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An investigation on the climate and ecology of the southeast region of the Caspian Sea in the first millennium AD based on archaeological data

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ABSTRACT

The vegetation covering of a region has a direct correlation with climate. So if data is available for vegetation cover, the second variable (climate) can be easily predicted and in reverse. The dominant species in a region are indication of its climatic conditions and vice versa. Accordingly, this is of significance in the science of historical botany. Fortunately, from the first millennium AD, and during the rule of Parthian and Sassanian era, documents and archeological evidence is considerable indicating climatic and habitat conditions as well as biodiversity in the region. However, this evidence has not been used for biological sciences and ecology. Through the discovery of 2746 clay tablet writings in the ancient area of Nisa which were the actual delivery receipts of stock to a storage house, researchers are now able to study data regarding socio-economic conditions that prevailed in the Partian society and agricultural activities which took place in northern Khorasan during the first and second century BC. Moreover, Rhyton (golden and silver vessels) discovered in Sassanid era, in the first millennium AD were totally important based on animal geography. After identifying the dominant agricultural species contained on the clay tablets and the mammalian single indicator that were depicted on Rhyton, our investigation team was able to determine the appropriate climatic conditions and individual habitat circumstances for these species. Consequently, this evidence accomplished that there is no noticeable change based on the development of the dominant species of fauna and flora in the southeast of the Caspian Sea in the first millennium AD.

Keywords: *Archeological evidence, the first millennium AD, southeast of the Caspian Sea, animal geography, Nisa.*

INTRODUCTION

Menestor recorded the discovery of the relation between vegetation cover and climate in ancient Greece in the fifth century BC (Morton, 1981). However, Theophrastus conducted the first extensive study of vegetation geography and ecology between 285 and 370 BC (Horton, 1916). In 1973, Tunçedilek stated that different kinds of vegetation are the result of two elements, climate and soil.

The type of climate depends more on local temperatures and amounts of precipitation. Since the life of plants depends on the occurrence of precipitation throughout the year in addition to temperature changes, the specific vegetation cover of an area is indication of its temperature, humidity and seasonal distribution of rain or precipitation. Thus, if archeological findings and ancient remains contain information pertaining to the flora or fauna of an area, this information can play an indispensable role in determining the climatic conditions dominant in that area.

The first explorations of the Nisa ruins located 18 km northwest of Ishqabad, the capital city of Turkmenistan, took place in the 1930s and Masson supervised the resumption of scientific excavations there in 1946. During various excavations, excavators discovered and unearthed

numerous clay tablets containing text written in Parthian (Arsacid) language. The number of tablets reached 2746 (Diakonoff and Livshits, 2004) during the last phase of the excavations (1959-1961). The Diakonoff brothers and Livshits (2004) later undertook the task of deciphering the first and second century BC tablets. Based on the information obtained, the investigators concluded that labels on the pots and crocks were, in fact, listings of various texts, names, places, weights and dates of products delivered to the Nisa storage house and were mostly wine containers. Thus, the tablets are a unique archive containing valuable documents from the beginning era of the Parthian.

On the other hand, in museums around the world (e.g Metropolitan Museum of art in New York), a large number of decorative objects, especially the Sassanid silverware (3 to 7 century BC) held that the various scenes are depicted. For instance, viewing the hunting rams appears in many dishes. The main feature of Sasanian designs could be defined based on its unparalleled elegance and address details. In other words, the animal species can be diagnosed based on this evidence.

Methodology

The main data for this study was provided through information collected from archaeological museums; determining the habitat of Iranian mammals (based on studies of biodiversity and ecology), data on the places of natural growth of each habitat and eventually preparing a list of agricultural products and resulting products (such as oil and flour and wine) and the amount delivered to Nisa warehouses.

The study area

The northern mountains of Iran bifurcate in Northern Khorasan and extend to the north and the south of Mashhad Plain. The northern branch is known as Kopeh Daagh. Hezar Masjed and Radkan are its most famous mountain ranges. The Binalood Mountains comprise the southern branch (NGO, 2000). The study area including northern Khorasan is shown in Figure 1.

On the outer parts of the northern and southern branches i.e. Kopeh Daagh and Binalood, one may observe steep slopes as well as slopes facing lower altitudes and plain areas. Even though mountains fill two-thirds of Khorasan and the highest mountain peak in the east of the country (Mt. Binalood) with an elevation of 3615 meters is located in the north, this province may be divided into two mountainous areas in the north, and semi-arid plains in the south. The lower limit of this mountainous area from west to east consists of Berdsken, Kashmar, Torbat Heydarieh and Torbat Jaam, and the upper limit ends with Sarakhs, Kalat Naderi, Dargaz, Ishghabad and Bezmin. Among the last cities previously cited, Ishghabad and Bezmin are located in the Republic of Turkmenistan. However, they are within the natural boundary of northern Khorasan (NGO, 2000).

The study area of this research (Figure 1) was selected due to the topography of the eastern part of Alborz region and especially its northern range including southeast coast of the Caspian Sea and continue its foothills to Turkmenistan desert.

Fig 1. Southeast of the Caspian Sea showing study area

Climatic conditions of study area

This area covered with high mountains and deep valleys has, as the effects of wind and water erosion of the highlands filling the valleys, formed somewhat flat plain areas that are appropriate for cultivating orchards. Thus, irrigated and non-irrigated orchard cultivation is because of the presence of local underground water tables as well as to the permanent rivers that lie on one side and the rich alluvial soil present on the other. This area is surrounded by vast, arid plains and steppes famous for their cold and dry winds in the north and hot burning air in the south (Jafarpour, 1998). Even though the north of Khorasan is affected by the cold arid climate of the north and the hot arid climate in the south, it is dominated by its mountainous climate. Table 1 shows the average levels of maximum temperatures and precipitation in addition to the major agricultural items cultivated in various cities of northern Khorasan (Saeedian, 2001).

According to the climate classification system of Troll-Paffin (Jafarpour, 1998) based on plant-life support conditions, length of growth and germination periods as well as annual and daily temperatures within an area, falls within the semi-temperate climate categorization of steppe areas. Similarly, Khorasan, as categorized according to Koppen's climate classification system based on the relation between different kinds of natural vegetation, temperature conditions and rain, has a semi-arid climate (Jafarpour, 1998).

Plant geography of study area

Within any region of a certain climate, some plants grow that reproduce the specific climate conditions. Macroclimates develop when microclimates join with each other (Tunçdilek, 1973). The vegetation spectrum of Iran can be divided into two categories: the Holarctic, which covers that major portion of Iran and the Paleotropic that covers the coastal areas of the Persian Gulf and surrounding mountain bases (Frey and Wilfred, 1986). The Holarctic vegetation spectrum consists of the Titan sub-spectrum. This sub-spectrum covers Irani- Toorani, and the Western Asian vegetation regions.

The sub-region of Western Asia in Iran comprises three provinces: the Armenia-Iran, Hirkani and Toorani (Aral-Caspian) regions of which Armenia-Iran consists of six sub-provinces. One of these sub-provinces is the Khorasan sub-province (Takhtajan, 1986).

Table 1. A comparison between climatic conditions and major agricultural products in various cities of study area

City	Average Annual Rainfall (mm)	Maximum Annual Temperature (C°)	Major Agricultural Products	Climate
Sarakhs	180	38	Cotton, cumin	Temperate and dry
Dargaz	350	38	Cotton, apples, grapes	Hot and semi-humid
Ishghabad	350	32	Cotton, wheat, sesame	Arid and dry
Kalat Naderi	150	35	Wheat, barley	Arid and dry
Chenaran	250	37	Wheat, barley, sugar beets	Temperate and dry
Ghoochan	410	35	Wheat, barley, grapes	Temperate and semi-humid
Bojnoord	250	40	Wheat, barley, grapes	Temperate and semi-humid
Ashkhaneh	350	36	Wheat, barley, grapes	Temperate and semi–humid
Lower Chakaneh	270	34	Wheat, barley, apples	Arid and dry
Esfarayen	180	37	Cumin, raisins, apples	Arid and dry
Fariman	250	35	Wheat, barley, cotton	Temperate and dry
Neishabour	250	37	Wheat, barley, grapes	Temperate and dry
Sabzevar	220	42	Wheat, barley, cumin	Temperate and dry
Jajreom	150	40	Cumin, grapes, cotton	Temperate and dry
Torbat Jaam	254	40	Wheat, grapes, cotton	Temperate and dry
Kadkan	250	36	Grapes, grains	Temperate and dry
Revash	260	37	Apricots, walnuts, almonds	Temperate and dry
Tayebad	240	40	Cumin, wheat, barley	Temperate and dry
Torbat Heydarieh	250	40	Wheat, cumin, grapes	Temperate and dry
Kashmar	180	38	Grapes, apricots, cotton	Temperate and dry
Berdesken	150	45	Cumin, cotton, grapes	Hot and dry
Davarzan	83	43	Wheat, barley, sesame	Hot and dry

Source: Saeedian, 2000

Vegetation growth in the Irani-Toorani Region

The Irani-Toorani region of the Middle East covers the vast steppes of the Sinai Mountains, parts of Palestine and the deserts of Syria. It also includes Central Anatolia, northwestern Iraq, a major part of Iran, Afghanistan and Central Asia including Kyrgyzstan, Tajikistan and Turkmenistan, the semi-arid flats of Kazakhstan, the highlands of the central Asia and the high altitude flats of Northern Africa (see Figure 3) (Zohary, 1973). The Irani-Toorani region contains the provinces of Mesopotamia, Central Anatolia, Armenia-Anatolia, the Zagros Mountains and the Central Iran province. In this region, the low altitude plains are very poor in vegetation covering. However, high altitude sections are rich in that regard and form regions hosting plant species such as *Pistacia atlantica* (a species of pistachio tree), *Amygdalus* spp (one of the almond species), *Juniperus polycarpus* (Junipers are coniferous plants) (Zohary, 1973).

Western Asia Sub-Region

The Western Asia sub-region consists of the entire western section of the Irani-Toorani spectrum and the region above Balkhash, central Tian Shan and Western Himalaya. This sub-region is the richest in vegetation coverage in the whole Irani-Toorani region and hosts many endemic species. Figure 2 showing Nisa situation in the Western Asia sub-group includes Kopeh Daagh, as well as its mountain bases and adjacent steppes.

The record further reveals that the classification of plant species growing in the southern edge of Turkmenistan, the city of Ishghabad and the Nisa sub-group differs from that of Central Asia.

The Armenia-Iran province that consists of the Kopeh Daagh mountain range hosts a very specific and rich flora group**.** These are more than 20 higher endemic species (Hedge and Wendelbo, 1978). One of the Armenia-Iran sub-provinces is the Khorasan sub-province that encompasses the Turkmen Mountains, present-day Khorasan, eastern Alborz Mountains and the Gorgan-Mashhad valley passageways. One of the special characteristics of the branched province is the presence of various types of shrubs and open fields (Takhtajan, 1986).

Hence, the Khorasan sub-province that includes the southern edge of Turkmenistan now contains similar kinds of vegetation and, together, they form a single group. Figure 3 shows Irani-Toorani region in the Southwest Asia. In this figure two main regions are recognized:

- The Holarctic vegetation spectrum includes **I.A.** (Hyrcanian Caucasus province in Europe-Siberia), **I.B.** (Mediterranean region), **I.C.** (desert sub-region in Saudi Arabia Eastern and Northeast of Africa), $I.D_1$ (Mesopotamia province in Irani-Toorani region), $I.D_2$ (Iran Anatolia province in Irani-Toorani region) and $I.D_3$ (Toorani province in Asia Pacific),

- The Paleotropic vegetation spectrum containing $II.A_1$ (Northeast of Africa) and $II.A_2$ (Northeast of Africa and the coastal areas of the Persian Gulf).
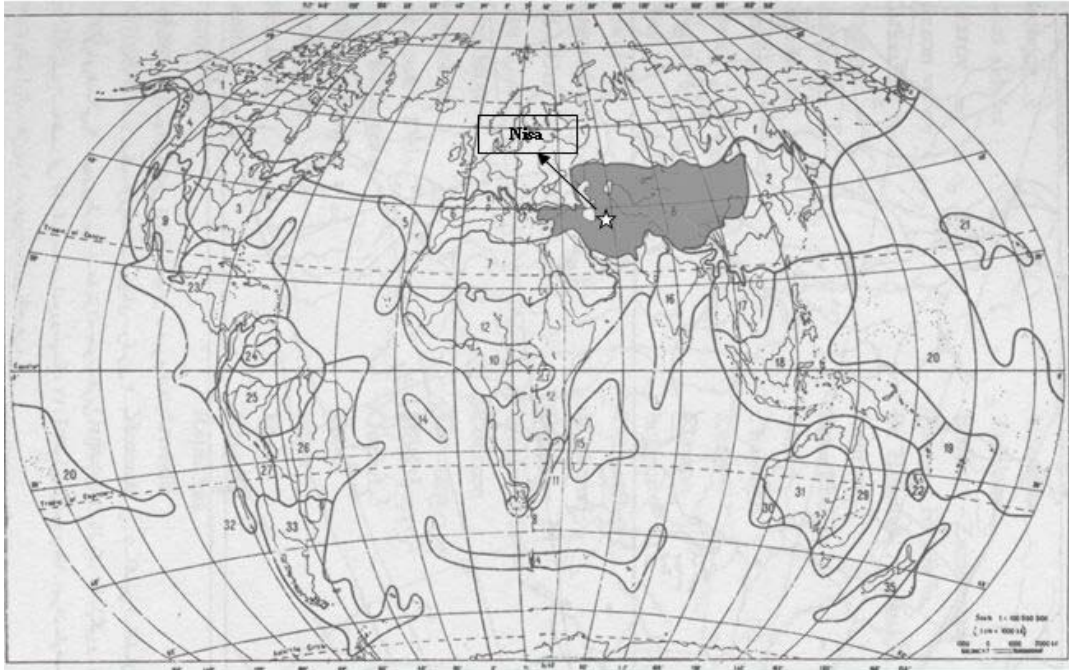
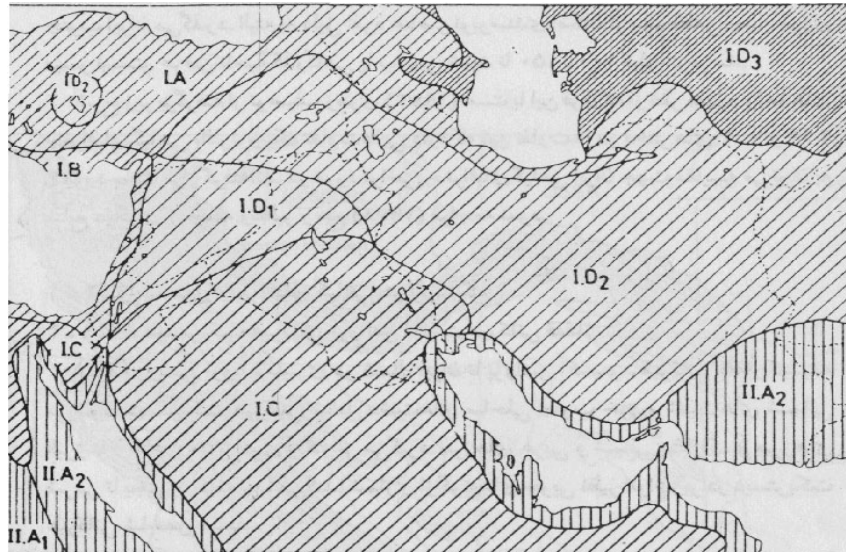**Fig 2.** The location of Nisa in the Western Asia sub-group includes Kopeh Daagh (Zohary, 1973).

Fig 3. The location of Irani-Toorani region in the Southwest Asia (Zohary, 1973).

Animal geography of study area

According to biogeography (Eilers, 1983), Iran is located in the Palearctic area including Asia, Northern Europe and the Himalayan Mountains. However, because of the vicinity to the oriental area including South Himalayas and Ethiopian area containing the Afrotropical zone, Iran has shown an important role in animal distribution derived from these two mentioned areas as well (Anderson, 1968; Firouz, 2000). Hence, Iran has a special distribution in the two main regions (Figure 3):

- Plateau region including the Anatolian highlands of Turkey and Iran to Afghanistan. This area is called Irani-Toorani region (Figure 3). The recent region also can be divided into two parts containing the Iranian zone for that species restricted to the elevated areas and the Aralo – Caspian zone where related species is mainly distributed in Turkmenistan and other Central Asian countries; and

- Saharo – Sindian region including low-altitude deserts of the southern Paleotropic area from Northwest Indian subcontinent

to North Africa (Anderson, 1968; Firouz, 2000).

Considering that the southeast region of the Caspian Sea including Northern Khorasan and Turkmenistan is determined as the study area of this research, in terms of animal geography (Anderson, 1968), the relevant area encompasses four important habitats:

Caspian forest habitats: including the dense broadleaf forest of northern Alborz with high rain and humidity. The main mammals of this habitat consist of red deer (*Cervus elaphus*) and Roe deer (*Capreolus capreolus*). This habitat comprises the western part of our study area in the Golestan forest (Ziaie, 1996).

Mountain habitats: including elevated grassland area showing the wild goat (*Capra aegagrus*) and mountain slopes revealing wild sheep (*Ovis ammon*) (Ziaie, 1996). This habitat is located in Kopeh Daagh range, the northern mountains of Hezar Masjed range and Binalood range.

Desert habitats: containing sabulous and the Central Deserts of Iran with very low rainfall and humidity. The most important mammals of this habitat consist of sand fox (*Vulpes rueppelli*) and sand cat (*Felis margarita*) (Ziaie, 1996). This habitat continues to deserts of Turkmenistan and the Turkmen Sahra (Golestan province in Iran).

Steppe habitats: including all the broad plains and relatively high among the Alborz and Zagros Mountains to the border of Afghanistan and Pakistan with relatively low rainfall. Cheetah (*Acinonyx jubatus*) and gazelle (*Gazella subgutturosa*) could be found in this habitat (Ziaie, 1996). More steppe habitat areas are located in Northern Khorasan and eastern regions of Turkmenistan.

It is very important to note that some of the above species are found in two or more habitats for instance brown bear (*Ursus arctos*) and some of them do not belong to a particular habitat and could be seen in the whole Iranian plateau for example the leopard (*Panthera pardus*) and boar (*Sus scrofa*) (Anderson, 1968; Ziaie, 1996).

RESULTS
clay tablet writings of Nisa
Agricultural products (Stoskopf, 1997) referred to these clay tablets are as follows:

Agricultural products**:** raisins, wheat, barley, flax (plant seeds), sesame (new and old).

Agricultural Supply**:** wine (new, old, musty, strong alcoholic wine and colorless), vinegar (new, old and wine converted to vinegar), flour (probably from wheat and barley), oil (probably from flax or linseed). The above findings are represented in Table 2.

Table 2. Scientific name and adaptation of plants listed on the clay tablet.

Scattered in the study area	Climate condition for growth	Scientific name (Genus)	Plant species
Entire area	Mediterranean	*Vitis*	Grape
Entire area	Temperate regions	*Tritcum*	Wheat
Entire area	Temperate regions	*Hordeum*	Barley
Cold and wet areas	Mediterranean	*Linum*	Flax
Hot and dry areas	Mediterranean	*Sesamum*	Sesame

Imprinted dishes of the Sassanid era and Rhyton of the first millennium AD

A silver Rhyton was found based on Archeological research in the study area that is being stored in Metropolitan Museum of art in New York (Figure 4). It was thought that the animal seen in this Rhyton, was a domestic cat. However, following a comprehensive survey (morphological studies and typology) done by a research team, it was realized that it is a wild cat or caracal (*Caracal caracal*) (see Figure 5).

This species belongs to the family Felidae (Ziaie, 1996) and in the past, has been trained as a raptor. Caracal is able to hunt a bird by extraordinary jumping. The high intelligence of this species was an attraction for kings and princes. The natural habitat of this species is the desert and steppe regions.

Fig 4. A Rhyton showing caracal
(Metropolitan Museum of art in New York),
(Ziaie, 1996).

Fig 5. A picture of wild cat roe
or caracal (*Caracal caracal*).

In the Sassanid era, the image of hunting rams (Ghirshman, 1962) plays an important role on the golden and silvery containers (Figure 6). For instance, on the silver plates that were found in Daylaman (Guilan province in Iran), Shapur I is seen slaying a red deer (*Cervus elaphus*) (Figure 7) or killing a tiger (*Panthera tigris*) (Figure 8).

At the Hermitage Museum (in St. Petersburg, Russia), an image of an onager (*Equus hemionus*) can be seen on a silver plate. Also, this species was found on a silver plate with gold plated in the Louvre Museum in Paris, France (Figure 9). These containers probably have been made in Mazandaran and Golestan provinces (in Iran). In addition, in the early Sassanid era, a Rhyton has been discovered showing a roe deer's head. This Rhyton has been found in Amlash (Ghirshman, 1964) (Guilan province in Iran).

Fig 6. A Silver plate depicting a
Sasanian king hunting rams
(Metropolitan Museum of art in New York)

Fig 7. A Silver plate from Daylaman
showing Shapur I slaying a red deer
(Source: Ghirshman, 1962)

Fig 8. A Silver plate from Daylaman showing Shah killing a tiger (Source: Ghirshman, 1962)

Fig 9. An image of an onager on a silver plate with gold plated (Louvre Museum in Paris, France)

Moreover, other animals like the wild sheep (*Ovis ammon*), wild goat (*Capra aegagrus*), panther (*Panthera pardus*), boar (*Sus scrofa*), pheasant (*Phasianus colchicus*) and partridge (*Alectoris chukar*) can been seen on the plates or Rhytons (in Sassanid era). Therefore, the mentioned evidence represents the habitat conditions of northeastern Iran (southeast of the Caspian Sea) in the first millennium AD. The summary of these findings is shown in Table 3.

Table 3. Scientific name and the relevant habitat of species seen on the ancient plates and Rhytons

Scattered in the study area	Habitat	Scientific name	Animal species
West areas and Sarakhs ferns	Caspian forest	**Panthera tigris**	Tiger
West areas (Golestan Forest)	Caspian forest	**Cervus elaplus**	Red deer
West areas (Golestan Forest)	Caspian forest	**Capreolus capreolus**	Roe deer
Entire area (except the west) and mountainous regions	Desert - Steppe	**Equus hemionus**	Onager
Entire area(except the west) and elevated mountains	Desert - Steppe	**Felis caracal**	Caracal
Southern areas and elevated mountains	Mountain	**Capra aegagrus**	Wild goat

DISCUSSION AND CONCLUSION

Currently, the main crops in the study area (Stoskopf, 1997) including north of Khorasan and south of Turkmenistan (southeast of the Caspian Sea), include cotton, grapes, wheat and barley (domestic plants) (Stoskopf, 1997). Considering the climatic conditions for each of the plants listed in the Ashkani-Nisa clay tablet writings, it becomes obvious that Mediterranean climate is the most appropriate climate for these species and the area of the north of Khorasan as well as Northern Range Mountains of Hezar Masjed (located in the south of Turkmenistan) were hospitable areas for their cultivation. For example, the optimum rainfall for the various species mentioned matches the amount of precipitation that occurs in the study area. In addition, their preferred cultivation temperatures and seasonal rain distribution requirements fall within the variations of this area.

As Huetz de Lemps (1970) states, climatic change is adequate to create complete disorder in the distribution of plant types as well as changes in the appearance of various plants and the level of species distribution. However, in the region of this study, none of the above changes has occurred, even though the species mentioned in the clay tablet writings of Nisa indicate that the domesticated and agricultural cultivars, account for a simple

ecosystem and do not exhibit complex ecosystem characteristics.

Other evidence, however, indicates that wild (natural) vegetation in the study area did not go through any fundamental changes. One can infer this reality from the available written clay tablets (Frey and Wilfred, 1986). On the other hand, Frey and Wilfred have shown that Artemisia herba-alba (white wormwood) in the northeast of Iran has been replaced by *Peganum harmala* (harmal peganum) (Frey and Wilfred, 1986). This means *Peganum harmala* has been a dominant plant species in the north of Khorasan. Scientists have classified the vegetation covering post-ice age into six periods using botanical analysis (Huetz de Lemps, 1970; Elhai, 1978).

Six periods using botanical analysis based on vegetation covering post-ice age:
  - The period after ice sheets known as the Semi-Polar period (11000 years ago) having cold climate.
  - The Pre-Boreal period (9000 to 10000 years ago) which had a more temperate and variable climate.
  - The Boreal period (7000 to 9000 years ago) that was a second period of warming having incidences of drought.
  - The Atlantic period (5000 to 7000 years ago) that had temperate climate and a temperature of 2 to 3 degrees Celsius; this period was warmer than present day and was more humid than the periods before.
  - The Semi-Boreal period, 2500 to 5000 years ago, that had a dryer climate than before.
  - The Semi-Atlantic period, from 2500 years ago to present day, that had more a humid and cooler climate than the Semi-Boreal period.

Considering this classification system, the Partian clay tablets came into existence at a time when approximately four centuries has passed since the Semi-Atlantic period began. The botanical analysis of the last ice age shows that the Parthian clay tablets came into existence after approximately four centuries had passed since the beginning of Semi-Atlantic period. Since the climate of this 2500-year period did not have a noticeable change (Huetz de Lemps, 1970; Elhai, 1978), then, not only do the above classifications of periods support our conclusion, but the written clay tablets

of Nisa, in turn, confirm the classifications made by paleobotanical scientists.

Based on animal geography (Ghirshman, 1962; Ghirshman, 1964), and as a result of human intervention, natural habitat (wild plants) of sensitive species has been destroyed (for example, Caspian tiger or *Panthera tigris* was extinct due to destruction of vegetation), however, the remnant animal species still define the habitat situation. For instance, Caracal (*Caracal caracal*), gazelle (*Gazella subgutturosa*), Cheetah (*Acinonyx jubatus*) and onager (*Equus hemionus*) could be determined as the indicators of steppe and desert habitats. Red deer (*Cervus elaphus*) and Roe deer (*Capreolus capreolus*) show Caspian forest habitats and wild goat (*Capra aegagrus*) and wild sheep (*Ovis ammon*) reveal Mountain habitats. As mentioned, these species live in the southeast of the Caspian Sea (Tables 2 and 3).

All species studied in this research belong to the Palearctic area. Although Caspian tiger (*Panthera tigris*) and red deer (*Cervus elaphus*) belong to Hirkani region, other species are placed in Irani-Toorani region. Indeed, in this region (Irani-Toorani), plant growth, climatic circumstance and animal species are similar to the first millennium AD, and over two thousand years, a significant difference based on habitat condition is not seen.

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شرایط اقلیمی و بوم شناسی سرزمین‌های واقع در جنوب شرقی دریای خزر در هزاره اول میلادی (براساس مدارک و داده‌های باستان شناسی)

ش. شفیعی، ک. ثابت رفتار

چکیده :

دانش ما در حال حاضر مبین این واقعیت است که پوشش گیاهی با اقلیم ارتباط تنگاتنگ و مستقیمی داشته و وابستگی این دو عامل به یکدیگر در حدی است که می توان بر اساس داده های مربوط به یکی از این دو عامل دیگری را تجزیه تحلیل دقیقی نمود. از این رو گونه‌های شاخص یک منطقه معرف وضعیت اقلیمی حاکم بر آن منطقه بوده و یا بر عکس با دانستن شرایط اقلیمی یک ناحیه می‌توان به تنوع و نوع پوشش گیاهی آن ناحیه پی برد.

ناگفته پیداست که این موضوع در علم دیرینه بوم شناسی و یا دیرینه گیاه شناسی اهمیت زائد الوصفی می‌یابد.

خوشبختانه از هزاره اول میلادی و همزمان با دوران حکومت‌های اشکانی و ساسانی در ایران، اسناد و مدارک و شواهد باستان‌شناسی قابل توجهی باقیمانده است که گویای وضعیت اقلیمی و شرایط زیستگاهی و حتی تنوع زیستی در منطقه تحت نظر سلسله‌های مذکور بوده که تاکنون بعنوان داده‌های خام برای علوم زیستی و بومشناسی مورد توجه جدی قرار نگرفته‌اند. کشف ۲۷۴۶ سفال نوشته در محوطه باستانی نسا که درواقع قبوض اجناس تحویلی به انبار هستند، اطلاعات متنوعی از وضع اقتصادی – اجتماعی جامعه پارتی و کشاورزی شمال خراسان در قرن یک و دو قبل از میلاد بدست داده و ریتون‌های مکشوفه از همین ناحیه و ظروف زرین و سیمین ساسانی در شناسایی جانوران هزاره اول میلادی کمک فراوانی می‌کنند. در این مقاله با تعیین گونه های شاخص زراعی مندرج در سفال نوشته ها و پستانداران شاخصی که بروی ظروف و یا بصورت مجسمه‌ی انتهای ریتون به تصویر کشیده شده‌اند، اقلیم مناسب این رستنی‌ها و زیستگاه اختصاصی هر گونه جانوری مشخص و درنتیجه معلوم گردید که طی دوهزار سال گذشته در پرورش گونه های غالب و بطورکلی فون و فلور ناحیه مورد مطالعه در نتیجه اقلیم منطقه تغییر محسوسی حاصل نشده است .