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Analysis settlement patterns of prehistoric sites of Mazandaran

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(71-88)

Abstract

Present paper review 350 sites from Middle Paleolithic, upper Paleolithic, Epipaleolithic, Neolithic, Chalcolithic, Bronze and Iron Ages, respectively, 4, 9, 6, 28, 36, 15 and 252 sites. Pearson correlation coefficient test indicates a meaningful relationship between number of sites through every single period and other variations including longitude, distance to river and climate. Some 60.9% of sites located at -26 m to 500 m longitude, including fertile plains and foothills that reward seashore and marine sources. Most of the sites locates at the eastern part of the region that is generally plains with low humidity and precipitation. There are 18.1% of Iron Age sites at 1000-1500 m longitude that consist of seasonal settlements of mountain valleys. There is not meaningful relation between number of sites and slope variable. Most of the sites locates at 0-1500 m far from rivers. Considering analysis about settlement patterns in prehistoric sites of the region, number of Middle Paleolithic to Chalcolithic sites suggest an ascending process, however, they the number decreases during Bronze Age. Then, the sites increase during Iron Age, which indicate ties between high density of settlements and high capacity of environment. Finally, the average area of settlements increased from Neolithic to Bronze Ages, then decreased during Iron Age.

Keywords: settlement pattern, Mazandaran, Prehistory, Geographical analyzing system, environmental variables.

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1-Introduction

Understanding significance of the ancient societies within their environmental contexts emerged since the early formation of "New Archaeology" during 1940s to 1960s. It is a view that insists the significance of settlement pattern in recognizing relation of human organizations to environmental sources. It was one of the main topics of research proposals within New Archaeology, especially from processual point of view. Gordon Willey, a Harvard anthropologist, pioneered the researches. He attempted to understand settlement system of Incas at Viru Valley of Peru (Willey, 1953). Settlement pattern is distribution of human activities at the landscape and any relation to the activities and the landscapes and social environment (Schreiber 1996). The plan of life and settlement quality, which roots in human-human and human-environment relations emerges following economic, social, and religious functionality (Fagan, 2006). Therefore, analysis of settlement patterns not only enlightens internal social dynamics, but discover local and regional political dependence (Volta, 2007: 8).

Tracing and general understanding of settlement patterns of ancient sites enable us to recognize demographic or settlement pattern distribution changes comparing to earlier period(s), and know distribution of human activities within a landscape, any relation between the activities, landscapes, and social environments (Schreiber 1996). It can be a hard issue to understand how ancient social organizations and subsistence in every single region formed, ignoring variables of demographic changes and settlements. Settlement pattern studies create a desirable regional vision of settlement and demographic changes through timeframe and lead to an increase of understanding regional cultural evolution (Greenfield & Van Schalkwy, 2008: 131). However, enlightening ancient human-environment interactions is the most important aim of archaeologists that research settlement pattern. Accordingly, they study human influences in the regional landscape (Volta 2007: 8). Big and small monuments, mounds, gullies, dikes, ancient routes, residues of exploitations of ancient agricultural fields, meadows, and mines that have transformed lands during time, reflect human settlement through various activities. The settlements manifested environmental factors, technologies, level of building technologies, and different structure of social interactions. Earlier cultural patterns are understandable and identifiable following studying the settlement patterns. We know that field of development of cultural patterns is relatively wide and roots in cultural demands. Therefore, researches in settlement patterns at ancient sites can be regarded a strategic focal point of fundamental interpretations of cultural archaeology (Willey, 1953). One can enjoy conclusions of researches about settlement patterns in order to vast area of problems from subsistence to cosmology (Volta, 2007: 22).

As mentioned above, present paper attempts to explain distribution of prehistoric sites at Mazandaran Province, relying on archaeological data within ecosystem, distribution of sites comparing to natural factors and knowledge of their changes during different prehistoric times influence to understanding settlement patterns

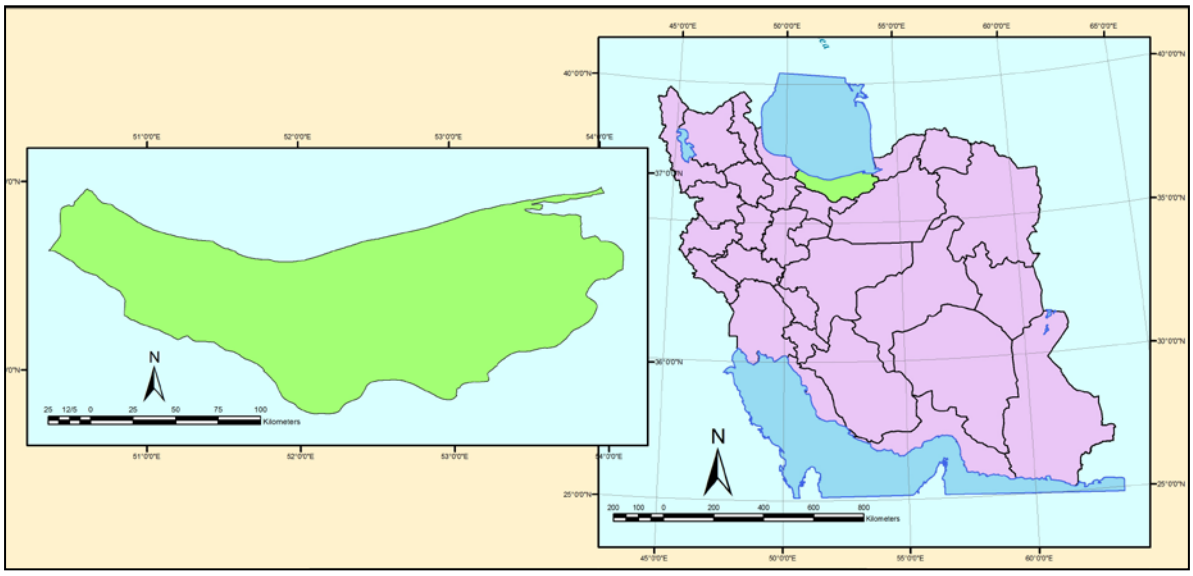
of ancient societies. The recognition helps to better understanding of chronological changes of the region. On the other hand, organizing information and defining future research methods could be other achievements of the paper, which works as data bank in recognition of weak points and deficiencies of information of the region, however, influential on new horizons of regional archaeology and presentation of plans and proposals.

2-Area of the study

Since past times environmental and geographical conditions played decisive role in human life. It makes us to study environmental and geographical conditions in order to understand cultural evolutions and evolutionary trajectory of societies; otherwise, one cannot know how past cultures evolved. Actually, it is necessary to recognize geographical and environmental conditions that our ancestors lived in, to know how ancient cultures and civilizations generally changed (Alizadeh, 2001). Geographically, present paper covers entire Mazandaran Province. Mazandaran is located at 35˚36″ to 36 ˚58″ latitude and 50˚21″ to 54˚8″ longitude from Greenwich meridian (Map 1), with 23833 Km^2 area (Geographical Organization of the Armed Forces, 2000: 313) that covers 1.46% of area of Iran. the province northwardly reaches to Caspian Sea, southwardly ends to Semnan, Tehran and Qazvin provinces, while limits westwardly to Gilan Province. Some 43% of urban centers of Mazandaran locates along the coastal strip (Eshaghi and Shidfar, 2003). Considering characteristics environmental parameters of Mazandaran including water, fertile soil, rich marine and forest sources, it was potentially an appropriate environment in formation of prehistoric societies. On the other hand, however, Alborz mountain range stretched from east to west as a barrier that limited relations between northern and southern regions, the plain has worked as a corridor between northwestern, central north, and northeastern cultural zones of Iran and southwest of Turkmenistan (Heidari, 2016: 300).

Because of environmental factors of rich water sources, fertile soils, rich forest and marine sources, Mazandaran province was appropriate in formation of societies during prehistoric times, while influenced by neighboring cultures. There are three mountainous, middle parts of lowland and up land, and plain ecosystems in northern front of central Alborz. Condition and capacity of mountainous regions created various circumstances for human societies evolution and development, and intra and inter relations from prehistory to, at least 2^{nd} millennium BC. In other words, whereas high ridges limited relations, mountain valleys created an appropriate context for cultural development of human societies in the region. In order to recognize intra and inter regional relations, one should comprehensively understand details of chronological evolutions of the region, then study prehistoric cultural developments and transitions from one period to a later one. From earliest archaeological activities, Mazandaran attracted foreigner archaeologists since 19^{th} century (Vandenberg 2000; Gabriel 1348).

Meanwhile, the regional cultural, economic, social, and chronological problems are less known, comparing to other regions of Iran. Maybe, the most important reason of the loss is lack of coherent and purposeful archaeological activities, and question-based research projects.



Map 1. Area of Mazandaran Province and field of study

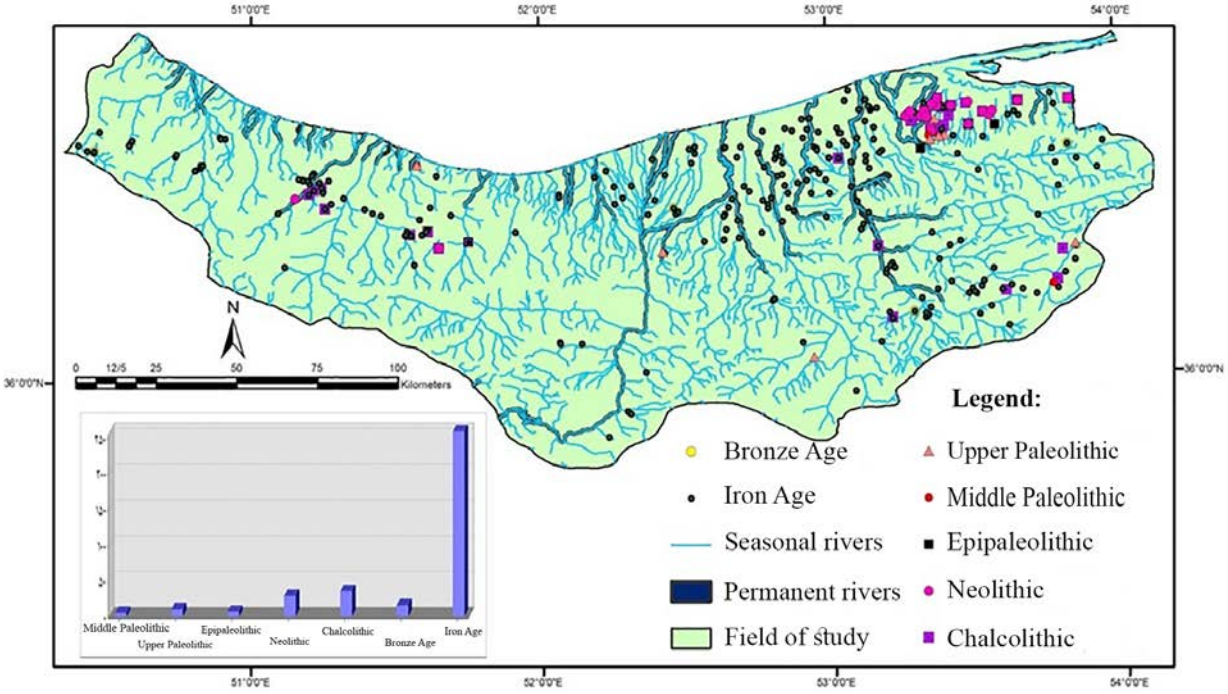
3-Material and methods

As the first step in the study, present paper enjoyed field and bibliographical methods to gather information. In order to create a context for settlement pattern analysis method, geographical information and coordinates gathered from reports from archaeological surveys and excavations. However, the sources had deficiencies that influenced the gathering process. Next, descriptive and basic information organized as a data bank. Later, following gathering geographical coordination of prehistoric sites, there was revision of the point using Google Earth software. Then, there was locating the point using ArcGIS software, while data processed as maps and numerical charts following combination of descriptive and locative information. Variables selected for this analysis included area of sites, altitude, distance to rivers, slope of location of the sites, and climate. It was purposed to understand natural context of settlements and distribution the prehistoric sites comparing to the variables. Finally, there were statistical analysis and general conclusion using Pearson Correlation Test and SPSS software.

4-Settlement pattern analysis of the sites

Referring to earlier archaeological researches and studies about the field of study, there is a list of sites from every single period that totally sums up to 350 sites, consisted of 4 Middle Paleolithic, 9 Upper Paleolithic, 6 Epipaleolithic, 28 Neolithic, 36 Chalcolithic, 15 Bronze, and 252 Iron Age sites. Map 2 presents distribution of prehistoric sites at

Mazandaran Province. Sites from Iron Age, the most abundant sites, consist 73% of the volume. Respectively, the other periods are available as 1% Middle Paleolithic, 3% Upper Paleolithic, 2% Epipaleolithic, 8% Neolithic, 10% Chalcolithic, and 4% Bronze Ages in the volume (Figure 1). Environmental variables will be discussed using settlement pattern analysis as follows.



Map 2. Spatial distribution of prehistoric sites at Mazandaran (Heidari 2016)

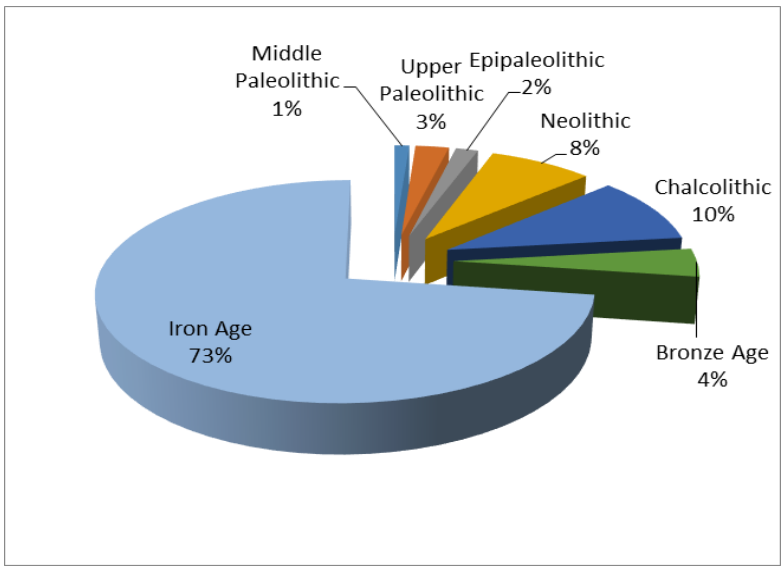
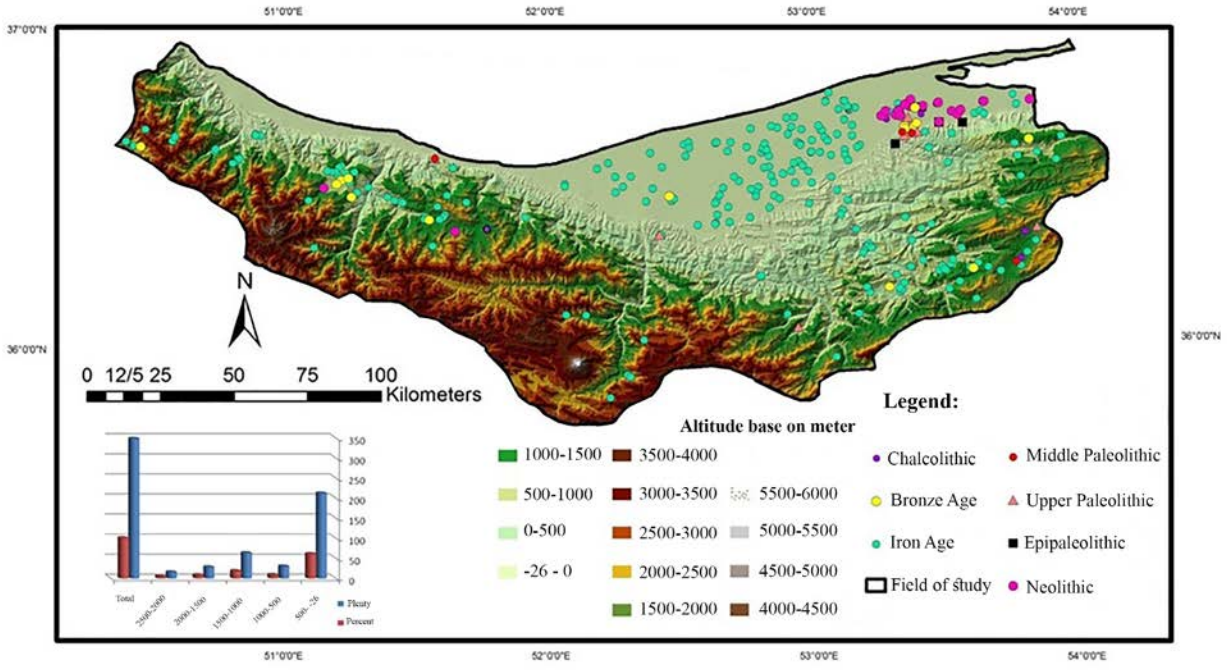


Figure 1: share of the prehistoric settlements of Mazandaran

4-1 Evaluation of sites based on altitude parameter

Generally, the altitude of the field of study ranges between -26 m, Caspian Sea level, and 5671 m, height of Damavand (Khoshravan and Vafaei 2016:4). Accordingly, the field of study would be categorized to 13 altitudinal levels. Considering location of the points, 60.9% of prehistoric sites located between -26 m to 500 m ranges, which is highest abundancy of the sites. The range consists of foothills and plain lands with fertile soil, on the other hand, with the most accessibility to sea shore to exploint marine sources. The environmental advantages were favorable and appropriate for formation and continuity of settlements.

There are locations of 8.6%, 18.1%, 8%, and 4% of the sites, respectively, at 500 m to 1000 m, 1000 to 1500 m, 1500 to 2000 m, and 2000 to 2500 m altitude. There has not seen any settlement higher than 2500 m altitude (Map 3, Table 1). By increasing altitude from sea shores to plain lands, southwardly to Alborz heights, moderate mountainous climate dominates within a strip from 150 m to 3000 m altitude. Reduction of temperature and transformation of precipitation to snow include main regional factors that appear as cold, long and glacial winter, with short and temperate summer. These regions present appropriate circumstances for formation of seasonal settlements and migration of societies during warm seasons of the years, which should be considered when analyzing distribution of settlements during various periods.



Map 3: distribution of prehistoric sites considering altitude

Table 1: distribution of prehistoric sites considering altitude

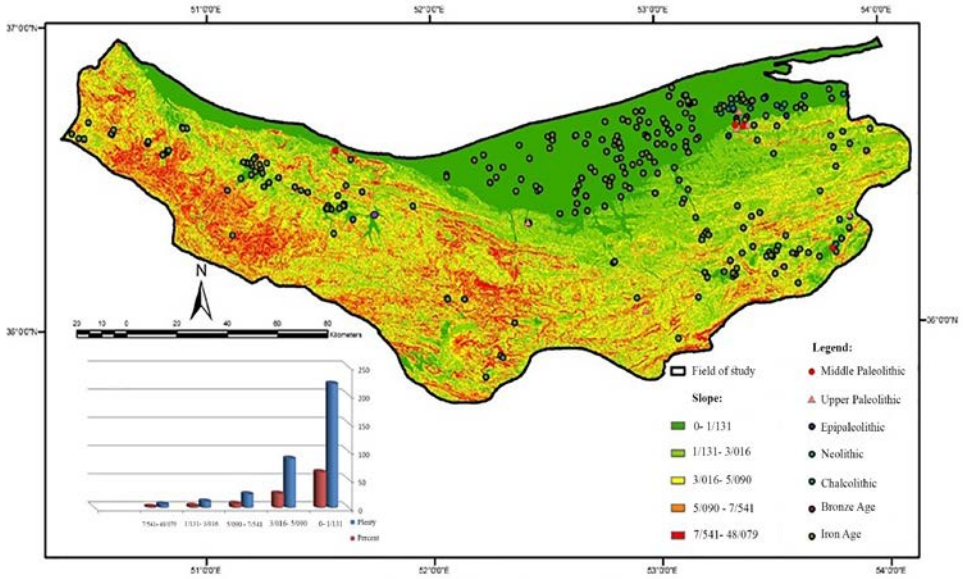
altitudinal levels in meter	Plenty of sites (Number)	Percent of sites
-26-500	212	%60/9
500-1000	30	%8/6
1000-1500	63	%18/1
1500-2000	28	%8
2000-2500	15	%4/3
Total	350	%100

4-2 evaluation of sites relying on slope parameter

The field of study categorized to five groups considering percentage of slope. The most abundant sites, 63.2% of prehistoric sites, locate at 0% to 1.131% of slopes. Then, 25%, 6.9%, 3.2%, and 1.7% of the sites locate, respectively, at 1.31%-3.016%, 3.016%-5.09%, 5.09%-7.541%, and 7.541%-48.079% slopes. Therefore, increasing percentage of slope inversely relates to abundance of the sites, which means increasing slope follows decrease of number of the sites and vice versa (Table 2, Map 4).

Table 2: distribution of prehistoric sites relying on slope

slope	Plenty of sites (Number)	Percent of sites
0-1/131	220	%63/2
1/131-3/016	87	%25
3/016-5/090	24	%6/9
5/090-7/541	11	%3/2
7/541-48/079	6	%1/7
Total	350	%100



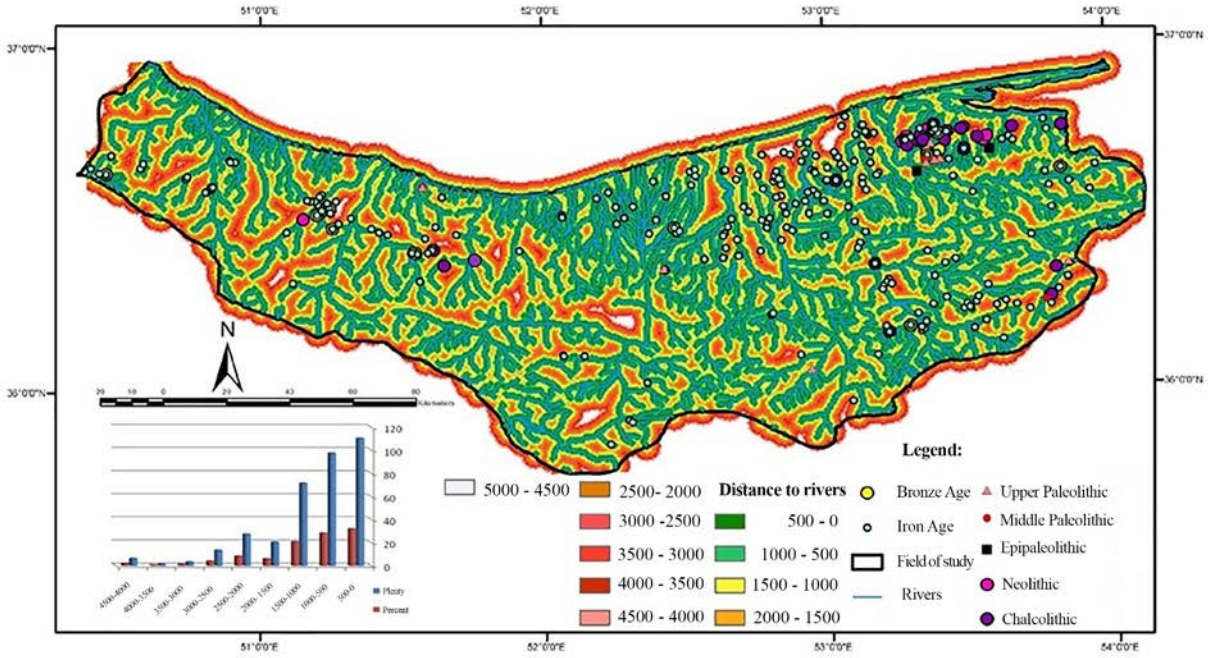
Map 4: distribution of prehistoric sites relying on slope

4-3 evaluation of the sites relying on distance to rivers

Mazandaran Province is the territories of rich water sources and lots of rivers. “The rivers consist Mazandaran water basin that flow to Caspian Sea” (Riahi 2002: 14). “The rivers are short and relatively low” (Badiei 1999: 148). “The length of the rivers is shorter than the eastern rivers, because of proximity of ridges to the sea, however, rate of flow of Mazandaran Rivers is more the latter’s (Bayat 1988: 14). Like other territories, Mazandaran has both permanent and seasonal rivers. Important and big rivers of Mazandaran are Haraz, Tajan, Neka, Farim, Babolrood, Talar, and Chaloos. Considering map of rivers area of the field of study, there are 31.6% of sites at 0-500 m distance and 27.9% at 500-1000 m distance from rivers. Also, there are 20.4% of sites at 1000 to 1500 m distance and 5.7% of sites at 1500 to 2000 m distance from the rivers. However, 89% of sites locates at lesser than 2000m from the rivers (Table 3 and Map 5).

Table 3: distribution of prehistoric sites of Mazandaran, considering distance from rivers

distance from rivers	Plenty of sites (Number)	Percent of sites
0-500	110	%31/6
500-1000	97	%27/9
1000-1500	71	%20/4
1500-2000	20	%5/7
2000-2500	27	%7/8
2500-3000	13	%3/7
3000-3500	3	%0/9
3500-4000	1	%0/3
4000-4500	6	%1/7
Total	350	%100



Map 5: distribution of prehistoric sites of Mazandaran considering distance to rivers

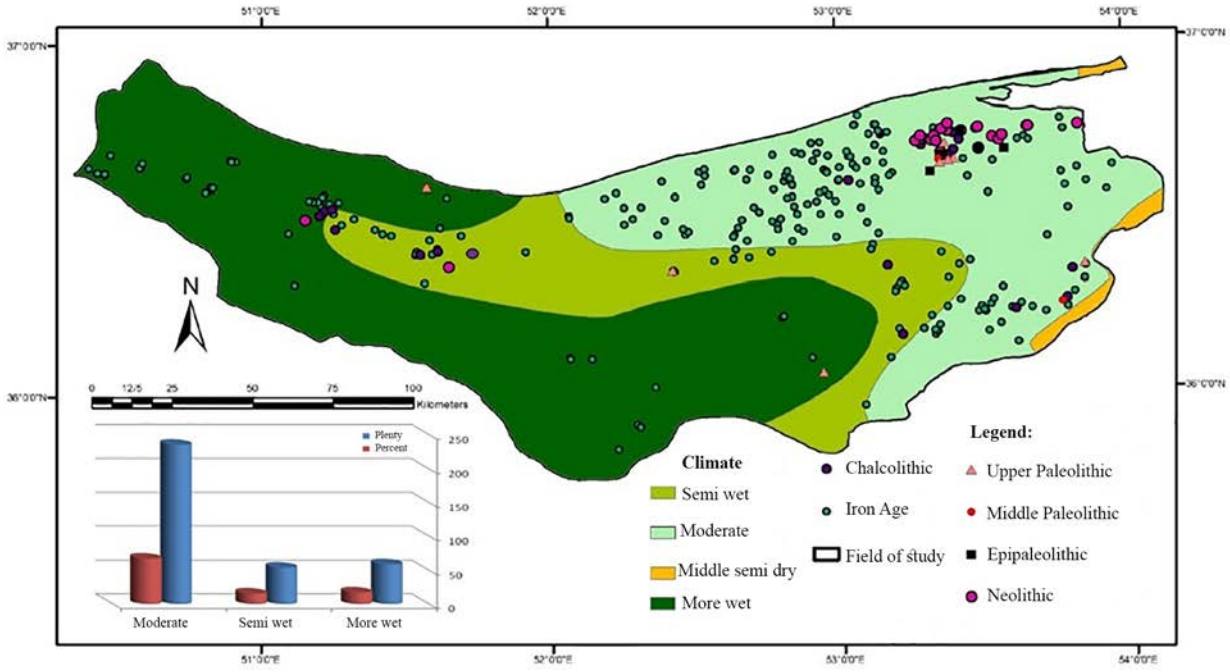
4-4 evaluation of the sites considering climate

The influential factors on formation of the climate of Mazandaran consist of Caspian Sea, Alborz range, and rainy winds that create varieties of climates for the regions. Continuous precipitation, high humidity, and slight difference in annual temperature include climatic characteristics of Mazandaran. However, Alborz mountain range is a natural barrier at south of Mazandaran that separates, geographically, northern and southern lands and prevents penetration of humidity into Iranian Plateau, and constraints the humidity in northern regions. Summing up positioning of the site in the environment, one can suggest that most of the sites, 67.5%, locate at moderate climate. "Hot summers, and moderate and wet winters are of the most major characteristics of the climate" (Zendedel 2000). Then, there are 17% of sites at wet climate, while only 15.5% of sites locate at semi wet climate. For average precipitation at west of the province is more than east of the region, one can witness more wet and semi wet climate at west and central regions of the province, however, prehistoric sites reveal less density in these regions (Table 4 and Map 6).

Table 4: distribution of prehistoric sites of Mazandaran, considering climate

Climate	Plenty of sites (Number)	Percent of sites
More wet	59	%17
Semi wet	54	%15/5

Moderate	235	%67/5
Total	350	%100



Map 6: distribution of prehistoric sites of Mazandaran Province considering climate

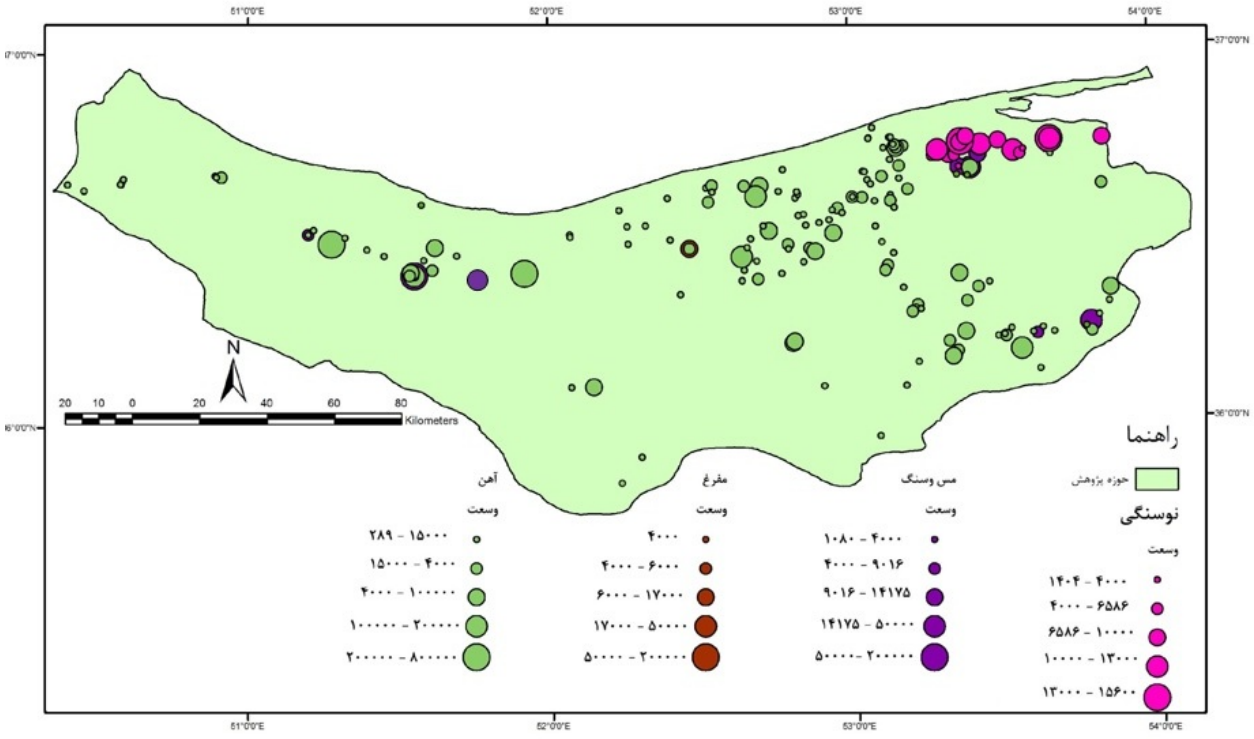
4-5 evaluation of sites relying on area

By Neolithic and later periods, settlement patterns formed as sedentary, semi sedentary, seasonal and non-seasonal, permanent and temporary, rural and urban styles. The area of settlement pattern is one of important factors of definition of sites. Naturally, one can think of vast settlements as the indicator of density of more population and developed social and economic activities. Furthermore, social, political, and economic influences of bigger sites on the peripheral smaller ones can be the other characteristic and significant hypothesis that usually formulated within researches. However, defining form and pattern of settlements is not a simple issue and relates to different factors including affiliation of sites to every given prehistoric period, environmental, economic, social, and political variables (Roberts 2003), spatial relation of discovered architectural plan to subsistence and social structure (Parsons 1972; Trigger 1967), spatial interrelation of sites according political and environmental setting, and central location and secondary location issues (Darvill 2002), and regional systematic methods that lead to definition and reconstruction of a regional settlement pattern and understanding regional political cycle (Underhill et. al 2008). Furthermore, defining area of settlements at every single prehistoric period, regarding surficial surveys, is one of the most important future challenges.

Generally, present paper presents analysis of settlement pattern for Neolithic, chalcolithic, bronze, an Iron ages in order to draw an overview of condition of settlement areas. However, considering discussed limitations and lack of vertical and horizontal excavations at the field of the study, the authors attempted prevent further analysis. However, regarding available data one can say that the area of settlements averagely increased since Neolithic to bronze Ages, but it decreased during Iron Age. The other conclusion is area of 21% of settlements between 0.15% to 0.4% hectares, whereas 32% of settlements cover 0.4% to 1 hectares that both consist about 53%, 107 of sites (Table 5 and Map 7).

Table 5: distribution of Neolithic, Chalcolithic, Bronze and Iron Age sites of Mazandaran, considering area

Area in meter	Percent of sites	Plenty of sites (Number)
200-1500	17	8/4
1500-4000	42	20/7
4000-10000	65	32
10000-20000	44	21/7
20000-50000	22	10/8
50000-100000	6	3
100000-200000	7	¾
Total	350	100



Map 7: distribution of prehistoric sites of Mazandaran considering area

Fluctuation of water level during Pleistocene and Holocene eras is the other influential factor on spatial distribution of prehistoric settlements of Mazandaran. As a lake, Caspian Sea is not connected to Seas. Separation from seas caused water level of Caspian Sea increases slowly, while reaches to the highest altitude, it decreases altitude with the same speed. In most of the cases, ruins of earlier settlements bury under sedimentations following advances of water (Moshiri 2010). By analyzing available information, one can suggest rate of discharge of the rivers, as one of the reasons of fluctuation of water level of the sea (Froehlich et al., 1999). Intensity of water evaporation is another reason (Moshiri 2010: 29). On the other hand, sudden short fluctuations root in meteorological and hydrological factors at sea coasts that depend on climatic conditions of different coastal regions, and lead to different consequences in various regions. The fluctuations in Caspian Sea also appear seasonally, while water level increases following increasing water discharge of the rivers during warm seasons (Qanqormeh and Malek 2005: 3, 4). The morphology of sea shores differs in response of the fluctuations (Firoozfar et al., 2012: 141). Caplin and Silviano suggested a model indicating Caspian Sea's response to the increase of water level regarding slope of different position of shores. Undoubtedly, low slope coastal regions have more sensibility. Southeastern regions of Caspian Sea is sensitive to water level, however, morphological changes of regional coasts have not been so noticeable in other areas of Caspian Sea. So this would be one of the most appropriate regions to reconstruct water level of Caspian Sea (Kakroodi 2013: 35, 43). Qamari Fatideh studied water levels of Caspian Sea since 3rd millennium until modern times and combined the results to archaeological information to conclude that the fluctuations, especially the latest increase of water level at 700 hundreds years earlier (1300 AD) was the most significant factor that buried human settlements under sedimentations at southeastern regions of Caspian Sea. He suggested that far location of the sites from the sea shore is because of rising the water and consequent burying of the sites following every single fluctuation. Regarding Caspian Sea altitude as -35 m at about 6600 years earlier, coast line was considerably further than modern coastal lines, especially at south and southeast of Caspian Sea. On the other hand, rising the sea water could bury and destroy earlier generations. Actually, tides gradually wash and hide upper and surficial parts of settlements, and now we can only witness the sites that located upper than -20 m altitude (Qamari et al., 2015: 38-54).

6-Conclusion

Of the total 350 sites, Middle and Upper Paleolithic, Epipaleolithic, Neolithic, Chalcolithic, Bronze and Iron sites, respectively, consist of 4, 9, 6, 28, 36, 15, and 252 sites. Regarding nature of data, the authors used Pearson Correlation Coefficient Test to understand relations between number of sites and variables including slope, altitude, climate, distance to the rivers, area of sites, and definition of types and rate of relation between the quantitative variables and the rate of significance of their interrelationship.

The values of Pearson Correlation Coefficient Test vary between 1 to -1, however, proximity to 1 leads to more correlation of two variables. Conclusions (Table 6) indicate significant relation between number of the sites at every given period and variables of altitude, distance to the rivers, and climate, while there is no significant relation between number of sites and slope. Considering the measured correlation between number of sites and the altitude variable (0.164), and the estimated level of significance (0.002), one can claim there is a positive and significant relation with 99% confidence between them. In other word, the altitude directly influenced on the number of the sites during every single period. The most number of the sites, 60.9%, locate at -26 m to 500 m altitude, where is plain and foothill with fertile soil and close to coastal lines and marine sources. These factors are ideal and appropriate environmental condition for formation and continuation of settlements.

Table 6: The correlation between factors of environmental condition and number of sites

Correlation coefficient Between factors and sites	Area	Distance to rivers	Altitude	Slop	Climate
The amount of correlation	0/088	*0/117	**0/164	۰/۰۸۷	*-0/127
Significant	0/212	0/03	0/002	0/106	0/018
Number of sites	203	350	350	350	350
Explanation of correlation	Nonsense	and Significant positive	Significant and positive	Nonsense	Significant and Reverse
*Correlation is significant at the 0.05 (2-tailed)					
** Correlation correlation is significant at the 0.01 (2-tailed)					

It should be noted that the main part of the area of the plains locate at eastern part of the field of the study, where the highest density of the sites appeared. Next, most of the sites, 18.1%, locate at 1000 m to 1500 m altitude that consist of mountain valleys and provide an appropriate environment for seasonal settlements. One can use area of sites as a criterion to understand seasonality of the sites. The area of the sites is small in seasonal settlements. Surprisingly, most of the sites that distributed within the altitude date to Iron Age[4]. Despite of not see a significant relation between the number of sites and the slope variable, the highest density of the sites is at -1.131% that indicates most of the prehistoric sites emerged at low slopes. On the other hand, considering the estimated correlation between the variable of the number of the sites and the variable of distance from the river, 0.117, and also the estimated significance of relation of these

two variables, 0.030, one can acknowledge there is a significant and positive relation between the variables; in other words, most of the sites locate 0 m to 1500 m away from the rivers. However, considering the estimated rate of correlation of number of the sites of every single period and the climate variable, -0.127, and the estimated significance between these two variables, one can conclude a significant and inverse relation; in other word, most of the sites distributed at the regions with lower precipitation, temperate, that is eastern front of Mazandaran.

The authors noted earlier that most of plain areas locate at east of Mazandaran. Settlement pattern of Mazandaran indicate the settlements at eastern region of the province. Regarding available information, if one ignores focus of archaeological researches at eastern Mazandaran and scarcity of field studies at central and western regions of the province, there will be attraction to relations between climate and altitude variables, from one hand, and distribution of sites from the other hand. Therefore, people desired occupy low and plain lands with moderate climate that naturally was available at east of Mazandaran. Eastern regions consist of foothills and plains with marine sources and fertile soil.

Regarding the analysis of settlement pattern of prehistoric sites of the field of the study, number of the site increase from Middle Paleolithic to Chalcolithic periods, however, there is a decrease in number of the sites during Bronze Age. Later, during Iron Age, number of the sites considerably increased. The settlements increased from 15, at Bronze Age, to 258 at Iron Age. It is probable that the region over populated during Iron Age when people exploited most of the regions with environmental possibilities, which is an indication of relation between high density of the settlements and high environmental capacity.

The area of the settlements that is recognizable considering definition of area and distribution of material during every given period, has not had so much accuracy in field studies since earliest researches. It is one of the challenges in the studies of settlement pattern of the prehistoric sites of the region. Considering available information, average area of the settlements increased from Neolithic to Bronze Ages, however, it decreased during Iron Age. The average area of the settlements, during Iron Age, was 18 hectares that considerably decrease comparing to the average area of the settlements during Bronze Age that is about 40 hectares. This is a transformation that indicates a change in the type of occupation that means transformation of permanent settlements to seasonal ones. High density of settlements during every single period makes them probable seasonal settlements, however, present information never leads to a precise conclusion. Nomadic and semi nomadic life style with pastoralist subsistence strategy always were fundamental elements of the field of the study. Most of these societies include foothill and mountain valley peasants, and semi nomadic pastoralists that commuted summer and winter residences within plain and mountain ecosystems.

Continuation of settlement levels at the sites, is another parameter defining appropriate ecological condition in a region. There have been scarce stratigraphical trenching and study of sequences of strata, considering absolute and relative chronology and typology of potteries, to understand sites with multi-period settlements. On the other hand, considerable amount of information resulted of survey projects leads to absence of understanding lower strata of the discovered sites. Therefore, large amount of available data about the chronology of the sites resulted of typology and comparative studies at the excavated sites.

Fluctuation of water level of Caspian Sea is the other influential factor on the spatial distribution of prehistoric settlements at Mazandaran Province. Caspian Sea experienced fluctuations since early formation during Pliocene. Just the opposite of seas that have very slow fluctuations, Caspian Sea have had sudden and speedy fluctuations. Therefore, the fluctuations directly effect on distribution of human settlements, life style, and subsistence strategies. The fluctuations follow the other factors including catchments of the rivers that reach to Caspian Sea and intensity of evaporation that influenced, undoubtedly, on sea shores and distribution of the settlements. Parts of lowlands of northern Iran sank following every single advance of water of Caspian Sea. The morphology of sea shores varies in response to the fluctuations and vastly ranges characteristics, considering slope of the coast and the sea. Naturally, water level advancements in shallow parts was more effective than the regions with deep water on formation of the sites.

Finally, one should acknowledge what present paper discussed about settlement pattern of prehistoric sites at Mazandaran Province relied on few archaeological surveys and excavations, and naturally not far from research deficiencies. However, the authors confirm that present paper has identified information losses, in addition to primary conclusions about settlement patterns. Therefore, future archaeological researches at Mazandaran can exploit present paper, in order to purposefulness and questioning, saving budget and human source, and more importantly more successful scientific achievements.

Footnote

[1]. This research was conducted in 2016 based on information collected from excavation and survey reports. It is notable that the sites used in this article as Iron Age sites have been introduced as Iron Age sites by relative chronology based on gray pottery and by archaeologists with traditional method and many Iron Age studies in this area have been based on surveys so Many of these pieces of information may change over future studies**.**

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تحلیل الگوهای استقرار محوطه‌های پیش از تاریخی مازندران

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چکیده

۳۵۰ محوطه پارینه‌سنگی میانی، پارینه‌سنگی جدید، فراپارینه‌سنگی، نوسنگی، مس‌سنگی، مفرغ و آهن مازندران در مقاله حاضر با روش تحلیل الگوی استقرار مورد مطالعه قرار گرفتند که سهم هر یک از دوره‌های مذکور به ترتیب ۴، ۹، ۶، ۲۸، ۳۶، ۱۵ و ۲۵۲ محوطه است. آزمون ضریب همبستگی پیرسون، بیانگر وجود رابطه‌ای معنادار بین تعداد محوطه‌های هر دوره و متغیرهای ارتفاع از سطح آب‌های آزاد، فاصله تا رودخانه و اقلیم است. ۶۰/۹ ٪ از محوطه‌ها، در ارتفاع بین ۲۶- و ۵۰۰ متر (شامل اراضی جلگه‌ای و کوهپایه‌ایِ حاصلخیز و بهره‌مند از خط ساحلی و منابع دریایی)، واقع شده‌اند. بیش‌ترین تعداد محوطه‌ها در بخش شرقی حوزه پژوهش که عموما جلگه‌ای و دارای رطوبت و بارش کم‌تر است، پراکنده شده‌اند. در محدوده بین ۱۰۰۰ تا ۱۵۰۰ متر ارتفاع (شامل دشت‌های میان‌کوهی مناسب برای استقرارهای فصلی)، ۱۸/۱٪ از محوطه‌های دوره آهن واقع شده‌اند. رابطه معناداری بین تعداد محوطه‌ها و متغیر شیب وجود ندارد. بیش‌ترین تعداد محوطه‌ها در فاصله ۰ تا ۱۵۰۰ متر از رودخانه‌ها قرار دارند.

با توجه به تحلیل‌های صورت‌گرفته در مورد الگوی استقراری محوطه‌های پیش از تاریخی در حوزه پژوهش، شمار محوطه‌ها از دوره پارینه‌سنگی میانی تا دوره مس‌سنگی، سیر صعودی را نشان می‌دهد اما در دوره مفرغ، از تعداد آنها کاسته می‌شود. پس از آن، در دوره آهن به طور چشمگیری بر شمار محوطه‌ها افزوده می‌شود. این احتمال وجود دارد که در دوره آهن، تقریباً تمامی مناطقی که دارای امکانات زیست‌محیطی قابل بهره‌برداری بودند، مورد استفاده قرار گرفتند. این موضوع، نشانگر وجود رابطه بین تراکم زیاد استقرارها و ظرفیت بالای زیست‌محیطی است. همچنین میانگین وسعت استقرارها از نوسنگی تا مفرغ سیر صعودی و در دوره آهن سیر نزولی داشته است. که این دگرگونی احتمالا نشانگر تبدیل استقرارهای دائمی به فصلی است. این جوامع اغلب شامل روستانشینان کوهپایه‌ها و دره‌های میان‌کوهی و عشایر نیمه‌کوچ‌رو بودند که در میان زیست‌بوم‌های دشت و کوه، ییلاق و قشلاق می‌کردند.

واژه‌های کلیدی: الگوی استقرار، پیش از تاریخ مازندران، سیستم مطالعات جغرافیایی، متغیرهای زیست‌محیطی.

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