakht *et al.*, 2019). ▶



Fig. 7: Potsherds of glazed Mina'ee style recovered from Robat Aghaj, 12-13th centuries CE (Nikbakht & Montazer Zohouri, 2021: 3). ▶

The Nazi complex has a 1×1 m entrance followed by a corridor of similar width and height extending for 30 m. Beyond this corridor, the

passage narrows and turns northward. Due to destruction, filling with soil, and the lack of excavation, other spaces remain unidentified (Fig 8). Cultural materials from Nazi also date back to the 12th and 13th centuries CE and are comparable to the samples of Samen in Malayer (Hemati Azandaryani, 2017), Zino-Abad in Hamadan (Mohammadi and Shabani, 2017), and Reyy (Treptow and Whitcomb, 2007), (Fig. 9).

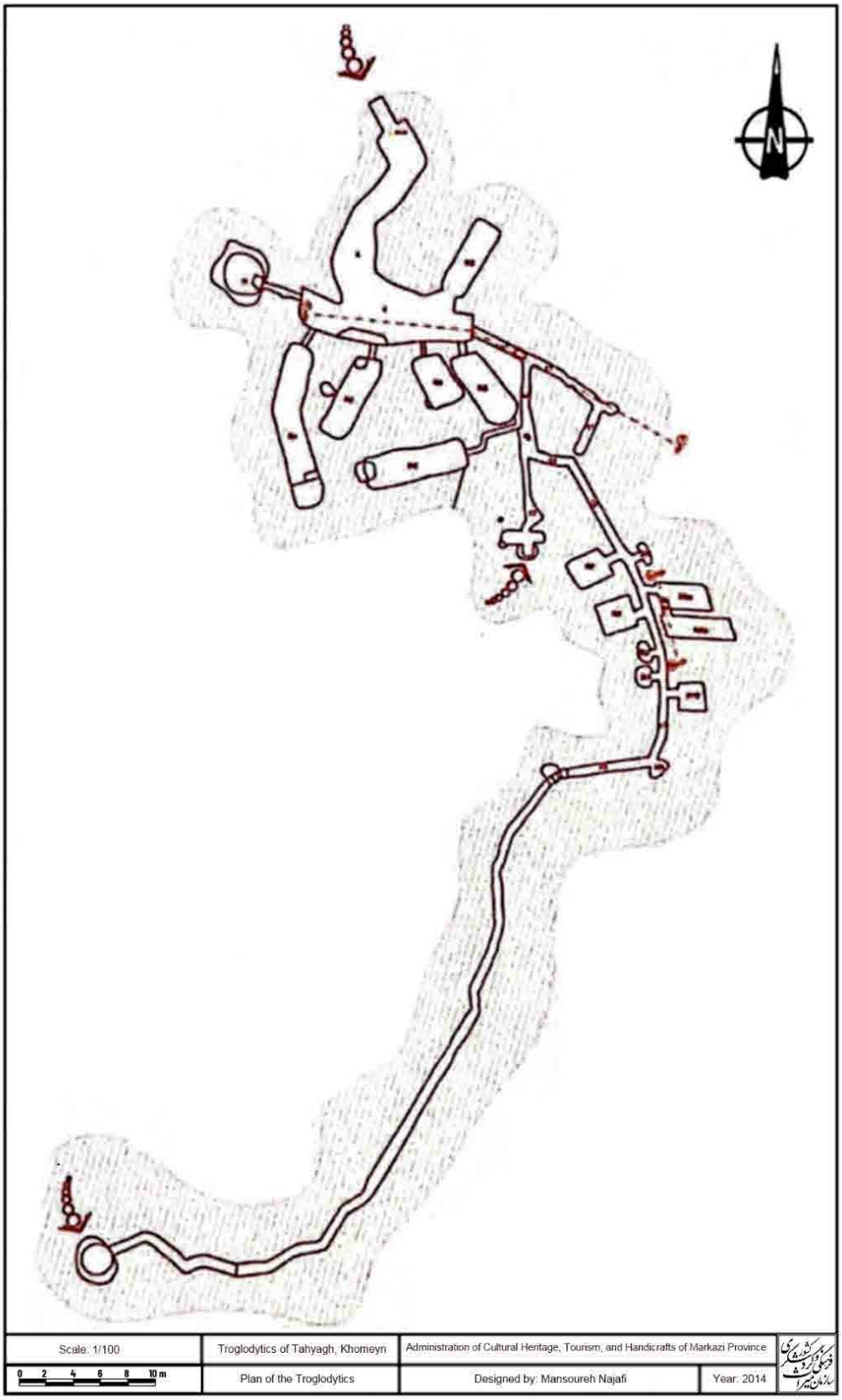
At Tahyagh, spaces such as an entrance, entrance corridor, a hall, 11 rooms, four storage chambers, five corridors, three ventilation shafts, and two wells were identified and excavated (Sharahi, 2021: 43–44), (Fig. 10). Historically, access was provided through ventilation shafts equipped with footholds, which could be blocked for security purposes. The central hall is the largest space and provides access to other parts of the complex (Fig 11). A bioarcheological study provided evidence of violence at this site (Sołtysiak and Sharahi, 2017). Cultural materials, especially ceramic fragments, suggest a 12–13th century CE chronology for Tahyagh (Fig. 12). These ceramics are comparable to the samples of Moshkoyeh, Zarandiyeh, and Zolf-Abad (Sharahi, 2021), Siraf (Whitehouse, 1979: 49, pl. IIIa), Zino-Abad in Hamadan (Mohammadi and Shabani, 2017), Reyy (Treptow & Whitcomb, 2007), and Kashan (Fehervari, 2009; Yazdani *et al.*, 2016).



◀ **Fig. 8: Entrance of the Nazi complex (First author, 2023).**



◀ **Fig. 9: Some ceramics from the Nazi complex (First Author, 2023).**



▲ Fig. 10: Plan of the Tahyagh complex (Sharahi, 2021: 77).

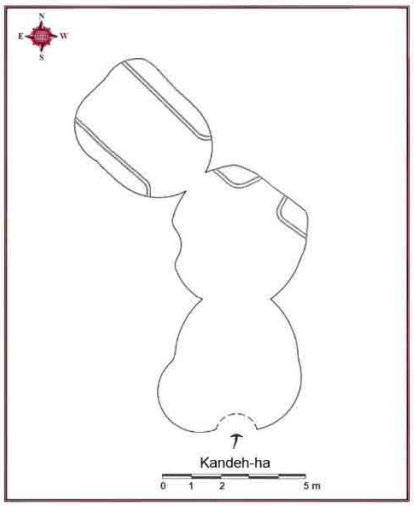


◄ Fig. 11: The main hall of the Tahyagh complex (Sharahi, 2021: 80).



◄ Fig. 12: Some ceramics from the Tahyagh complex (After: Sharahi, 2021).

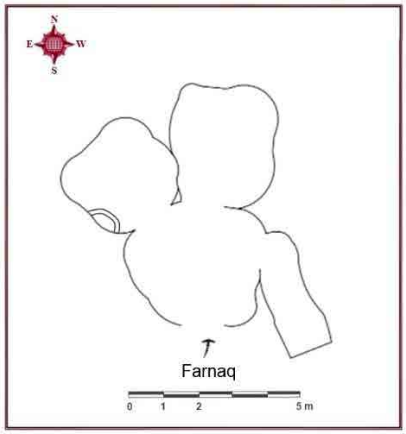
Parts of the Kandeh-ha complex became visible following recent earth-digging activities on a hill in the village. According to villagers, it originally had several entrances facing north and northeast, most of which are now blocked. The remaining spaces include three rooms measuring 4.5×5 m, 5×5 m, and 4×5 m (Fig. 13). In recent years, cob-built mangers have been added, and the complex has been used as a stable and storage area. The small size of these mangers suggests use for small livestock such as sheep and goats, and parts of such complexes were commonly used as lambing areas (Fig. 14).



▲ Fig. 13: Plan of the Kandeh-ha complex (First Author, 2023).



◄ Fig. 14: Two carved spaces in the Kandeh-ha complex (First Author, 2023).



▲ Fig. 15: Plan of the Farnaq complex (First Author, 2023).

The Farnaq complex was identified following the formation of two well-like shafts in the courtyard of a fortress. Its original entrances are no longer visible. But after the collapse of the roof, two holes were created in the castle courtyard, which allowed entry to the site. Beyond the larger shaft lies a room measuring 4×4 m with a height of 2 m. To the east, a corridor extends for 6 m before being completely blocked by debris. A second room (3.5×3.5 m) lies to the north of the first, and a third room of similar size is located to the northwest (Fig. 15). An added cob-built manger indicates its latest use as a livestock shelter (Table 1), (Fig. 16).



Fig. 16: The Farnaq underground troglodytic space (First Author, 2023). ▶

Spatial Analysis

To analyze the relationship between the spatial distribution of the underground troglodytic structures and the landscape of Northern Teymareh, their locations were compared in terms of elevation (asl), slope, proximity to rivers, and land use. The altitudinal distribution map indicates that all eight complexes in Northern Teymareh were carved at a low altitude (Fig. 17), which can be interpreted as evidence of their "defensive and shelter" function. In these areas, there are no high mountains or naturally elevated features suitable for use as hideouts or shelters, and the inhabitants of the surface sites in this region were compelled to create such underground spaces as refugia.

These complexes were carved in areas with low slopes (Fig. 18). Slope is an important factor influencing water flow velocity, drainage, erosion, and degradation rates, type of vegetation cover, and plant species selection (Mousavinia, 2013: 132). Based on this, since water flow velocity increases on steep slopes, causing damage, the carving of the underground troglodytic architectures on low slopes is justifiable. Thus, the residents wisely carved the complexes on low slopes to minimize erosion, damage, and losses caused by floodwaters.

Table 1: Location and structural characteristics of the studied underground troglodytic structures in the Northern Teymareh Region (First Author, 2023). ▼

Name	Location	Features and characteristics
Robat Aghaj	39 S 416644.61 m E 3742942.45 m N 1940M North of Robat Aghaj Village, North-east of Khomeyn	- A castle measuring 100 × 150 m on top of the hill where the underground troglodytic architecture was excavated. The total area of the complex is approximately 345 m². - Linear plan (north-east and south-west direction) - Cultural materials include pottery fragments, glass vessels and ornaments, stone beads, iron and bronze tools, and bone remains (Nikbakht & Montazer Zohouri, 2021).
Nazi	39 S 415242.45 m E 3730749.28 m N 1809M 200 meters east of Nazi village, North-east of Khomeyn	- A castle on top of the hill where the underground troglodytic architecture was excavated. - The area of the identified space is 35 m² (other parts are blocked). - Linear plan (north-east and south-west direction) - Cultural materials include pottery fragments found around the complex.
Danian	39 S 408466.79 m E 3724889.52 m N 1846M In the village of Danian, North-west of Khomeyn	- One blocked entrance was recorded with the guidance of villagers. - A second entrance is reportedly located near the Khomeyn–Shazand road, close to the village. - The internal spaces could not be examined due to blockage.
Tahyagh	39 S 406461.82 m E 3725317.11 m N 1864M 100 meters east of Tahyagh village, North-west of Khomeyn	- Area of the complex is 175 m² with a linear plan (north and south direction). - storage spaces, including four small storerooms, large ceramic storage jars (*Lavak*), and vessels for water and food storage. - two-story room (Room 8). - A square stepped platform with traces of burning at the end of Room 1 (the largest room). - Narrow and low-ceiling corridors with a cruciform space functioning as a vestibule or waiting area in Corridor 2 (Sharahi, 2021). - Cultural materials include pottery, glassware, dinar coins, gold, silver, and bronze ornaments, iron agricultural and military tools, stone beads, and bone remains (ibid.).
Kandeh-ha	39 S 404547.56 m E 3726936.55 m N 1877 M In the village of Kandeh-ha, North-west of Khomeyn	- The complex covers an area of approximately 70 m². - Linear plan (north and south direction). - Small animal pens in two of the three rooms, likely for small livestock. - No cultural materials identified due to the spaces being filled with debris and rubble.
Choqa Gorg	39 S394029.06 m E 3728217.25 m N 1968 M 20 kilometers west of Khomeyn city	- A historic fortress atop the underground troglodytic structure. - According to villagers, one of the corridors was exposed as a result of unauthorized excavation. It was closed by the administration of Cultural Heritage in Khomeyn, making it impossible to access the interior. - Cultural materials around the fortress include pottery.
Farnaq	39 S 403438.02 m E 3708840. 65 m N 2013 M 16 kilometers southwest of Khomeyn city	- A historic fortress atop the underground troglodytic architecture. - The complex covers an area of approximately 48 m². - Centralized and radial plan (one central space with surrounding rooms). - Possible connection of the complex spaces with the Farnaq River (according to villagers).
Ashnakhor	39 S 400334.38 m E 3703203.65 m N 2120 M In the village of Ashnakhor, southwest of Khomeyn	- According to villagers, the complex had four entrances, all of which are now blocked. - The locations of two entrances were identified with guidance from villagers. - Access to the internal spaces was not possible.

Thermal fluctuations between day and night are less pronounced on low slopes compared to steep ones, which is an important factor in plant growth (Mousavinia, 2013). As argued earlier, although there is evidence of animal husbandry activities in the Northern Teymareh complexes, based on the study of the bones discovered in Robat-Aghaj, the storage rooms and ceramic jars, and the land use map (Fig. 20), it appears that the inhabitants of these complexes during the Islamic period were a community with an agriculture-based economy. Therefore, choosing a settlement location on a low slope was necessary to increase agricultural production in the community living in Northern Teymareh.

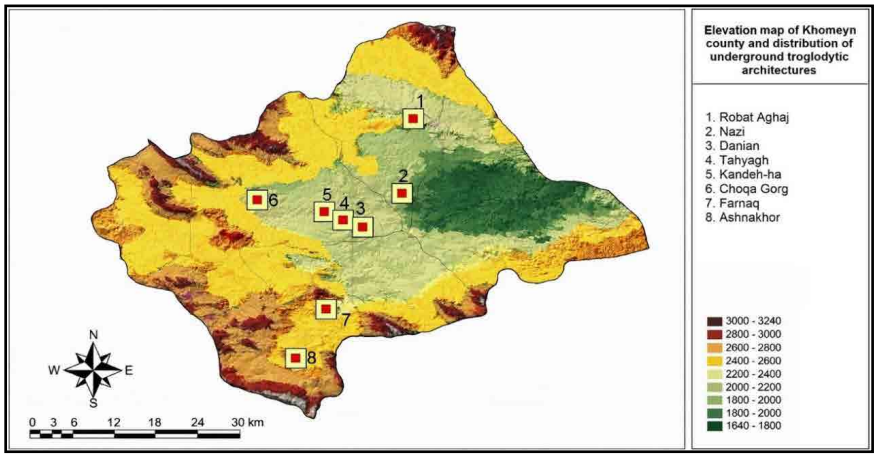


Fig. 17: Distribution of underground troglodytic architectures in relation to altitude (First Author, 2023). ▶

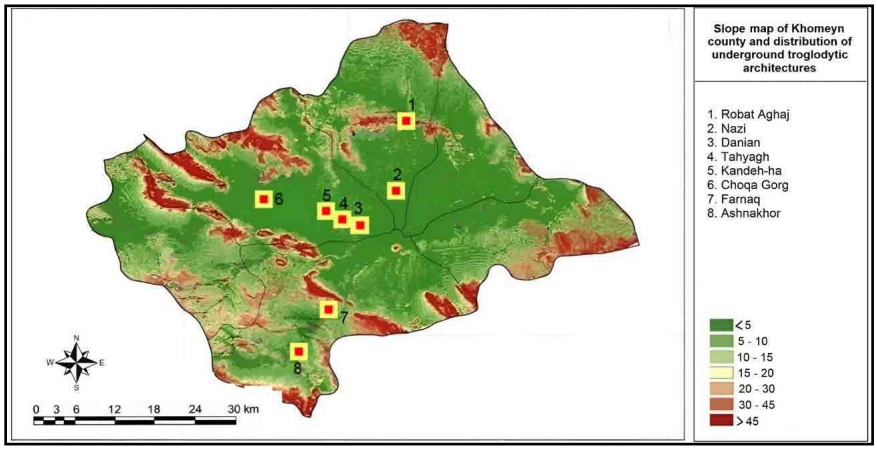
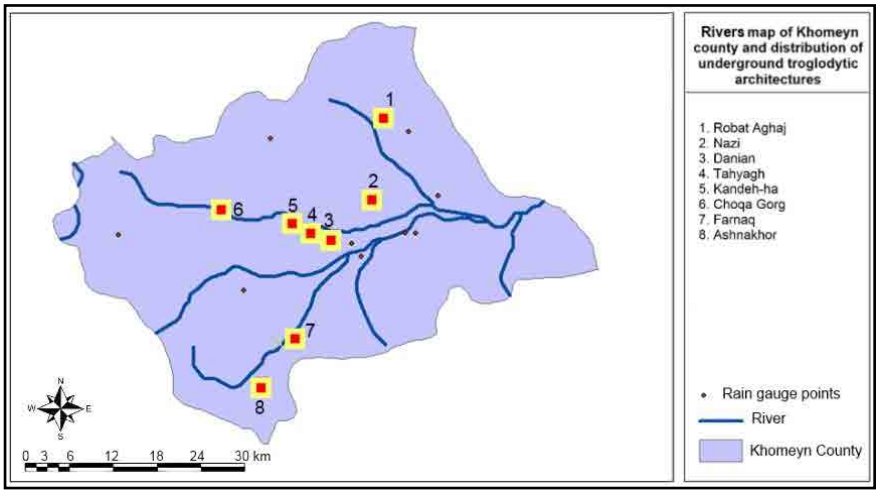


Fig. 18: Distribution of underground troglodytic architectures in relation to slope (Second Author, 2023). ▶

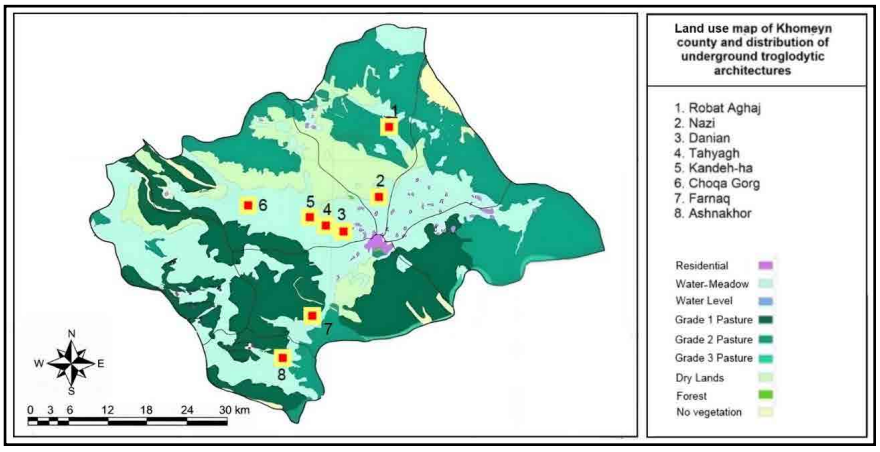
According to the map showing the distribution of the underground troglodytic architectures relative to the rivers of Khomeyn County, except for the Nazi complex, which is located near a very large spring, the other complexes are situated close to rivers, which have been the primary and strong sources of irrigation water for the inhabitants (Fig 19). Furthermore, based on the distribution map of the complexes relative to land use, all eight spaces are located in irrigated agricultural lands (Fig 20). Thus, the inhabitants of the complexes were engaged in agriculture

for their livelihood, and agricultural activities usually require a sedentary lifestyle with permanent settlements. This provides strong evidence for the residential function of the complexes in this region.

Another important point is the existence of Qanats very close to Robat Aghaj, Choqa Gorg, and Tahyagh. This suggests that the community living in the nearby surface settlements, who had experience in Qanat carving, were fully aware of the land's geological conditions and features. With knowledge of the substrate and valuable experience in Qanat digging, they also undertook the carving of the underground troglodytic architectures to be used when necessary. For instance, the builders of Tahyagh, with thorough understanding of the substrate, carved spaces within a marl soft layer. The height of the spaces in this complex corresponds directly to the thickness of the marl layer. In some parts, the height of the space reaches 170 cm, while in others it is as low as 80 cm (Sharahi, 2021: 43).



◄ **Fig. 19: Distribution of underground troglodytic architectures in relation to rivers (Second Author, 2023).**



◄ **Fig. 20: Distribution of underground troglodytic architectures in relation to land use (Second Author, 2023).**

Another important point is that ensuring the security of the Teymareh plain dwellers, especially in the context of the political and military events of the 12th and 13th centuries CE[2], was an important issue. Given

the considerable distance between the settlement sites in the plain and the surrounding mountains, it was difficult for the people to seek refuge in the mountains during invasions by hostile tribes or other threats. Thus, their security was ensured either by building defensive walls and fortifications around villages and towns, by carving underground living spaces in the form of rock-cut complexes.

Classification of Underground Structures

The underground troglodytic architectures in Northern Teymareh can be classified into two categories based on their architectural plan and structural organization: 1) complex, large-scale spaces characterized by diverse architectural elements and multi-part spatial organization, and 2) small, simple spaces with limited internal differentiation.

The Robat Aghaj and Tahyagh complexes fall within the first category. Both exhibit sophisticated architectural planning, including carved rooms and clearly defined spatial organization. In the Robat Aghaj complex, the identification of eleven rooms, a 90-m-long corridor, an additional 20-m-long passage, and multiple ventilation shafts underscores the structural complexity and functional significance of the site. Similarly, the Tahyagh complex comprises a well-defined entrance corridor, a central hall, eleven rooms, four storage spaces, five corridors, three ventilation shafts, and two wells. This spatial configuration reflects a high degree of internal organization and architectural planning.

In contrast, the Kande-ha and Farnaq spaces represent the second category. These spaces are comparatively small and architecturally simple, with limited spatial organization and no identifiable ventilation features.

In addition, the functional differentiation of these spaces is also important. Through comparative studies of the underground troglodytic structures of Northern Teymareh with examples from other regions of Iran, and by analyzing the social, political, religious, and geographical contexts of Northern Teymareh, the reasons for the carving of these complexes can be explained. One important aim of carving rock-cut spaces in Iran was providing space for human dwelling (mostly temporary or seasonal). The rock-cut villages of Maragheh (Sattarnejhad *et al.*, 2021b: 60), Hilevar and Kandovan in East Azerbaijan, and the rock-cut village of Meymand in Kerman (Zeinali Qutb-Abadi, 2015) are examples of architecture carved or used for settlement purposes.

Religious and ritual rock-cut complexes are another category, featuring a broad range of functions such as mosques, Khānqāhs (Sufi lodges), churches, Buddhist temples, open-air shrines, and funerary spaces

(Sattarnejhad *et al.*, 2021b: 61). For example, the rock-cut complex of Ghadamgah in Azarshahr is known as a Khānqāh (Sattarnejhad, 2020: 103), and the Imamzadeh Ma'sum or Varjovi complex in Maragheh has a similar function (Sattarnejhad *et al.*, 2021a). Additionally, rock-cut mosques such as Darab (Ahmadi, 2000), the rock mosque of Eyj (Azad, 2005b), and the Cheraghil rock mosque (Safaei *et al.*, 2018) are among the religious rock-cut complexes.

Furthermore, the architectural structure and plans of some rock-cut complexes indicate military and security objectives in their construction, such as the castle complexes of Alamut or the subsurface complexes of Noush Abad, Kashan (Sarokhani, 2015). Some rock-cut complexes were used for livestock keeping, while others served as water reservoirs and baths; for instance, Qiz Qal'asi in Khomeyn (Mousavinia, 2011), the water reservoirs of Shushtar (Askari & Aghaeian, 2015), the rock-cut bath of Pish-osta in Kerman (Riyahian & Labaf-Khaniki, 2015), and Dash-Hamami in Ardabil (Sattarnejhad *et al.*, 2018).

Therefore, examination of rock-cut complexes in Iran shows that these spaces were carved for multiple reasons, including settlement, religious worship and rituals, defense and security, livestock protection, storage, and preservation.

In the Tahyagh complex, Room 9 had a wooden door, and the discovered artifacts suggest it was a private space used residentially by a family. Room 8 was carved with high precision over two levels, indicating social hierarchy among the inhabitants of Tahyagh. The discovery of gold jewelry in Room 6 further reflects the social stratification of the residents. Notably, many of these adornments belonged to women, revealing a significant female population in this complex (Sharahi, 2021: 156). This evidence suggests that the primary function of Rooms 9, 8, 6, and likely other rooms in the complex was residential.

On the other hand, weapons such as dagger blades, spearheads, bayonets, and axe blades were found in this complex (Ibid: 186), indicating a need for defense against attacks. But these weapons may reflect the final stage of the occupation, when it was used as a refuge. Meanwhile, the presence of storage rooms 1 to 4 and the discovery of agricultural tools such as a shovel and two sickles during excavations (Ibid: 187) is important to understand the livelihood and economic model of the resident community.

Accordingly, it appears that the Tahyagh complex was a residential and possibly a refugial settlement. However, the distance between this complex and the nearest surface settlement is about 10 kilometers (Fig 21), and there is only a small hill from the Sassanian period, a Qajar

landlord's castle, and a Qajar cemetery around the Tahyagh (Sharahi, 2021: 16-18). Therefore, there seems to be no significant relationship between Tahyagh (a 12-13th century CE site) and the Sasanian and Qajar surface sites. Instead, Tahyagh should be considered in relation to the two underground complexes of Danian and Kandeh-ha, as the distance from Tahyagh to these two is less than four kilometers, and these three complexes should be studied together.

In Robat Aghaj, all rooms have traces of doors and locks, which not only indicate the concept of privacy among the inhabitants but also likely reflect its residential use. The large number of ceramic fragments related to everyday and kitchen use, glass objects, bangles, and other daily life tools (Montazer Zohouri & Hosseinzadeh, 2018: 376) further confirms the residential function of the Robat Aghaj complex. The use of rooms 5 and 6 as storage spaces (Ibid) probably correlates with relatively long-term habitation in this complex.

However, since one of the entrances of the Robat Aghaj is from within a castle situated atop a mound, the excavator has suggested the possibility that the complex was carved in connection with the castle (Ibid: 375). Therefore, the function of the complex should also be interpreted in relation to passive defense and with military and refugial purposes.

At the same time, archaeological evidence from room 1 of the Robat-Aghaj and the existence of a cruciform space (room 2) within the complex provide different results, suggesting a probable ritual use, related to Sufism, for this space (Fig. 4). First, unlike other rooms, the cruciform room shows the least archaeological evidence related to daily life. Second, the cruciform plan is a traditional ritual arrangement in Iranian architecture. Additionally, the presence of a square platform in the cruciform room, similar to the votive platforms in Iranian ritual architecture[3], on which traces of burnt layers can be seen, is probably related to ritual function. Third, given the cruciform plan and the well dug within it, this space closely resembles one of the ritual rock-cut architectures, namely the stone mosque of Darab, which was used as a mosque during the 12th and 13th centuries CE (Hasani, 2017), contemporary with the Robat Aghaj complex. Meanwhile, as mentioned earlier, other rooms with doors and locks indicate private ownership and were used for residence, shelter during emergencies or seasonal changes, and as storage spaces.

Overall, except for the suspected ritual space at Robat Aghaj, the main function of these complexes was residential, with lower-ceiling rooms serving as storage.

Chronology of the cultural materials (Table 2) attributes these complexes to the medieval Islamic centuries, particularly the 12th and 13th centuries CE (Sharahi, 2021: 127-129; Montazer Zohouri & Hosseinzadeh, 2018: 376). Although the reasons for initially carving these complexes in the 12th century CE are unclear, it seems their expansion in the 13th century CE and continued use was a response to the Mongol invasions, unrest, and dangers of that period. In other words, many rock-cut complexes in Iran were developed during the Mongol and Ilkhanid era, and as previously referenced, very few subsistence, residential, and defensive underground spaces can be found that do not have evidence from the 12th and 13th centuries CE. Therefore, it seems the Northern Teymareh complexes were also reused for security and defense during this era.

In the Kandeh-ha complex, the presence of small layered animal stalls indicates its use for housing small livestock like goats and sheep. This can be linked to an economy based on pastoralism and agriculture. Since these small stalls are later additions and postdate the initial carving, the secondary function of the complex should be interpreted as related to a community engaged in pastoralism and agriculture.

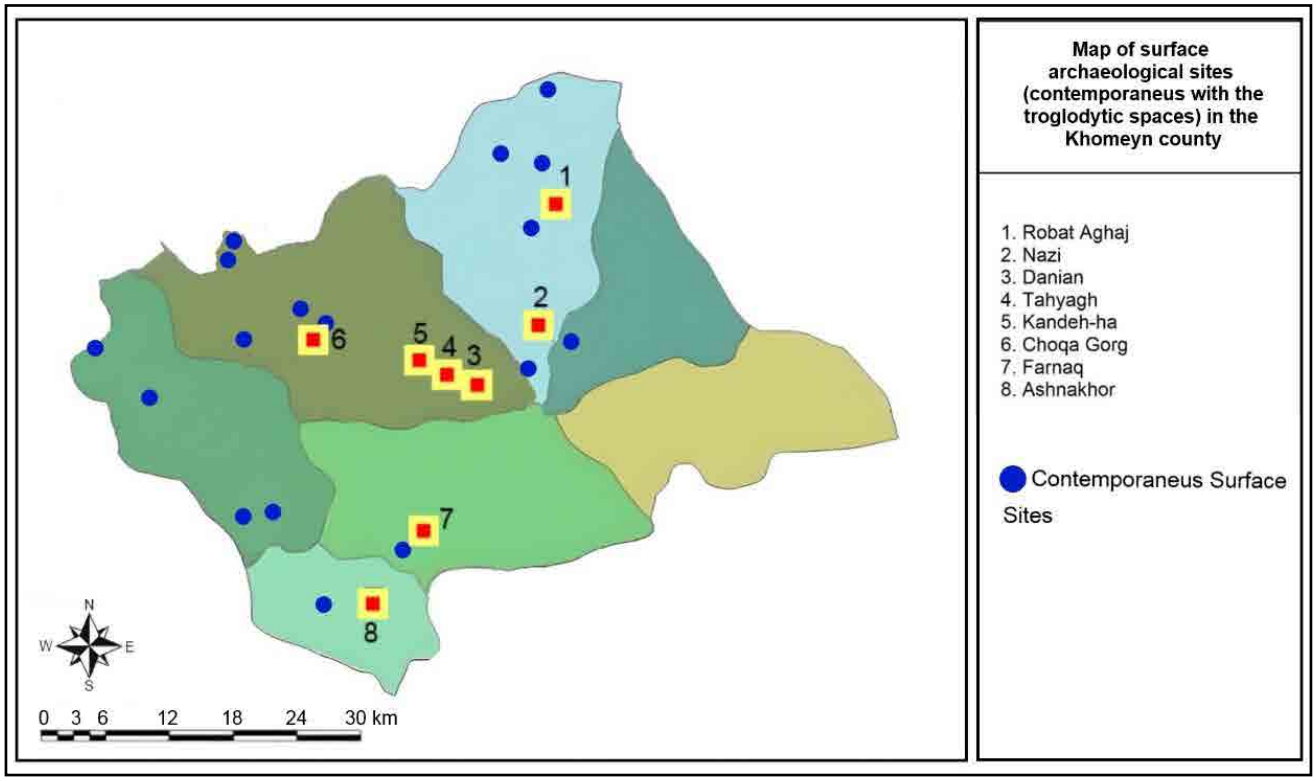
Another important point is that based on spatial distribution maps of underground troglodytic architectures and medieval surface sites in the region, five complexes, Farnaq, Chogaharg, Robat-Aghaj, Nazi, and Ashnakhor, were carved very close to or adjacent to contemporary surface settlements (Fig 21). This proximity is crucial for interpreting the reasons and purposes behind their carving and use. If these complexes served as residential refuges during crises and attacks, then considering the necessity of rapid evacuation and movement during danger, their proximity to contemporary surface settlements (within about two kilometers) is understandable.

Simultaneously, the pattern common in other Iranian regions, like the Sahand and Sabalan mountain slopes, might also apply here: underground rock-cut spaces served as storage and utility spaces supporting residential surface settlements. The existence of four historic castles adjacent to three complexes, Robat-Aghaj, Nazi, Farnaq, and Choqa Gorg, and the presence of contemporary surface settlements near these complexes support this hypothesis. A similar pattern is seen in the “Aghol Chavan” complex in Maragheh (Sattarnejhad *et al.*, 2021b: 64).

Furthermore, another factor in the formation of Northern Teymareh’s underground complexes could be protecting inhabitants from harsh winter cold. The architecture of underground complexes, embedded within rock

and earth, reduces heat exchange between inside and outside spaces, maintaining relatively stable internal temperatures. The high thermal capacity of the earth in these spaces minimizes temperature fluctuations and heat load. Additionally, thick walls limit heat transfer with the outside environment. Generally, underground complexes have cool air in summer and warm air in winter (Sattarnejhad *et al.*, 2021b: 58). In other words, in the summer, they have much lower (sometimes minimal) amplitude of temperature. But in the winter, using heating methods and stoves, they retained more heat, since they had no heat exchange with the outside.

Given that Khomeyn County is a cold to temperate region with recorded minimum temperatures reaching -16°C (Encyclopedia of Islam, Khomeyn: 184), it seems these underground spaces, with residential use, played a role in protecting inhabitants from severe winter cold. Such a role was important in other parts of Iran as well. For example, some villagers on the slopes of the Sahand mountains in Azerbaijan, until a few decades ago, carved underground rooms beneath their homes to shelter livestock from cold (Sattarnejhad *et al.*, 2021b: 59-60).



▲ **Fig. 21: Distribution of underground troglodytic architectures in relation to contemporary Islamic sites (First author, 2023)**

Conclusion

Based on the spatial distribution map of the underground troglodytic complexes in Northern Teymareh in relation to the surface settlement sites, and considering less than two-kilometer distance between some of these

complexes and surface sites, as well as the cultural materials discovered or recorded from these underground spaces, it appears that the complexes in Northern Teymareh were either carved by the inhabitants of the surface settlements during the medieval Islamic period, between the 11th and 14th centuries CE. Familiar with Qanat digging techniques and well aware of the bedrock, these people carved these complexes, taking into account the geological conditions and features.

In response to the research question, the location of underground troglodytic architectures of Northern Teymareh in irrigated and arable lands, along with their access to water sources, and the existence of storage rooms and jars in some complexes, especially in Robat Aghaj and Tahyagh, reflect the presence of a farmer community. The agricultural activities of such a community require a "sedentary" settlement or a "short-distance mobile" lifestyle. Also, the placement of complexes on low slopes facilitated resident movement, reduced damage from floodwaters, and increased agricultural productivity.

Moreover, the carving of these complexes at low elevation levels indicates their defensive and security purposes, since in these locations there are no high natural features like mountains for refuge, compelling the inhabitants of surface settlements for strategic and defensive reasons to create underground refuges near their settlements. The agricultural-based livelihood also required proximity to irrigated farmlands, thus prompting the inhabitants to create residential and sheltering rock-cut complexes around their lands for habitation and protection during crises.

On the other hand, unfinished spaces in Tahyagh and discontinuous use in later periods show that it was carved quickly in several stages to be used occasionally as a refuge. Furthermore, the architecture of private spaces with doors and the cultural finds suggest family life within these spaces.

Possible ritual functions of some spaces require further archaeological investigation. For example, at the Robat Aghaj, there are several reasons to propose a ritual function for the cruciform space: first, the cruciform plan is an ancient ritual archetype in Iranian architecture; second, there is a square platform with burn evidence in this space; third, this space yields the least archaeological evidence of daily life; fourth, the cruciform plan and the well dug inside closely resemble a known ritual rock-cut complex, the stone mosque of Darab, used as a mosque in the 12th and 13th centuries CE and contemporary with the Robat Aghaj complex. Therefore, it is likely that the cruciform space of Robat Aghaj was associated with ritual practices at that time, possibly connected to Sufi currents which were popular in the

Markazi Province region. Nonetheless, confirming this hypothesis requires further archaeological evidence.

In general, the underground troglodytic complexes of Northern Teymareh reflect a strategic response to security, environmental, and economic needs. Located on low slopes near irrigated agricultural lands and water sources, these spaces served primarily as residential and refugial shelters for farmer communities, with some areas possibly used for ritual purposes. Their architectural diversity, from large, multi-room complexes with ventilation and storage facilities to smaller, simpler spaces, demonstrates adaptation to defense, climate, and social organization. Collectively, these complexes illustrate how medieval Islamic inhabitants integrated underground architecture into protection strategies, daily life, and agriculture.

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Author Contributions

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Conflict of Interest

The Authors, while observing publication ethics in referencing, declare the absence of conflict of interest.

Endnote

1. Khanqah is a building for the residence, rituals, worship, and education of Sufis. A Sufi is a follower of Islamic mysticism who seeks a direct, personal experience of God through spiritual practice and inner purification. He is committed to performing acts of worship and enduring austerities and hardships to purify his soul (Mirbagherifard and Rezaei, 2010).

2 Most important political and military events include: Battles and riots during the Saljuq, Khwārazmshāhiyān, and Mongol period (Ravandi, 264-305; Grousset, 2009; Saunders, 2004; Bondari, 1977).

3 For example, at Hasanlu (Dehghani and Fazeli Nashli, 58).

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چکیده

تیمرهٔ علیا به‌عنوان بخشی از ناحیهٔ تاریخی تیمره، در جغرافیای سیاسی امروزی با شهرستان خمین مطابقت دارد. در بررسی‌های پیشینِ باستان‌شناسی در شهرستان، شماری دستکند زیرسطحی شامل دستکندهای تهیق، دانیان، کنده‌ها، فرنق، رباط آغاج، نازی، چغاگرگ و آشناخور شناسایی شده است. یافته‌های کاوش‌های باستان‌شناسی در دو دستکند تهیق و رباط آغاج مؤید استفاده از این فضاها در سده‌های میانی اسلامی، به‌ویژه سده‌های ششم و هفتم هجری‌قمری است و کاوشگران -مجید منتظرظهوری و اسماعیل شراهی- نظراتی را دربارهٔ کارکردها و علل حفر دو دستکند رباط آغاج و تهیق ارائه کرده‌اند. اما با وجود تعداد قابل‌توجه دستکندهای زیرسطحیِ شناسایی‌شده در شهرستان خمین، تاکنون مطالعاتی تحلیلی دربارهٔ علل شکل‌گیری، کارکردها، دلایل فراوانی آن‌ها در این ناحیه و رابطهٔ توزیع فضایی آن‌ها با چشم‌انداز و زمین‌سیمای منطقه صورت نگرفته است؛ بنابراین، در پژوهش حاضر تلاش شده است به این پرسش پاسخ داده شود که، توزیع مکانی دستکندهای زیرسطحی در ناحیهٔ تیمرهٔ علیا در ارتباط با زمین‌سیمای منطقه چگونه است و دلایل و عوامل مؤثر بر شکل‌گیری آن‌ها چیست؟ بر این‌اساس، تحلیل مواد فرهنگیِ دو دستکند کاوش‌شدهٔ تهیق و رباط آغاج و مقایسهٔ آن‌ها با سایر دستکندهای منطقه صورت گرفته و بستر شکل‌گیری و مؤلفه‌های مؤثر بر توزیع مکانی دستکندها در پیوند با زمین‌سیما با استفاده از سیستم اطلاعات جغرافیایی (GIS) و برپایهٔ مؤلفه‌های دسترسی به منابع و نقش رخدادهای تاریخی مطالعه شده است. یافته‌های پژوهش اولاً نشانگر وجود شماری از محوطه‌های استقراری هم‌دوره با دستکندها در مجاورت برخی دستکندها است. ثانیاً توزیع مکانی دستکندها در ارتباط با زمین‌سیما، شامل شیب، ارتفاع، رودخانه‌ها و کاربری اراضی نشانگر حفر دستکندها در محل‌های مناسب برای کشت آبی است؛ بنابراین، این محوطه‌ها را می‌توان به‌عنوان بخشی از یک سیستم استقراری کشاورزی تفسیر کرد که در آن جوامع در درجهٔ اول به کشاورزی متکی بودند و در نزدیکی زمین‌های کشاورزی خود در دشت‌ها زندگی می‌کردند، درحالی‌که فضاهای زیرزمینی را با اهداف پناهگاهی و دفاعی می‌ساختند.

کلیدواژگان: معماری صخره‌ای، باستان‌شناسی اسلامی، معماری دستکند، سده‌های میانی اسلامی.

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