



Investigating the Geotourism phenomena in eroded land of Iran, Qeshm Island

Revista Publicando, 5 No 16. (2). 2018, 35-94. ISSN 1390-9304

Investigating the Geotourism phenomena in eroded land of Iran, Qeshm Island

Abdollah Yazdi ^{1*}, Rahim Dabiri ²

1 Assistant Professor, Department of Geology, Kahnooj Branch, Islamic Azad University, Kahnooj, Iran

2 Associate Professor, Department of Geology, Mashhad Branch, Islamic Azad University, Mashhad, Iran. yazdi_mt@yahoo.com

ABSTRACT

Qeshm Island is one of the most beautiful Islands in Iran which has gathered a worldly unique and precious collection due to its eroded phenomena (i.e. Chahkooh canyon, Stars Valley and Tang-e Ali Strait); valuable geological heritage (i.e. Namakdan Salt Dome the world's largest salt cave and etc.) and cultural and historical diversities. This Island is of particular importance in national and international fora due to the aggregation of these attractions, being located in the strategic region of Persian Gulf, being the first geopark of Iran and the Middle East and being known as the eroded land, it also can be called the geotourism gateway of Iran. In this paper along with introducing the theoretical concepts, geographical and geological features; ecotourism and geotourism potentials of Island, the impact of erosion on the creation of amazing geosites were also studied in this Island and solutions were offered for the development of geotourism. The research method in this paper was descriptive - analytical and data collection was done through library research, field studies and satellite images.

Keywords: Erosion, Geotourism, Geopark, Qeshm Island



1. Introduction

Iran country has beautiful nature, diverse climate and the areas with unique phenomena of Geosciences; the study of these attractions seems to be necessary for getting further recognition and geotourism development [15]. Iran is one of the few countries in the world which due to its preferred geographical location enjoy the variety of beautiful natural and geological phenomena and Qeshm Island can be considered as the gateway of Iran's geotourism. This huge Island due to having a variety of unique geological and biological phenomena has high potential to become a major hub for ecotourism and geotourism in Persian Gulf [4]. In this paper, after representing the basic concepts, in order to develop the geotourism and sustainable development the geological attractions of this Island are also introduced.

2. Research method

In this research, a variety of library researches, interpretation and analysis of satellite images of the study area, geological and field studies as well as direct observation of phenomena, especially in terms of geotourism has been used.

3. The Geotourism Concept

Geotourism or land tourism is a relatively new concept in tourism industry which has gained considerable growth in last decades. According to Gates (2006), Geotourism means "Tourism in geological perspectives". Geotourism is a part of land associated with geology, geomorphology and natural landscape resources as well as available forms on the land surface, fossil-containing strata, rocks and minerals along with the emphasis on understanding the underlying and shaping processes of these complications [6]. Moreover, it can be said that geotourism is an informed and responsible tourism in the nature with the aim of observation and understanding of geology processes and phenomena as well as learning how they shape and progress [1]. As can be inferred from the above definitions, geotourism not only is a new part of tourism market, but also is a fundamental directive to help maintain the still life nature and its sustainable development which is compatible with the principles of balanced economic, social and ecological situations and is a complement for them.

4. The Concept of Geopark and Geosite

Geosite is a place with rare forms and attractive processes of geology and geomorphology. This is while the tourism infrastructures such as accommodation, access roads to Geosites, and the related management to that attraction and so on are considered for that area. Geosites are mainly divided to two groups: those that outcrop as special forms of geology and Geomorphology within the open boundaries limitations [8] and the others are geotourism access centers in confined spaces like Earth Sciences Museum and



etc. The German word of Geotope is another term which is equivalent to Geosite [13]. Geopark in word means Geology Park and it is said to a geographical area with determined borders in concept that has one or more special or unique geology phenomena as well as significant natural and cultural attractions in the available area. This set should affect the economic development of the region and has special protective measures and programs as well as complied management plans [2]. Also, in the range of Geopark, we can find a group of Geosites. Geoparks are a part of universal net and can have an important role in the country's economy and have a vast effect on sustainable development with tourism boom especially Geotourism.

5. The Impact of Geopark and Geotourism on Sustainable Development of Countries

Universal commission of environment and development was held in the conference of "Our Common Future" in 2009 and defined sustainable development as: a development that meets the needs of current generation with no harm to the need of next generations [9]. Sustainable development is a new era that pays attention to politics, culture, economy and business simultaneously [5]. According to a declaration of WTO, this growing industry has gained the third rank in 2000 international trade (Yavari, 2011). Therefore, countries that have various ecological phenomena and universally register their Geopark can be more successful in attraction of tourist, sustainable development and its economic incomes.

6. Problem Statement

In recent years, the issue of Geopark and geotourism is developing both scientifically and practically in the world. Iran has the capability of affecting local and national sustainable development through scientific, fundamental and legislation procedures, towards protecting the still life nature (Geoconservation), educating people about geosites and efficient management. Geotourism is widely known and has an important role in geographical protection. Geoparks through attracting tourists can lead to the development of local economy and creating new jobs [14]. Therefore, Qeshm Island is studied due to its beautiful and varied effects of attrition and its various biological, cultural and historical features.

7. Generalities about Qeshm Island

Qeshm Island is the biggest Island of Persian Gulf in Hormuz Strait, located between 26°, 32' and 26°, 59' N and 55°, 15' and 56°, 17' E with an area of about 1600 km. This Island includes a series of geological, biological, historical, cultural and natural attractions which the first Middle East Geopark has in it. Qeshm Geopark was introduced in 2003 and 2004 and was placed among the global Geoparks by UNESCO from March



2006. The length of Island is 130 km, its average width and max-width of 10 to 30 kilometers. The highest point of the Island is approximately 400 meters; above the Namakdan Salt Dome. Neighboring Islands of Qeshm are Hormuz, Hengam, Larak and Naz Islands (Figure 1).

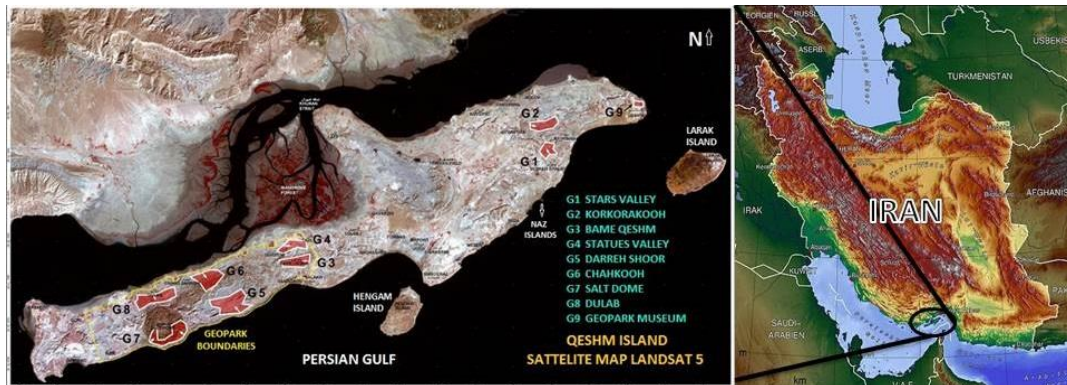


Figure 1: The location of Qeshm Island in the Persian Gulf and Geosites of this Island in Landsat 5 satellite image.

8. General Geology of Qeshm Island

Qeshm can be considered as a part of the southern Zagros based on tectonic and sedimentology evidences. Apparent similarity and coordination along major anticlines of this Island with those of Zagros are the evidence of this issue. The effect of Namakdan Salt Dome on the western part of the Island is clear and has created major tectonic and morphological changes on this part of Island [4]. The oldest formations that can be seen in the Island belongs to the series of Hormuz, in fact are caused by the performance of Namakdan Salt Dome, which is not considered as the main formations of the Island, but by salt Diapirism are transported to the top. Its average age has been estimated as Middle Cambrian. Other main formations of the Island, including Mishan Formation of late Miocene age, Aghajari to late Pliocene age, Qeshm Lime 25 to 30 thousand years ago, Doulab Conglomerate Early Holocene age, Souza sandstone 4 to 5 thousand years ago and Late Holocene sediments [12].

9. Qeshm Geopark

Due to the great variety of tourism attractions of Qeshm Island, its attractions can be divided in natural and biological, geological, geological and biological; historical and cultural groups [3]. Among these attractions, except Namakdan salt cave, salt, that in itself, is the world's largest. It can be said that the other attractions of this Island, such as erosional phenomena, Hara forests, Salt Dome, etc. can be found individually in other regions of the world and Iran. What has made Qeshm an exception and lead to its registration in the set of world Geoparks, is that a set of these phenomena are located in an Island, far less than what can be found in the world.



9.1. Natural and Biological Attractions

In this Island a fauna of almost 70 species of birds, aquatic, reptiles, etc. are living. More than 50 species of bivalve Mollusks, Gastropods, Cephalopods, Echinoderms, crabs, corals, all kinds of Oyster, marine bride, etc. can also be seen in Qeshm waters and shores. There is an amphibious fish called Mudskippers (*Periophthalmus waltoni*) in Hara forests which has increased the animal attractions of the Island. Fish diversity is very high in the waters around the Island and the varieties of commercial fish, decorative fish, sharks, gray dolphins, a type of whale to length of 12 m, can be seen. Two endangered species of sea turtles (green and hawksbill sea turtles) spawning near the Namakdan mountain [4].

9.2. Geological Attractions

Most notable attractions and events in Qeshm Island are caused under the influence of erosion by the function of wind, rain, waves, humidity, etc. The frequency of strata, loose sections made of marl and Silt, their alternation with harder strata and being influenced by erosion have created beautiful shapes that some of them are mentioned below:

Chahkooh canyon: This Geosite includes two North - South (Figure 2) and East - West (Figure 3) valleys, at the distance of 84 km from the West of Island, and is located near the Chahoo village. The canyon walls are made of silt, lime, calcareous sandstone and red marl alternatives and due to the water erosion in the karst environment of this area, beautiful groovy shapes and a variety of globular, spoon and glass cavities have been created which display a beautiful and amazing morphology. The entrance of first valley is U-shaped which gradually narrows and becomes V-shaped.



Figure 2: beautiful forms made by erosion in Chahkooh canyon (North - South valley)

- a:* the U-shaped entrance of valley with fresh water wells which have been dug by the natives of the region.
- b:* The middle of the valley, the confluence of East - West valley with North – South valley.
- c:* Final three-quarters of North - South valley and V shape of the valley.
- d:* End of the valley and its narrowing.



Figure 3: beautiful forms of erosion in Chahkooh Strait (East - West valley)
a: The entrance of East - West valley the confluence of North – South valley.
b: The erosional shapes in the middle of the valley.
c: Final three-quarters of valley.
d: extreme narrowing at the end of valley.

Tang-e Ali Strait: Geosite of Tang-e Ali Strait is located in the West of Island and South of Eastern Chahoo village with North - South direction. Several seams can be seen on the walls of the valley, which are likely affected by the growth and movement of the nearby salt dome. The entrance to this Strait is wide and its end is very narrow and beautiful. Northern entrance of this strait is adjacent to the Eastern Chahoo Village and its Eastern end ends to the salt dome. The strait walls are made of clay, marl and calcareous sandstone alternatives which under the influence of spates, water dissolution and erosion have created great sights in the form of big and small parallel linear grooves, Crescent, Spoon, spherical and blade shaped ones, at the looser strata and sections of clay and marl (Figure 4).



Figure 4: Beautiful images of erosion in Tang-e Ali Strait
a: entrance of Tang-e Ali Strait. *b:* Final three-quarters of Tang-e Ali valley.
c & d: End of the valley.

StarValley: This area includes one of the most pulchritudinous geomorphological forms and complications which under the influence of severe erosion through surface waters and seasonal storms has been made in old alluvial terraces and has created significant volumes in the form of strip walls, taper cones, columns, blade, etc. (Figure 5). The above mentioned complications are mainly of sandstone; loose calcareous cement and fossil shells. This area is located at a distance of 5 km from the Southern coast of Island in the north of Berkeh Khalf village.

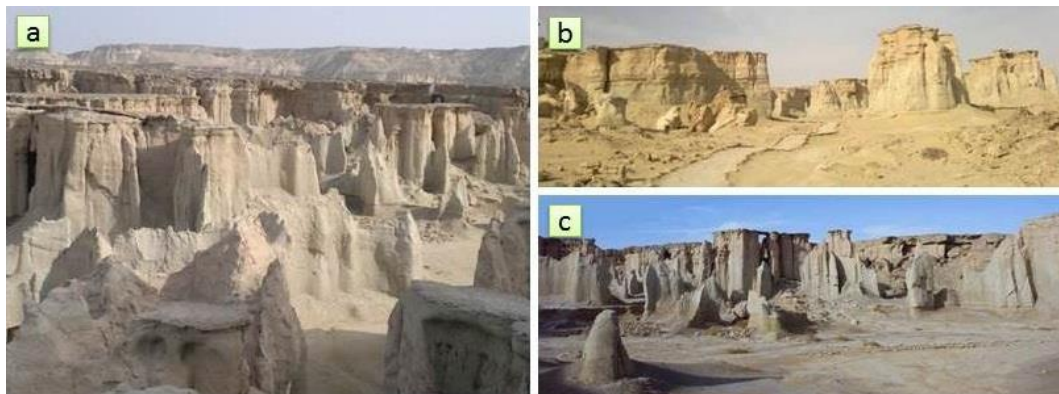


Figure 5: Amazing shapes and volumes created by water erosion in Star Valley Geosite.

a: Star Valley, view from the top of the surrounding mountains.

b: The entrance to the Stars Valley.

c: Part of the volumes caused by erosion in this area.

Namakdan Salt Dome: In the regions where the thick salt strata are located in the basement and there is a weakness e.g. thinning, cracks in the upper strata, the large volume of salt due to the special lower weight and high flexibility, moves upward and comes out in the form of Dome and brings all the strata to the top with itself, thus causes major changes in the structure of region. Reis et al. (1998) conducted some studies in order to estimate the uplift of Qeshm alluvial terraces and obtained 0.2 mm per year. This process was faster around the Namakdan salt dome about 6 mm per year [1]. This dome is in the South of Island (Figure 6).



Figure 6: Namakdan salt dome.

a: Satellite image of Namakdan salt dome.

b: A close-up of Namakdan salt dome.

Namakdan salt cave: Namakdan salt cave includes 15 salt caves with different sizes and lengths, including the world's longest salt cave with a length of 6580 km (Figure 7). The walls of cave are made of colorful strips of salt and Iron-bearing minerals e.g.



Hematite and Oligist which has given a certain beauty to it (Figure 8). Stalactite, Stalagmite and crystallized salts in the cave, has doubled its beauty (Figure 9).

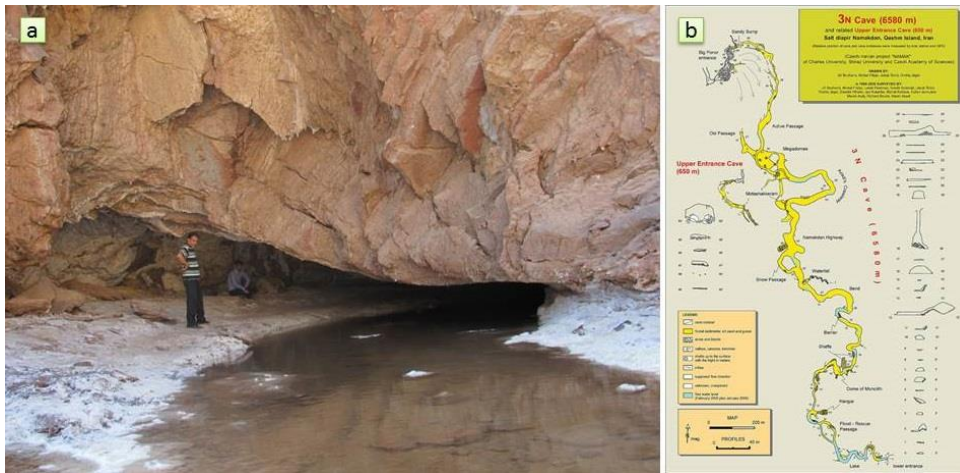


Figure 7: Namakdan salt cave.

a: The largest entrance to the cave of Namakdan salt dome.

b: Map of the world's largest salt cave in Namakdan salt dome.



Figure 8: Fine strata of salt and Iron minerals.



Figure 9: A few examples of stalactites and crystallized salts in Namakdan cave.

Salt Spring: due to the infiltration of rain water into the cracks of salt dome and high dissolution of salts and other soluble substances in these intrusion waters and finally the departure of supersaturated waters from other places in the form of fountain, much of these salts with beautiful shapes of blades, Cauliflower, pebble, salt Polygons, etc. deposit



at the edge of the fountain and usually the hematite compounds that are in them are placed at the bed of the streams and create a beautiful landscape (Figure 10 & 11).



Figure 10: Fine sight of hematite deposits of salt and saline springs.



Figure 11: Beautiful forms salts cauliflower nearby salt dome.

Bam-e Qeshm (Qeshm's roof): In Western part of Qeshm Island between the village of Salakh port (South) and Tabl village (North) there are elevations known as the roof of Qeshm. These are semi- high plateaus and since include the widest high part of the Island and when on them you can see the beautiful landscape, they are named so (Figure 12).



Figure 12: View of Bam-e Qeshm (Qeshm's roof), highest part of the Island.

The elevated sections are composed of hard limestone containing abundant oyster shells and slopes are made of loose sandstone, marl and eroded silt. Hara forest landscapes, the coasts of Persian Gulf and unique eroded views in the south of plateau called valley of Statues (Tandis ha), are among the notable attractions of Qeshm Geopark. In this region, beautiful statues carved from stones by the erosion, have made a beautiful views (Figure 13).



Figure 13: Excellent eroded landscapes and a statue made by erosion in the valley of statues.

Kaseh salakh (Salakh bowl): there is an area called the Kaseh salakh (Barahut) with the length and width of approximately 7 and 5 km in the southern coasts of island, which has no vegetation cover and is formed of large and small conical hills with beautiful eroded shapes (Figure14). In the area of Kargah which is located around the Salakh gas



field and core of Salakh anticline there is an artesian spring with relatively warm water; which has the combinations of salt, sulfur and H₂S gas along with foul odor.



Figure 14: Kaseh salakh Area (Salakh bowl).

Koorkoora Kooh: There is another Geosite named Koorkoora Kooh in the northern part of the Island located in the vicinity of Giahdan village. This area is mainly consisted of marl, therefore because of erosion caused by spate and rainfall; several valleys and canyons have been created between the hills of this region (Figure 15).



Figure 15: Marl morphology of Koorkoora Kooh Geosite.

9.3. Geological and Biological Attractions

Hara marine forests: these forests are located in the area of Khoran Strait, between the North of Qeshm Island and Bandar Khamir, in the range of 200 km (Figure 16). Hara species are trees of 3 - 6 meters named *Avicennia Marina*. The trees are Halophilic ones and at high water submerged in the water. The leaves of these trees absorb the sea freshwater and excrete its solutes [11]. These trees are mainly grown on fine sediments of beaches, deltas of coastal lagoon and rivers that are influenced by tidal currents, which [10]. Hara forests are always a safe habitat for tropical birds, mollusks, crustaceans and fishes due to its appropriate ecological situation.



Figure 16: Hara forest around the Qeshm Island.

9.4. Cultural and historical attractions

Khoorbas Cave: The cave is located in the edge of the southern road, at a distance of 12 km from Qeshm city, Khoorbas caves are inside a clay-marl hill overlooking the sea and Miyan Kaseh plate. The cave walls are mostly made of weak rock (marl and Silt), it seems that these holes and caves initially were created by the erosion and later were extended by the natives (Figures 17 & 18).



Figure 17: Mouth of khoorbas ancient caves.



Figure 18: Sample of human carvings in khoorbas ancient cave.

Talab or Tala wells: there are several water wells at the entrance of the Laft village and near the Naderi castle that are dug by indigenous people in Achaemenian period and Zoroastrian era (Achaemenid) in schist rocks of this area for saving the rain water. It is said that the number of these were 366, the number of days in leap year, for the use of water in all the year but over the time only some are remained intact (Figure 19).



Figure 19: Talab ancient wells.

10. The effect of erosion on the formation of Qeshm phenomena

Along with the Namakdan salt dome which is the main cause of colorful minerals, different strata and also sedimentology and stratigraphy phenomena that affect the morphology of the Qeshm Island, by far the most important cause of the formation of geological phenomena in this Island is erosion. Erosion in this Island is due to the performance of wind, sea waves, seasonal showers, changes in temperature, humidity and crystallization of minerals and secondary factors such as Tectonics and the gravity forces [4]. Mainly erosion has occurred in the loose strata of marl, sandstone and Silt in Neogene. In many cases, it can be seen in the strata which their underlying parts are weak but their above parts are robust, that due to the rapid erosion of underlying strata, these parts were emptied and upper resistant strata are broken because of the weight. Some samples of this destruction are evident in the coastal terraces near Souza and Dūstakū. In the central part of Island wind erosion and seasonal showers affected on the loose sediments which has low resistance and thus has created a different and heterogeneous morphology which its obvious example can be seen in Star Valley near Berkeh Khalf village. Totally, everywhere in this Island, there are numerous forms and volumes, that are made by the function of water, wind, seasonal showers, etc. erosions and make the Island more beautiful which is very important in terms of geomorphological studies (Figure 20).



Figure 20: Eroded forms (marine terraces) on the wall of Goori in the road margin of Goori – Kani.

11. Conclusion



These findings of this study indicated that due to the global importance of geotourism industry Qeshm Island has high capability to develop geotourism. Diversity in landscapes and Natural geological heritages, e.g. multiple erosion phenomena in the Geosites of Chahkooch canyon, Stars Valley, Tang-e Ali Strait and..., Hara forests, Namakdan Salt Dome, the world's largest salt cave, etc., and other historical and cultural attractions e.g. Koorbas cave, Talab wells and other archeology, tourism attractions and unique biological diversities have brought together a collection that the aggregation of these attractions in an Island is unique in the world. Qeshm Island with these features has great potential to become a hub for ecotourism and geotourism in the world. It is a virgin environment for the researches of different natural sciences, to scientifically develop the geotourism in this region based on the strong foundation of scientific research findings, along with the tourism and transporting scientific concepts of phenomena and Geosites to visitors. In such circumstances, geoconservation (protection of geological phenomena) is carried out well by tourists and along with economic development of ecotourism; Geotourism finds its true meaning. In this regard, eroded land of Iran (Qeshm Island) can be a natural institution for achieving the above mentioned objectives and can be considered as an environment for their implementation.

12. Suggestions

In order to strengthen the management and development of tourism geotourism in Qeshm Island, the followings are recommended:

- To establish specialized geotourism tours in tourism agencies by training managers and staff of these centers.
- To create Qeshm geotourism database for International Geotourists.
- To determine the Qeshm as an organizing center for commercial, economic and cultural exchanges of country in the Persian Gulf.
- To promote the culture of geological heritage conservation in line with sustainable development
- To prepare the documentaries and educational movies in order to introduce these attractions and build -culture about their protection.
- To develop the communication networks of Qeshm Island with national and international centers in order to achieve further flourishing in the tourism.
- To create investment conditions for private sector in Qeshm Island, in line with the policies of UNESCO for Geoparks.
- To protect the residents of Island Geosites in order to offer local products and set up welfare and recreational centers.
- To hold geotourism exhibitions and introducing the tourism capabilities of Qeshm Island to Iran and world.



REFERENCES

- 1- Amrikazemi, A. Atlas of Geopark & Geotourism Resources of Iran, Tehran, Geological survey of Iran publication, 2009; 22 & 23.
- 2- Amrikazemi, A. A look towards overall concept of Geopark, Geotourism and geology heritage and Iran position in this field, proceedings of twenty-sixth meeting of Earth Science, State Geological and Mineral Exploration, Tehran, 2006.
- 3- Amrikazemi, A. Iran's Future Geoparks, Geoscience & Mining Monthly Magazine, Geoheritage Special Edition, License Holder: Geological Survey of Iran, 2012; 34-37.
- 4- Amrikazemi, A. The Geotourism atlas of Qeshm Island, Tehran, Geological Survey of Iran publications, 2004; 13 & 14.
- 5- Bahramzade, H. A. Sustainable development, Tadbir Monthly Magazine, fourteenth year, No.134. 2003.
- 6- Dowling, R.K., Newsome, D. Geotourism's issues and challenges, Geotourism, Chapter Thirteen, Elsevier, Oxford, 2006; 242-254.
- 7- Gates, A. E. Geotourism: a perspective from the USA, Geotourism, Dowling, R.K., Newsome, D., Chapter Nine, Elsevier, Oxford, 2006; 157-179.
- 8- Hose, T.A. Geotourism and interpretation, Geotourism, Dowling, R.K., Newsome, D., Chapter Twelve, Elsevier, Oxford, 2006; 221-241.
- 9- Khoshraftar, R. Global network of Geoparks, Rasht, Hagh Shenan publication, 2012; 21 & 22.
- 10- Momeni, I. some specifications of ecology and sedimentology of Qeshm island's mangroves, Journal of Earth Science of Shahid Beheshti University, 1991.
- 11- Negaresh, H. coastal geomorphology of Gowatr gulf, Islamic Azad University of Zahedan, Journal of Applied Geology, second year, number 1, 2005; 23-32.
- 12- Samadian, M.R. movements of Zagros salt domes in the late Cenozoic, proceedings of Symposium diapirism with a special approach to Iran, Tehran, fist volume, 1990; 259 & 327.
- 13- Sturm, B. The Geotope concept: geological nature conservation by town and country planning, Geological and Landscape Conservation, In: D. O'Halloran, C. Green, M. Harley et al. (Eds), Geological Society, 1994; 27-31.
- 14- Xun 'Z, Milly 'W, National Geopark initiated in China: Putting geosciences in the service of society, Episodes 25, 2002.
- 15- Yazdi, A. A Study of Iran's Lut desert: Geomorphological and Geotourism Attractions, Proceedings of Annual International Conference on Geological & Earth Sciences (GEOS2012) 3-4 December, Singapore, 2012; 35-41.