

**کتابنگاری**

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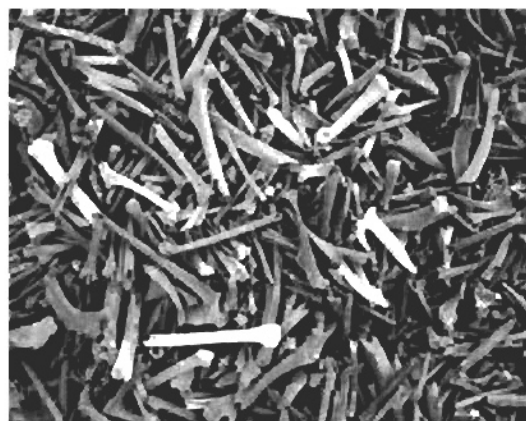
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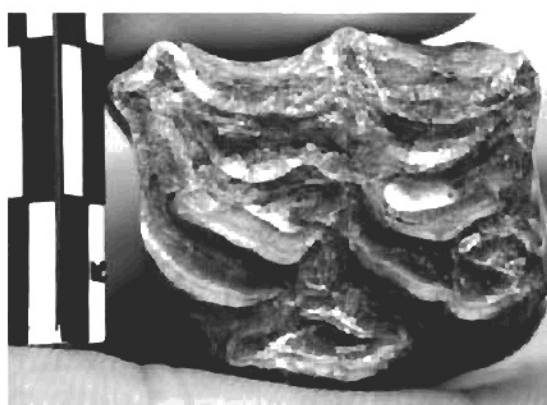
PLATE 3



1



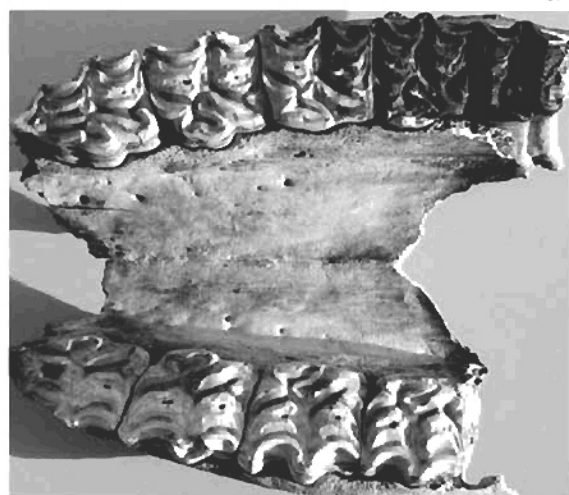
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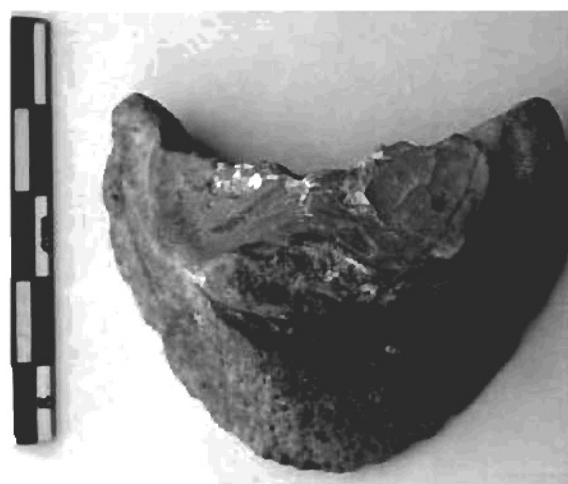
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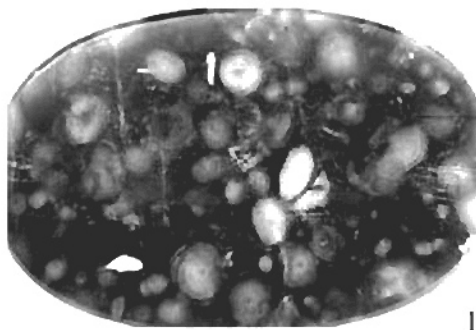
Fig. 1- Rodent and other small animal's remains hunted and consumed by man, sieved soil, washed and picked from Qaleh Bozi cave 2

Fig. 2- Birds and other small animal's remains hunted and consumed by man, sieved soil, washed and picked from Qaleh Bozi cave 2

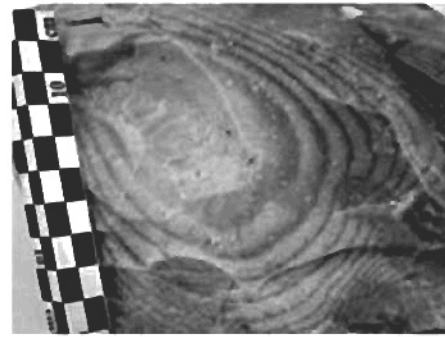
Figs 3, 4 & 6- Tooth and hoof of Equus (horse) discovered from Qaleh Bozi cave 2, hunted and consumed by man.

Fig. 5- Upper jaw of Equus (horse) discovered from Yekah Chah cave 1 (in the depth of 105 meters from entry of cave and 80 cm blow surface), hunted and consumed by man (see burned teeth)

PLATE 2



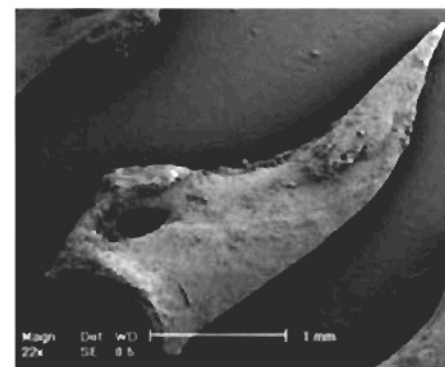
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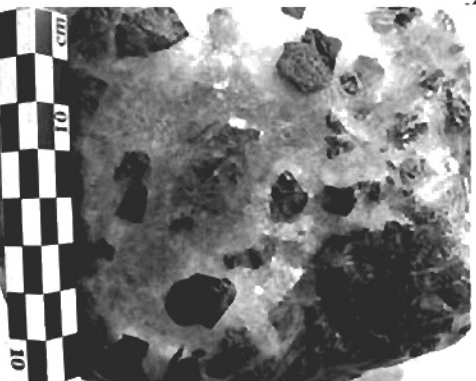
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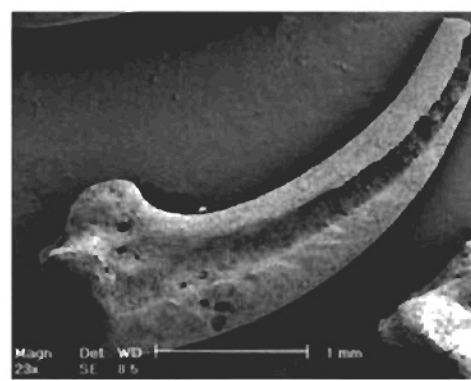
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4



5



6

Fig. 1- Cut and polished slice, changed to opal limestone with Nummulite

Fig. 1- cut and polished slice, changed to opal limestone with Nummulite (Paleocene to Eocene in age), Babahidar, area (Zagros, Sharkord) Pabdeh Formation, Yazdi's collection..

Fig. 2- Stripped opal bed with Nummulite, (Paleocene to Eocene in age), Babahidar, area (Zagros, Sharkord).

Fig. 3- The source of flints and opal pebbles (Man used them for tools in Qaleh Bozi, after transportation as pebbles by Zayandeh-Rud River), Paleocene to Eocene in age, Babahidar, area (Zagros, Sharkord). These beds sometimes change into nodules and opal concentration. Arrows show limestone with Nummulite bed that completely changed into silica (opal).

Figs 4 & 6- SEM photos from black bed (charcoal bed) sampled, washed and picked from Qaleh Bozi cave 2 (80 cm below surface) showing beak and nail of hunted and consumed birds.

Fig. 5- A part of pebble (opal) collected from Samsami & Doabe (Zagros, Balchitari) Talezang and Kashkan Formations showing glassy texture (particles in pebble are Radiolarite in the age of Late Cretaceous)

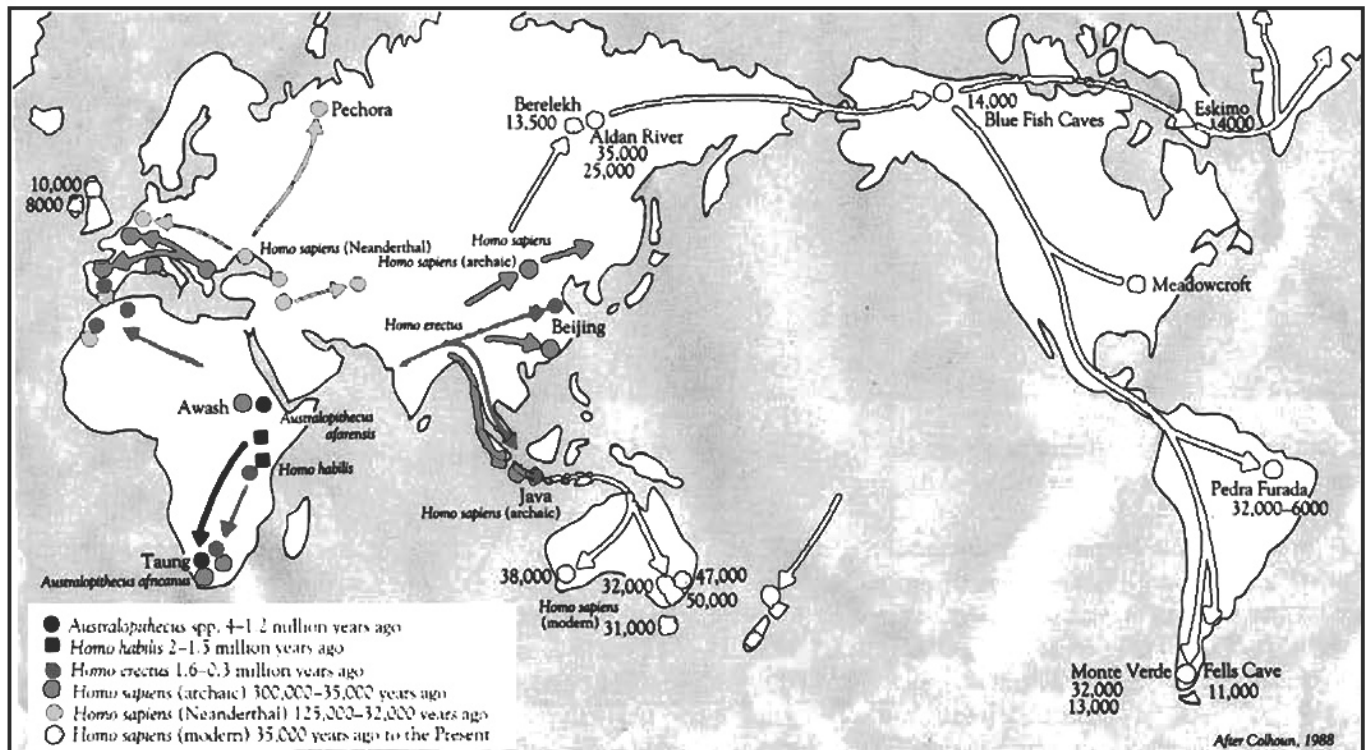
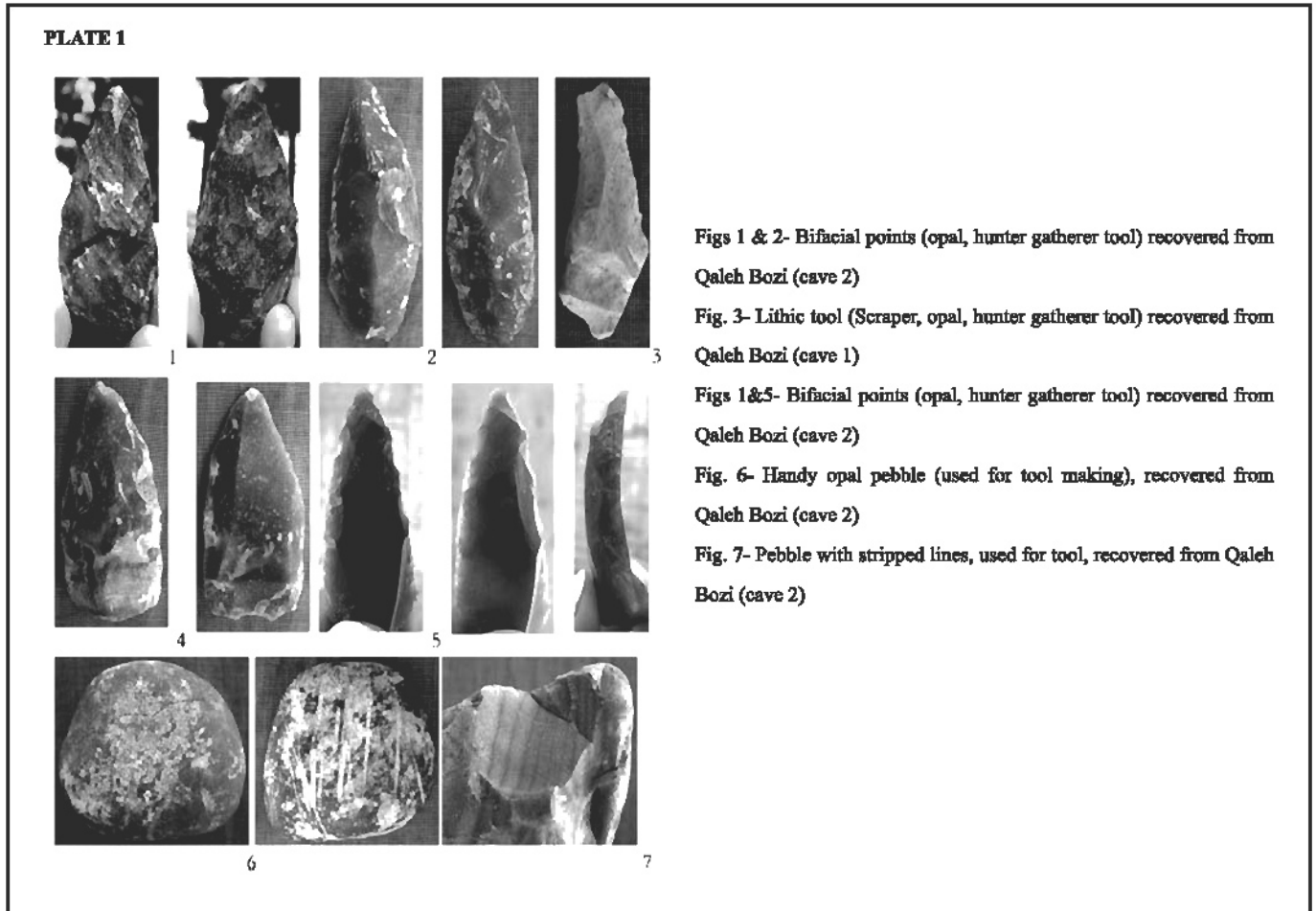


Fig.11- Main routes and time of migration of Hominids and early Man (After White, 1991, P. 123)



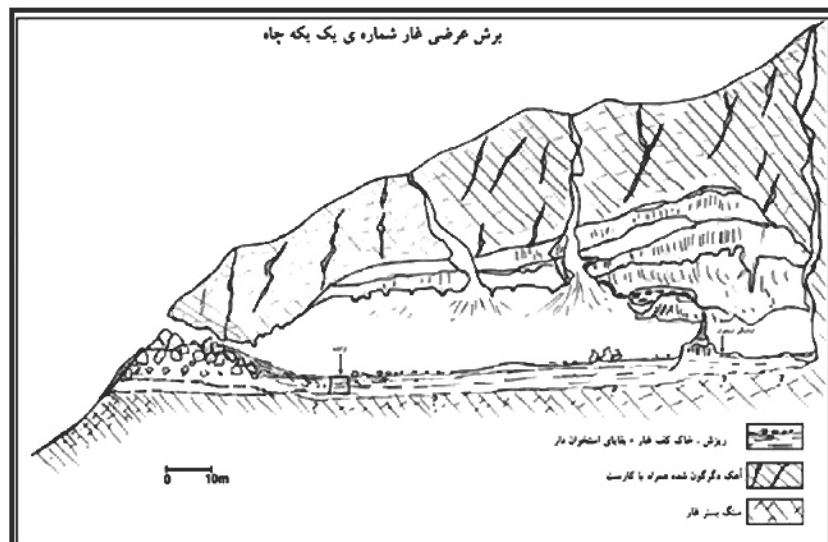


Fig.8- Cross section of Yeksh Chah Cave)

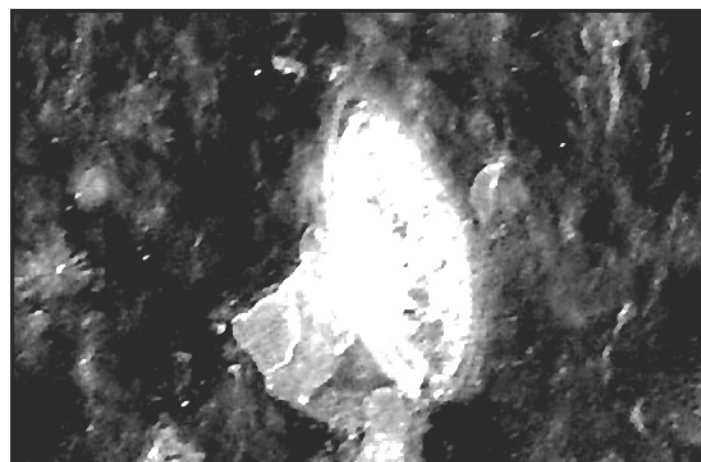


Fig.9- Lithic tool, Qaleh Bozi with Nummulite. Opalized carbonate bed with Nummulite from Babahidar, recovered from Qaleh Bozi

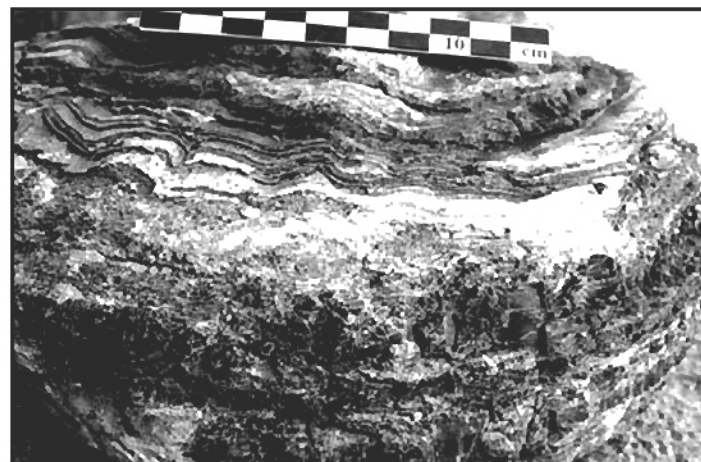


Fig.10- Cheghakhor concentration. Opalized beds(concentration), Jahrum Formation, Cheghakhor, Bakhtiari (Zagros Mountains)

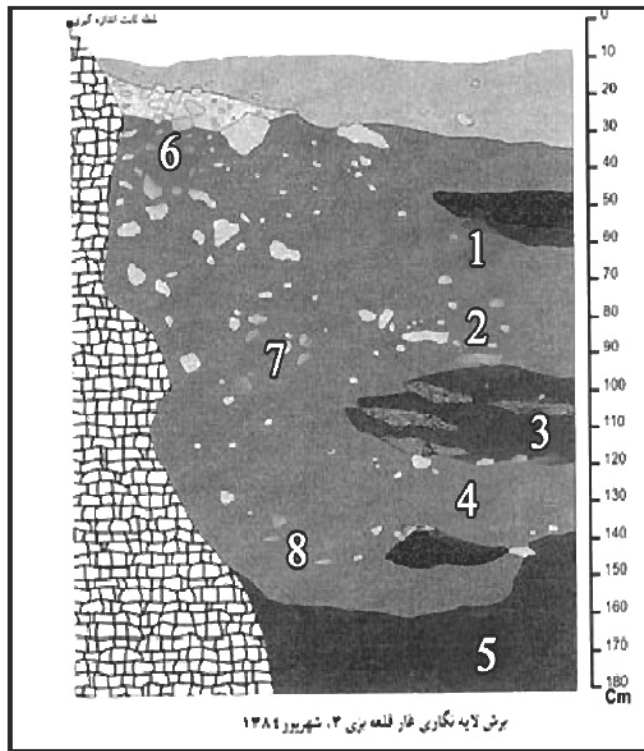


Fig.5- Lithostratigraphical beds of Qaleh Bozi trench 3

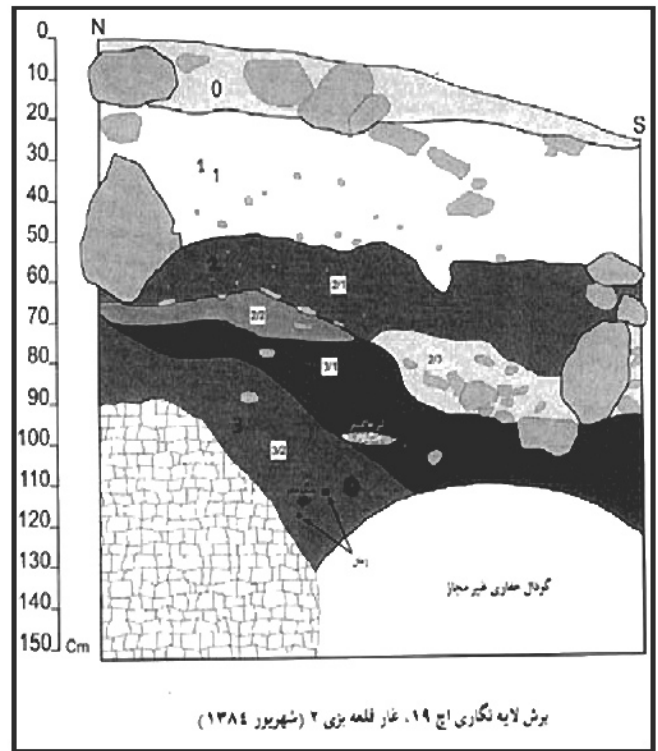


Fig.6- Lithostratigraphical beds of Qaleh Bozi trench 2

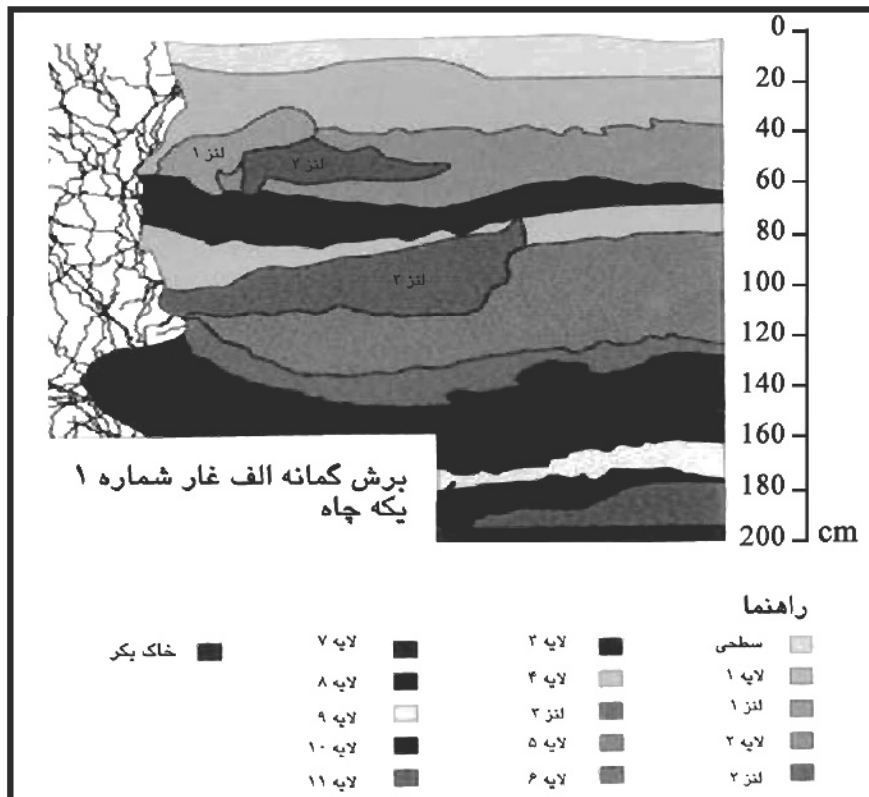


Fig.7- Beds and lithostratigraphical details of Yekeh Chah Cave.





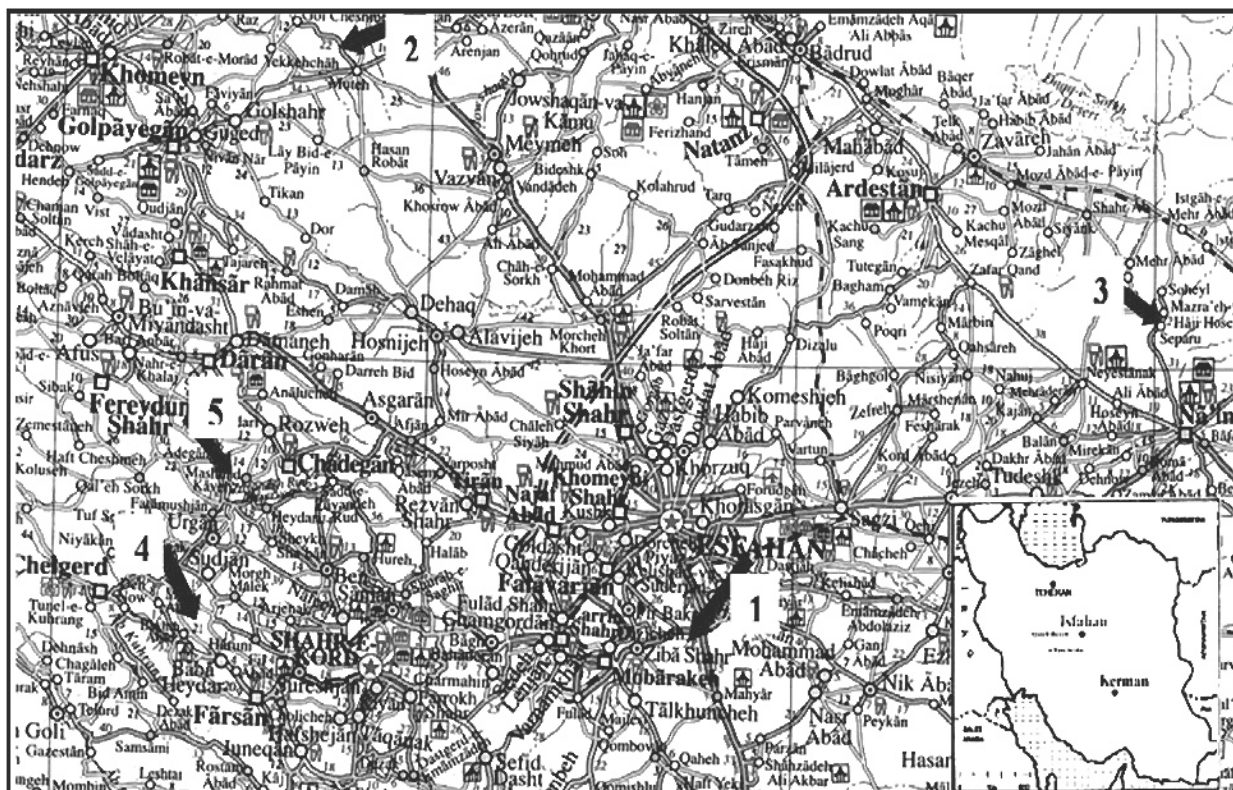


Fig.1- Localities studied in this research (From Gitashenasi, Scale 1: 2, 250,000. 2007)

1= Qaleh Bozi Caves. 2= Yekeh Chah Caves. 3= Separab-e-Nain. 4= Baba Hydar (source of lithic tools in Zayandeh Rud River or locality that opalized limestone with Nummulite can be traced) 5= Chadegan (Tapeh Ashena or New lithic area).

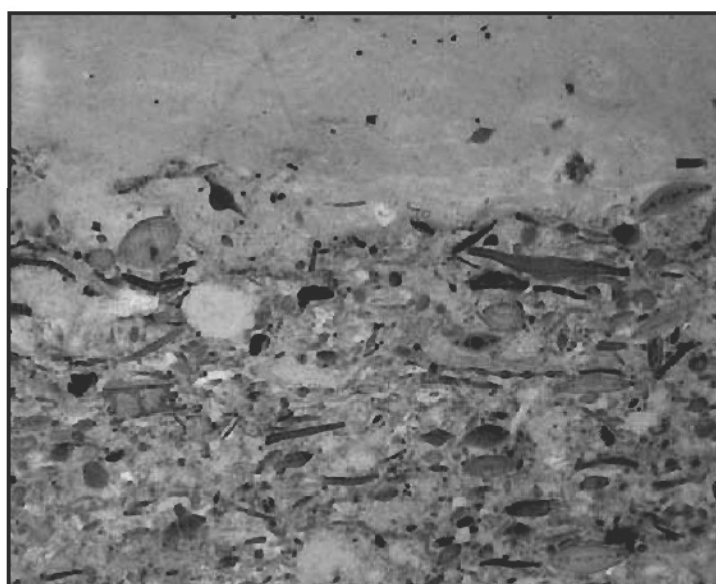


Fig.2- Polished and sliced opalized limestone with Nummulite, Baba Hydar, Zagros Mountains



sedimentology of flint and opal that man used as tools. Based on recovered Nummulite observed in a lithic tool, this idea was carried out and we found out that many opalized pebbles with Nummulite are abundant in Zayandeh Rud River. We tried to trace the source of these pebbles. We came to this conclusion that all of them come from Baba Hydar area (Shahr e Kord, Zagros Mountains).

#### Geological setting and sedimentology

Apart from a few examples of lithic tools exploited from Early Cretaceous limestone, more than 2000 pieces of opal lithic tools (knife, scrapers, points, handy axe and opal pebbles) were discovered from Qaleh Bozi caves and rock shelters (2004 & 2005), see plate 1, figs 1 to 7. Most of this assemblage is composed of flints and opal pebbles collected by Man (Paleolithic, mousterian) from nearly Zayandeh-Rud River. By thin section preparation and controlling of this assemblage under binocular microscope we found that, many of them had remains of Nummulite. We did a survey along the Zayandeh-Rud River from Mobarekeh up to Chehelgerd and Zardkuh in order to find the source of opal pebbles. In fact we choose two routes; firstly along the Zayandeh-Rud River and secondly a route from Isfahan to Broujen. All opal pebbles (100 percent) are coming from first route into the Zayandeh-Rud River (see plate 2, figs 1, and 3).

All rivers, detritus sediments and conglomerate beds along the second route (Isfahan to Broujen, Shalamzar, Farsan, and Shahr e Kord to Isfahan) had no trace of opalized limestone pebbles. Based on the presence of radiolarite layers in Late Cretaceous sequences in Zagros Mountains and following the presence of opal pebble with radiolarite in younger formations (Kashkan, Talezang and Shahbazan formations, see plate 2, fig. 5). Presence of opal layers with Nummulite in Pabdeh and Jahrum formations confirmed that biota remains changed into opal (see plate 2, fig 3). We can conclude that, at the time of Late Cretaceous a deeper condition was dominated in Zagros Basin. Radiolarite beds were deposited in deeper environment. Those beds were eroded and were redeposit in Kashkan, Talehzang and Shahbazan formations (biochemical opal pebbles, see plate 2, fig. 5). We believe that, the source of opalized beds with Nummulite in Pabdeh and Jahrum formations (see plate 2, fig. 3) could be as a result of pebble solution act at the Paleocene to Eocene time interval.(fig. 2,3)

Faults parallel to Zagros trust zone are passing close to the Qaleh Bozi Mountain. These Faults resulted caves and rock shelters. Man used them as shelter at least from Mesolithic time in Mobarekeh area. Since the trend of beds (deeps) is towards caves (B), simply calcium carbonate solution reacts and water can get into caves and rock shelters. At the time of man occupancy humid and wet condition was dominated. Water and faults created unstable conditions for caves (A). This situation optionally led to falling ceiling and covering floor by big rocks (fig. 4). By digging three trenches (Qaleh Bozi Cave 2, rock shelters 3 and Yekeh Chah cave 1),(figs. 5-8) systematic

sampling (sieving, separating, washing and picking methods) we found artifacts (lithic tools), consumed bones, egg shells (fresh and burned), seeds and microscopic microelements (beak and nail of birds, both fresh and burned). Since horse bones are abundant as a consumed hunt we can report that in the time of Mousterian, horses were a favorite food for man (see plate 3, figs 1 to 6). SEM photos from discovered microelements (after picking, both from Qaleh Bozi and Yekeh Chah) show that, at the time of famine they robbed and collected bird chicks (see SEM photos on plate 2, figs 4 and 6).

Within lithic tools we found out that some of opalized tools have Nummulite (fig.9). We convinced that our survey regarding to the tools source is correct. In Cheghakhor Lake the concentration of opal can also be found in the age of Paleocene to Eocene time interval (fig.10). In many humans sites in Zagros and central Iran we found the source of opal tools, which are biochemical opalized limestone and cherty beds. Regarding to man occupancy we believe that man migrated from northwest and west towards central Iran. After finding good sites they tried to live accord to land (hunting, gathering and collecting food). By increasing the number of population they migrated to new places as a result of obligation (fig.11).

#### Conclusion

A survey was done on at list on five caves (three in Qaleh Bozi, Yekeh Chah and Separab Naein) that were occupied by Man at the Mousterian time in central Iran. This research confirmed the presence of Man (hunter-gatherer) from at least 60 000 years ago up to 10 000 years ago in central Iran. Similarity between food and style of hunting (based on the remains of bones in trenches, see plate 3, figs 3-6) confirmed that a humid and cooler condition dominated Iran at that time. According to the presence of hunted and remained bones in studied caves, we propose that Man hunted: horses, rhinos, deer, wild sheep and goat, fishes and turtles and gathered greases and wild fruit in central Iran. According to White, 1991 Man migrated from Middle East (west) to Iran. Vanishing of many vertebrate groups from central Iran like Rhino and Bison (bones of them discovered from Qaleh Bozi caves) shows a dry and warmer paleoclimate from 10 000 years to now. Bones of rhino and bison's are not figured in this paper. These bones are under loan in Paris at the moment.

#### Acknowledgment

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# Sedimentology and Geoarchaeology of Paleolithic (Mousterian) Lithic Tools in Central Iran

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## Abstract

Determining and studying collected lithic assemblages, biota remains and deposited beds (regarding to sedimentology) of two rock shelters in the age of Late Pleistocene to recent interval in central Iran were the aims of this research. Mobarekeh (Qaleh Bozi) and Yekeh Chah (near Golpayegan) are two sites in which remains of consumed and hunted biota by human were checked by this research. Lithic assemblages are studied considering their sources. Mousterian lithic assemblages from Qaleh Bozi caves and rock shelters (Hassan Abad Caves) are made of silica pebbles (limestone with *Nummulite* or cherty beds in the age of Paleocene to Eocene time interval) that hominids had collected from the Zayandeh Rud River in the Middle Paleolithic Period. Finally it should be stated that lithic artifacts in Yekeh Chah are mostly Quartzite sandy shale (probably belong to Jurassic). Black beds (charcoal lenses) in Qaleh Bozi and Yekeh Chah caves were sampled and washed for Determining biota remains and sedimentary components. All washed samples from two localities had remains of: burned wood (charcoal), large vertebrate *mammals* (mostly horse), vertebrate and micro vertebrates (fish, rodent, reptile and amphibian), egg of birds, seeds and grass. SEM photos related to hunted and consumed birds' beak and nails from Mobarekeh and Yekeh Chah confirmed that the food of man in those localities could be similar. This research is first report the presence of hunter-gatherer hominids in Central Iran (Mousterian). Lithic assemblages are collected from Separab Naein in the age of Mesolithic and from Tapch Ashena (Chadegan) in the age of Neolithic as well.

**Key words:** Cherty bed, Limestone with *Nummulite*, Charcoal lenses, Lithic assemblages, Central Iran

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## 1- Introduction

Remains of hunted or consumed biota associated with Mesolithic assemblages were discovered (Plates 1-3) from three areas in Central Iran. Determining deposited or dumped levels (ash, charcoal, bones and lithic tools) within rock shelter levels or in the nearby sequences confirmed that at the time of humid occupancy cool conditions were dominated in central Iran. Collected scattered samples (bones and lithic tools) by farmers, geologists and students in year 2003 from Hassan Abad caves (No.1), Yekeh Chah (No.2) and Naein (No.3) areas were the base of an excavation and exploration project which started in 2004 under the support of University of Isfahan (project No. 830103). Since the source of recovered lithic assemblages is different in the studied areas, at first the project started to control the source of collected tools. The Paleoenvironment of the studied rock shelters in central Iran can be compared to the environment of man which was reported by Archer et al. (1991) in the Riversleigh area (Australia), Andrew and Stringer, (1989 p. 44) from Neanderthals, Europe, and White (1991) from Tasmania. In Separab Nain (No. 3), chipped and crafted tools can be found around a hill close to Dehshir farm (No. 3). Lithic tools from this area had been reported by: Davodzadeh (1972) for the first time. Collected lithic assemblages in Separab Nain were mostly red to light colored radiolarite (out of Ophiolitic

complex in the age of Late Cretaceous). The source of lithic tools from Qaleh Bozi caves and rock shelters is limestone with *Nummulite* of Paleocene to Eocene which can be traced in Baba Hydar area (No.4) (Farsan and Sharkord, Zagros Mountains). Since (2004) reconnaissance and controlling caves and rock shelters in central Iran (regarding to man's occupancy) has been under study of a team from the department of geology, University of Isfahan. Since that time several abstracts and papers have been published including: Hamadani et al.(2004) (in Persian), Yazdi & Salehi Kakhaki (2005) (in Persian), Javcri et al. (2005) (in Persian), Yazdi et al. (2006) (in Persian), Biglari et al. (2006) and Biglari et al. (2007).

In this research charcoal lenses and cave soils (Qaleh Bozi and Yekeh Chah caves and rock shelters) were sampled and studied for the source of human food and lithic tools. In charcoal and ash lenses (dumped ash and rubbish) in both areas we found several pieces of crafted lithic tools and consumed bones. Hunted, cooked and consumed bones are mostly remains of: horse, wild sheep and goat, deer, birds, rhino, bison, fishes, turtle and seeds. Regarding to the source of lithic tools we found out that, crafted tools in Qaleh Bozi caves were made out of opalized pebbles from Zayandeh Rud River or form (Baba Hydar area). A preliminary search was done on

## رسوب‌شناسی و زمین‌باستان‌شناسی ابزارهای سنگی (موسترین) در ایران مرکزی

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### چکیده

این تحقیق در ارتباط با بقایای حیاتی، مجموعه‌های ابزار سنگی و لایه‌های رسوب‌گذاری شده دو محدوده زندگی انسان به سن پلیستوسن تا عهد حاضر، در ایران مرکزی است. این دو محدوده مبارکه (قلعه‌بزی) و یک‌چاه (نزدیک گلپایگان)، از نقاطی هستند که بقایای شکار شده حیاتی و مصرف شده توسط انسان در آنها مورد بررسی قرار گرفته است. مجموعه ابزارهای سنگی موسترین به دست آمده از دو محدوده از دیدگاه منشأ آنها مورد توجه قرار گرفته است. در قلعه‌بزی ابزارهای سنگی ساخته شده با منشأ قله سنگ‌های اوپالی است (انتخاب شده توسط انسان) که از زاینده‌رود انتخاب شده‌اند. منشأ این قله سنگ‌ها آهک‌های نومولیت‌دار با سن پالئوسن تا اتوسن است که به سیلیکا (اوپال) تبدیل شده و از منطقه بابا حیدر (زاگرس) توسط زاینده‌رود تا گاوخرنی حمل شده‌اند. در نهایت، ابزارهای سنگی یک‌چاه بیشتر کوارتزیت و شیل ماسه (به احتمال به سن ژوراسیک) هستند. لایه‌های سیاه (لنزهای زغال‌دار) در غارهای قلعه‌بزی و یک‌چاه، (در زیر سطح) نمونه‌برداری شده و پس از الک کردن و شستشو، از دیدگاه ذرات تشکیل دهنده و رسوب‌شناسی مورد مطالعه قرار گرفتند. نمونه‌های مطالعه شده از هر دو منطقه (قلعه‌بزی و یک‌چاه) دارای بقایای چوب سوخته شده (زغال)، قطعات بزرگ پستانداران (بیشتر اسب) و خرده‌های میکروسکوپی حیاتی شامل ماهی، خزنده، دو زیست، پوست تخم‌پرنده‌گان و دانه‌های گیاهی است. یکسان بودن عکس‌های SEM تهیه شده از قطعات ناخن و نوک پرنده‌گان شکار شده و مصرف شده از مبارکه و یک‌چاه این احتمال را تقویت می‌کند که رژیم غذایی انسان در این دو منطقه شبیه به هم بوده است. این تحقیق برای نخستین بار حضور انسان شکارگر و جمع‌کننده را در ایران مرکزی اثبات می‌نماید. مجموعه ابزار سنگی مشابه با سن مزولیتیک و با سن نئولیتیک نیز از منطقه تپه آشنا در چادگان توسط این تحقیق مطالعه شده است.

**کلیدواژه‌ها:** چرت، آهک نومولیت‌دار، لنزهای زغال‌دار، مجموعه ابزار سنگی، ایران مرکزی

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