*J. Basic. Appl. Sci. Res.*, 2(3)2889-2895, 2012

ISSN 2090-4304
Journal of Basic and Applied Scientific Research
www.textroad.com

# Coastal – Marine Ecological Classification Standard (CMECS) of Caspian Sea – Iranian Coasts of Mazandaran Province (Nowshahr–Babolsar region), Using the Geographical Information System (GIS)

**Maryam Noory Balaneji[1*], Hamed Manuchehri[2], Fereidoon Owfi[3]**

[1,2] Department of Fisheries, Islamic Azad University, Babol Branch, Babol, Iran
[3] Fisheries Research Organization of Iran, Tehran, Iran

## ABSTRACT

Natural resource managers and environmental planners are faced with multiple problems in making decision for coastal-Marin ecologies protection, sustainable utilizing of valuable resources, and the Integrated Coastal Zone Management (ICZM). Despite the fact that there are considerable data about the multiple types of ecologies and their importance in the various life stages of valuable fauna and flora species available, their knowledge about diversity of ecologies, range, distribution of ecologies, and their ecological characteristics is negligible. In addition, according to the existing criteria and standards and resources and reserves management, implementing the programs which protect the local settlement and sensitive and vulnerable ecologies will be delayed, and it will be impossible to evaluate their condition without the availability of maps which are based on the geographical information system (GIS). The coastline of Caspian sea is 873 km long, of which 487 km belongs to Mazandaran province; the Iranian Fisheries Organization (Shilat) and also the private sector have considered this area for investigating and utilizing the aquaculture industry, so before any activities and actions it is better to determine the capacity of these coasts for development based on the international standards in order to provide a clear vision of available potential and limitations for development and management strategies for administrators and macro planners. This study is implemented during a one-year period (1389-1390) and four seasonal field studies (in order to determine the possible effects of seasonal climate change) with the aim to identify, classify and coding the coastal ecologies of Nowshahr - Babolsar regions in Mazandaran province based on the ecological standards of CMECS model.
**KEYWORDS:** Ecological assessment; coastal ecologies; CMECS model; Geographical Information System (GIS); Iranian coasts; Mazandaran province (Nowshahr – Babolsar region); Caspian Sea.

## INTRODUCTION

The coastal area is a confluence of land and marine ecosystems and includes the independent biological, ecological, and geological area. These are the dynamics areas including the interaction of land, water, atmosphere, and human manipulation (Beatley et al., 2002). Having a variety of ecologies, the coastal environment as a refuge for various species, is the most sensitive ecosystems on Earth; and the biological scientists have been interested in it due to its valuable economic resources (Sharifipour et al, 1384). This vulnerable area is exposed to the accumulation of terrestrial and marine pollutants and the potential threats by which the land processes directly affect on the sea processes and its applications (Owfi et al, 1384).

The sea pollution and the consequence of economic-social development directly affect the coastal – marine ecologies. In addition, the development of industrial and servicing sets, human's increasing focuses, and increasing pressure on these areas, have changed the coastal areas and gradually the natural forms and especial ecologies transformed to the structures and centers of human activities; therefore, the natural resource managers and environmental planners are faced with the multiple problems in making decision for coastal- marine ecologies protection, sustainable utilizing of valuable resources and reserves, and integrated coastal zone management (ICZM) (Madden et al., 2005). Despite the fact that there are considerable information about the types of ecologies and their importance for various life stages of valuable fauna and flora species available, their knowledge about the diversity of ecologies, range and distribution of ecologies, and their ecological characteristics is negligible, (Tyrrell., 2004) and this obliged them to make definitive decisions about the use of coastal-marine areas without having enough knowledge about ecologies; in addition, without the availability of basic and complete maps of coastal-marine environment based on the geographical information system (GIS), and standard ecological classification of coastal-marine ecologies based on the available criteria and standards and management of resources and reserves, the implementation of programs and projects which protect the ecologies and sensitive and vulnerable settlements, will be delayed and the their condition assessment will become impossible (Wilbur & Lund., 2007). The ecology classification is a process in which the identification of multiple types of ecologies will be done based on the series of standard terms and descriptions (Wilbur & Lund., 2007).

***Corresponding Author:** Maryam Noory Balaneji, Department of Fisheries, Islamic Azad University, Babol Branch, Babol, Iran.
Email: noory1390@yahoo.co.uk

In this regard, several ecological classifications are used by researchers and managers, but none of them are accepted globally. (Karami Khaniki, 1383). Based on the results of Environmental Management Plan (EMP) and integrated coastal zone management (ICZM), the coastline of Caspian Sea in the north of Iran is 873 km long of which 487 km belongs to Mazandaran province has long; it has unique features and is the concentration of most valuable ecosystems such as estuaries, Deltas, wetlands, important wildlife ecologies, etc. (Owfi and Sharifpour, 1386), so it is used for investing and fisheries utilizing by the Iranian Fisheries Organization and other private and public institutions in the aquaculture industry, therefore, before any actions about the identification and classification of valuable ecosystems and settlements, it is better to specify the capacity of these coasts based on the international standards for development in order to make the clear horizon of current potential and limitations for development, and management strategies available for administrators and macro planners (Majnounian and Mirab Zadeh, 1384). Thus, identifying these sensitive ecosystems and classifying and protecting them play a vital role in saving the natural resources and genetic reserves (Daneh kar, 1379).

The coastal and Marine Ecological Classification Standard (CMECS) is an important research model which was first introduced by Madden and his colleagues in 2004 on the coasts of Northern America; this system was upgraded and improved and was presented as the second version in 2005. Changes in CMECS are still continuing and completing, and the recent changes have resulted in a new framework and based on the latest version (CMECS III) (Owfi et al., 2009). This study aims to establish a national standard in the classification of ecologies in order to ensure the compliance of collected information by various national regional and international areas with the standard information. This classification is developed by reviewing the best elements of previous plans in order to establish a national classification with national and regional capabilities, and its boundaries of coastal zone includes the estuaries, rivers, coastlines, islands, benthic zones, inter-tidal areas, and the whole of water column from the beach to the depths of oceans. One of the features of this model is the central role and place of Biotopes as the certain and repeatable communities of organisms within a physical ecology; these Biotopes have been specified by the dominant species; they depend on seabed, are stable, and sometimes are used synonymous with the word ecology (Madden et al., 2008).

Based on the results of environmental management plan (EMP) and integrated coastal zone management (ICZM), the Caspian Sea in the north of Iran, with 873 km coastline (487 km of coastline belongs to Mazandaran province) and unique features, is a place for valuable ecosystems such as estuaries, the deltas, wetlands, important wildlife ecologies, etc. (Owfi and Sharifpour, 1386), so the Iranian Fisheries Organization (Shilat) and also the private sector have considered this area for investigating and utilizing the aquaculture industry, therefore before any activities and actions about the classification of valuable ecosystem and ecologies, it is better to determine the capacity of these coasts for development based on the international standards in order to provide a clear vision of available potential and limitations for development and management strategies, for administrators and macro planners (Majnounian and MirabZadeh, 1384). Hence, for sustainable development of coastal-marine areas, preservation, restoration, and development of soil and water resources, job creation, and development of agriculture, fisheries, and tourism activities in these areas, all its natural characteristics should be identified and the collected data should be classified and processed. Obviously, by assessing these properties, the best tool for optimal management of coastal areas will be provided and damages caused by a lack of statistics and information in the executive and research projects and plans in these areas will be prevented. Developing the criteria for classification and evaluation of coastal-marine areas is in line with the principle of sustainable development and optimal utilization of the existing potentials. Therefore, in addition to increase the managerial capacity to protect and restore the valuable marine reserves and resources, it can compensate the lack of information about protected coastal-marine areas in the network of official protected areas in our country, and be effective in the policy making and planning the sub-sector of fisheries (Shilat) or other organizations and relevant executive agencies (Karami Khaniki, 1383).

So far the multiple different studies about the southern coast of Caspian Sea (Iranian coasts) have been conducted, but this applied and scientific experience has not been implemented so far on the southern coast of Caspian Sea based on the coastal and Marine Ecological Classification Standard (CMECS Model) and therefore it can be considered as a new study (Owfi et al., 2009).

## MATERIALS AND METHODS

In this study, first we collect information about the status of studied zone for costal and marine ecological classification standard and then collect information about the status of biological and non-biological zone based on the library studies, computer searching, and studies conducted in this area. Certainly, collecting and classifying the current information of study area by the reports, theses, etc. is very important, because the nature of CMECS model is based on the data analysis and history of previous Ecological studies.

The study area is located in the West to East of Mazandaran province coastline, from the beginning of Nowshahr County to the beginning of Babolsar County. According to the clear and obvious coastal features based on the natural condition and Geomorphology (such as rock, sand, clay) or man-made facilities and areas

(such as buildings, dock, harbor, and other coastal structures, etc.) and based on the size of study area (Coast of Mazandaran province, Nowshahr – Babolsar area) and the ease of classifying the information, it is essential to divide the study area into smaller areas and sub-regions; this was implemented based on the pilot (preliminary) tour in Mehr 1389 in order to select the stations. Therefore, the study area was divided into four sub-regions based on four areas, Nowshahr – Sea sangan (27 km), Sea sangan - Noor (23 km), Noor - Mahmoud Abad (25 km), Mahmoud Abad - Babolsar (38 km), and 92 stations. The ecosystem area and covered regions in the whole of passed paths were documented and determined by taking photos and capturing videos, by recording the geographical location (with GPS) with the model 2009 CX 60 and software Map source.

Dominant fauna and flora communities within the framework of distinct Biotopes were studied by the coastal-marine examination and survey, and the fauna and flora dominant species in the area were examined based on the field information and taking the photographs, and for final confirmation of identification, the samples were transported to the laboratory, in addition the main physical - chemical and biological parameters, the structure of seabed, and the slope of coast were measured in the place, and the information were recorded in the environmental data forms as the Classifiers and Modifiers in order to ease coding the ecologies.

Moreover, the field operation and sampling in this research was conducted during a one-year period and four-time surveys (in order to identify the potential effects of climate changes of seasons) in Mehr 1389, Dey 1389, Farvardin 1390, and Tir 1390.

After transferring collected data from the Global Positioning System (GPS) to computer and sorting and classifying the recorded information based on the information forms, the data will be classified according to the SWOT matrix tables with model CMECS and the geographical coordinates will be prepared for The GIS map.

As mentioned before, the CMECS model is the first Coastal and Marin ecological classification standard classification which is provided for the coasts of Northern America (Madden et al., 2005). The third version of CMECS includes five components which each one describes different features of coastal-Marine environment and these components can be used alone or together. The examined components in this study include the Surface Geology Component (SGC) and the Biotic Cover Component (BCC) (Madden et al., 2008-2009).

Fixed names and codes are needed for facilitating the communication among the management, scientific and cooperative groups in the classification of ecologies. The encoding or name rules usually consist of a sequence of numbers or letters or both of them (Lund & Wilbur., 2007) and this encoding system can facilitate the information organizing in the geographic information systems (GIS) (Kutcher et al. , 2005). For coding each component of Surface Geology Component and the Biotic Cover Component the following actions are implemented respectively:

b:Biotic Class.Sub Class.Group Biotic.Modifier(BCC)

s:Surface Geology.Class.Sub Class. Group.Modifier(SGC)

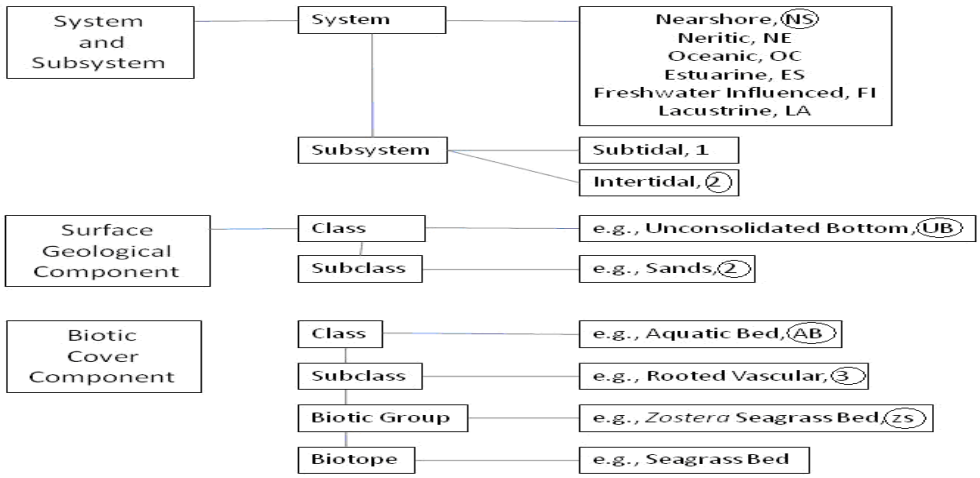


**Figure 1 – Encoding the spatial information in the CMECS III model**

It is worth noting that the compliance of recorded field information with the Biotic Cover Components table was conducted precisely and according to the characteristics of each Biotope. Besides, it is possible to introduce a new ecology with a new (exclusive) standard code because among the features of this model introducing the ecologies is unique. In addition, this model does not aim to identify the species in Taxon species range; therefore the ecologies are encoded based on the Biotopes and the dominant environmental groups in the region especially for communities living in the area. It should be noted that the classification of CMECS model has been implemented just in few regions of America due to being new. According to the single evolution of

this classification and the designers' statement, its strengths and weaknesses should be identified by executing and selecting its criteria in different ecologies and areas.

## RESULTS

**Table 1 – Ecologies and codes of cover components and surface geology components in the study area, sub - region 1, (Iranian Coasts of Mazandaran province, Nowshahr - Sea sangan region) based on the ecological classification of CMECS III model**

| Row | Sub Area | Cover Type | | | | | | | | CMECS Code |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Abiotic | | | | Biotic | | | | |
| | | System | Sub System | SGC | | BCC | | | | |
| | | | | Class | Sub Class | Class | Sub Class | Biotic Group | Biotope | |
| 1 | Nowshahr - Sea sangan | Freshwater Influenced [FI] | Intertidal [1 ] | Rocky Shore [RS] | Boulder [3 ] | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Papilionaceae* | FI.1 _ s:RS.3.IMPD_ b:AB.3. NVC. *Papilionaceae* |
| | | | | Unconsolidated [US] | Gravel [1 ] | | | | *Papilionaceae* | FI.1 _ s:US.1.IMPD_ b:AB.3. NVC. *Papilionaceae* |
| | | | | | | | | | *Rosaceae* | FI.1 _ s:US.1.IMPD_ b:AB.3. NVC. *Rosaceae* |
| | | | | | | | | | *Phragmites australis* | FI.1 _ s:US.1.IMPD_ b:AB.3. NVC. *Phragmites australis* |
| | | | | | Sand [2 ] | Faunal Bed [FB] | Mobile Epifauna [2 ] | Mobile Crustaceans [mc] | *Pontogammarus Maeoticus* | FI.1 _ s:US.2 _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Rosaceae* | FI.1 _ s:US.2.IMPD_ b:AB.3. NVC. *Rosaceae* |
| | | | | | Gravel [1 ] | | | | | FI.1 _ s:US.1_ b:AB.3. NVC. *Rosaceae* |
| | | | | Rocky Shore [RS] | Boulder [3 ] | Mollusks Communities [MC] | Bivalve Bed [1 ] | Oyster Bed [a] | *Cerastaderma Lamarki Dreissena Polymorpha* | FI.1 _ s:RS.3 _ b:FB.1.a. *Cerastaderma Lamarki Dreissena Polymorpha* |

Based on the classification of CMECS model and according to tables 1-1, 2-1, 3-1, 4-1, 38 ecologies were identified based on the Biotic Cover Components and the Surface Geology Components in the study area (Iranian coasts of Mazandaran province, Nowshahr – Babolsar region) and according to the ecological classification of CMECS III model. By the process of achieving to the standard codes based on the classification of CMECS model, 20 standard codes which were influenced by the Freshwater were determined for the Iranian coasts of Mazandaran province ecologies, Nowshahr-Babolsar region, and these ecologies included the standard codes of encoding and classification system (CMECS III) and finally the map of ecologies was prepared based on these standard codes. These results suggest that the CMECS is a suitable and efficient system for the zone classifying, classification, and understanding the coastal and marine ecologies in the southern regions of Caspian Sea coast.

**Table 2 – Ecologies and codes of cover components and surface geology components in the study area, sub - region 2, (Iranian Coasts of Mazandaran province, Sea sangan - Noor region) based on the ecological classification of CMECS III model**

| Row | Sub Area | Cover Type | | | | | | | | CMECS Code |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Abiotic | | | | Biotic | | | | |
| | | System | Sub System | SGC | | BCC | | | | |
| | | | | Class | Sub Class | Class | Sub Class | Biotic Group | Biotope | |
| 2 | Sea sangan - Noor | Freshwater Influenced [FI] | Intertidal [1 ] | Unconsolidated [US] | Gravel [1 ] | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Rosaceae* | FI.1 _ s:US.1_ b:AB.3. NVC. *Rosaceae* |
| | | | | | | | | | *Rosaceae* | FI.1 _ s:US.1.IMPD_ b:AB.3. NVC. *Rosaceae* |
| | | | | | | Faunal Bed [FB] | Mobile Epifauna [2 ] | Mobile Crustaceans [mc] | *Pontogammarus Maeoticus* | FI.1 _ s:US.1.IMPD _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | Sand [2 ] | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Phragmites Australis* | FI.1 _ s:US.2 _ b:AB.3. NVC. *Phragmites Australis* |
| | | | | | Gravel [1 ] | Faunal Bed [FB] | Mobile Epifauna [2 ] | Mobile Crustaceans [mc] | *Pontogammarus Maeoticus* | FI.1 _ s:US.1.IMPD _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | Sand [2 ] | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Papilionaceae* | FI.1 _ s:US.2 _ b:AB.3. NVC. *Papilionaceae* |
| | | | | | | Faunal Bed [FB] | Mobile Epifauna [2 ] | Mobile Crustaceans [mc] | *Pontogammarus Maeoticus* | FI.1 _ s:US.2 _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Pontogammarus Maeoticus* | FI.1 _ s:US.2.IMPD _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | | | | | | FI.1 _ s:US.2 _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | Gravel [1 ] | | | | *Phragmites Australis* | FI.1 _ s:US.2 _ b:AB.3. NVC. *Phragmites Australis* |
| | | | | | | | | | *Papilionaceae* | FI.1 _ s:US.1.IMPD _ b:AB.3. NVC. *Papilionaceae* |

**Table 3 - Ecologies and codes of cover components and surface geology components in the study area, sub - region 3, (Iranian Coasts of Mazandaran province, Noor- Mahmoud Abad region) based on the ecological classification of CMECS III model**

| Row | Sub Area | Cover Type | | | | | | | | CMECS Code |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Abiotic | | | | Biotic | | | | |
| | | System | Sub System | SGC | | BCC | | | | |
| | | | | Class | Sub Class | Class | Sub Class | Biotic Group | Biotope | |
| 3 | Noor - Mahmoodabad | Freshwater Influenced [FI] | Intertidal [1 ] | Unconsolidated [US] | Gravel [1 ] | Mollusks Communities [MC] | Bivalve Bed [1 ] | Oyster Bed [a] | *Cerastaderma Lamarki Dreissena Polymorpha* | FI.1 _ s:US.1.IMPD _ b:FB.1.a. *Cerastaderma Lamarki Dreissena Polymorpha* |
| | | | | | Sand [2 ] | | | | | FI.1 _ s:US.2.IMPD _ b:FB.3.a. *Cerastaderma Lamarki* |
| | | | | Rocky Shore [RS] | Boulder [3 ] | Faunal Bed [FB] | Mobile Epifauna [2 ] | Mobile Crustaceans [mc] | *Pontogammarus Maeoticus* | FI.1 _ s:RS.3.IMPD _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | | Mollusks Communities [MC] | Bivalve Bed [1 ] | Oyster Bed [a] | *Cerastaderma Lamarki Dreissena Polymorpha* | FI.1 _ s:RS.3.IMPD _ b:FB.1.a. *Cerastaderma Lamarki Dreissena Polymorpha* |
| | | | | | | Faunal Bed [FB] | Mobile Epifauna [2 ] | Mobile Crustaceans [mc] | *Pontogammarus Maeoticus* | FI.1 _ s:RS.3.IMPD _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | Unconsolidated [US] | Sand [2 ] | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Papilionaceae* | FI.1 _ s:US.2.IMPD_ b:AB.3. NVC. *Papilionaceae* |

**Table 4 - Ecologies and codes of cover components and surface geology components in the study area, sub - region 4, (Iranian Coasts of Mazandaran province, Mahmoud Abad- Babolsar region) based on the ecological classification of CMECS III model**

| Row | Sub Area | Cover Type | | | | | | | | CMECS Code |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Abiotic | | | | Biotic | | | | |
| | | System | Sub System | SGC | | BCC | | | | |
| | | | | Class | Sub Class | Class | Sub Class | Biotic Group | Biotope | |
| 4 | Mahmoodabad - Babolsar | Freshwater Influenced [FI] | Intertidal [1 ] | Unconsolidated [US] | Sand [2 ] | Faunal Bed [FB] | Mobile Epifauna [2 ] | Mobile Crustaceans [mc] | *Pontogammarus Maeoticus* | FI.1 _ s:US.2 _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Phragmites Australis* | FI.1 _ s:US.2.IMPD_ b:AB.3. NVC. *Phragmites Australis* |
| | | | | | | | | | | FI.1 _ s:US.2 _ b:AB.3. NVC. *Phragmites Australis* |
| | | | | | | Faunal Bed [FB] | Mobile Epifauna [2 ] | Mobile Crustaceans [mc] | *Pontogammarus Maeoticus* | FI.1 _ s:US.2 _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | Rocky Shore [RS] | Boulder [3 ] | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Phragmites Australis* | FI.1 _ s:RS.3.IMPD_ b:AB.3. NVC. *Phragmites Australis* |
| | | | | Unconsolidated [US] | Sand [2 ] | Faunal Bed [FB] | Mobile Epifauna [2 ] | Mobile Crustaceans [mc] | *Pontogammarus Maeoticus* | FI.1 _ s:US.2_b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | | | | | | FI.1 _ s:US.2.IMPD _b:FB.2.mc. *Pontogammarus Maeoticus* |
| | | | | | Gravel [1 ] | Aquatic Bed [AB] | Rooted Vascular [3 ] | NVC Groups | *Phragmites Australis* | FI.1 _ s:US.1.IMPD_ b:AB.3. NVC. *Phragmites Australis* |

## DISCUSSION

The results of conducted study showed that the diversity of study area is limited to the coastal and sand – gravel ecologies as the dominant group in the area, the deltaic ecologies (permanent and seasonal rivers), lagoon - canebrake ecologies, and the forest one. In addition, the influence of environmental changes (season) is distinct and separable from each other for two periods of time fluctuations in the spring - summer and autumn - winter.
In this study, 38 ecologies of 92 recorded stations and 20 standard codes which were influenced by freshwater were identified by the encoding system CMECS III, and these numbers of ecologies were related to the diversity of geologies. Most of the codes and Biotopes and codes have been observed in the sub-region 1 (Nowshahr – Sea sangan region) and sub-region 2 (Sea sangan – Noor region) and that is due to the non-identical structure of ground. In this region the crustaceans such as *Pontogammarus Maeoticus* species and mollusks such as *Cerastaderma Lamarki* and *Dreissena Polymorpha* species and the *Phragmites australis* as a plant species can be mentioned as the exclusive species of sandy - gravel, rocky - stone, and sandy - rocky coasts. Despite the fact that among the studied stations the sub-region 2 (Sea sangan - Noor) has the maximum number of codes, but according to the type of ground some of the fauna and flora species which are listed above were not available due to the impact of human activity in this area. Although the conducted study about the coastal and Marine classification ecological standard (CMECS) based on the species diversity and dedicated Biotopes was less diverse for each ecology than other studies based on the CMECS model in the south of our country (Shahraki et al, 1387; Ansari et al, 1390; Rahimi et al, 1390; Zolghi et al, 1390), it did not demonstrate the less importance in the coasts of study area according to the species and its distribution. Unlike the southern areas, the identified species in this study are more and diverse along the coastline.

In fact, the provided encodings were kind of ecologies and ecosystems approval based on the presence of fauna and flora species in each of ecologies. Therefore, by identifying these areas, the sensitive and vulnerable ecologies can be identified, and then introduced to the relevant organizations in order to improve the management of coastal areas protection to organizations concerned; the importance of this subject depends on presence of an international standard Support for introducing the regions. This model of classification has a wide range; and because it is at the beginning of way has a lot of problems; and if it is merged with other models of classification, it will provide a new classification system which includes the defects of current classification.

**Appreciations and Thanks**

Thanks to my dear teachers, Dr. Mr. Fereidoon Owfi, and Dr. Mr.Hamed Manouchehri, and also Islamic Azad University, Babol Branch, they all accompanied and supported me in all stages of this research.

## REFERENCES

1. Ansari, Z.; Seif Abadi, S.J; Owfi, F.; 1390, "Ecological classification of tidal areas in the southern of Qeshm island based on the CMECS model using the GIS", MS thesis, Department of Natural Resources and Marine Sciences of Tarbiat Modarres; Noor (Marin Biology group), p. 113;
2. Jahani, A.; Mesgari, S., 1380. "GIS in a simple word", translated by: Jahani, Ali, and Mesgari, Sousan, Geographical organization of Armed Forces Publications, p.128;
3. Daneh Kar, a.; Majnounian, H., 1383. "Proposed criteria for evaluation of coastal- marine areas in order to determine the coastal- marine protected areas of Iran (case study: the evaluation of protected areas in the Caspian Sea)", Journal of Environmental Studies (No. 35), pp. 9-32;
4. Daneh Kar, A., 1382. "The criteria for identifying and choosing the sensitive marine areas in Iran", the port and sea Publication (Eighteenth year, No. 101, 102, Farvardin), pp. 8-12;
5. Rahimi, M., Seif Abadi, S.J.; Owfi, F., 1390, "Ecological Classification of between tidal zones in the north of Qeshm island by model CMECS using the GIS", MS thesis, Department of Natural Resources and Marine Sciences of Tarbiat Modarres University, Noor (Marine Biology group), p. 100;
6. Zolghi, S.; Seif Abadi, S.J; Owfi, F, 1390, "Ecological classification of coasts of Khor Musa estuary Moses CMECS model using the GIS", MS thesis, Department of Natural Resources and Marine Sciences of Tarbiat Modarres University, Noor (Marine Biology group), p.97;
7. Sharifi Pour, R., Owfi, F., 1387, "Important ecosystems, the natural effects and attractive environmental landscapes in the coastal areas of Iran (integrated management of coastal areas of country)", Tehran, Ports and Maritime Organization Press, p.205;
8. Sharifi Pour, R.; Owfi, F., 1386, "Environmental management of coastal areas (the evaluation of status quo), Tehran, Ports and Maritime Organization Press, p.396;
9. Shahraki, M.; Savari, A.; Chegini, V.; Owfi, F., 1387, " Costal and Marine ecological classification standard (CMECS) of sensitive and vulnerable coastal- Marine ecologies (Sea of Oman, Chabahar - goiter), M.S. Thesis, Marine Ecology course, Khorramshahr University of Marine Science and Technology. P.98;
10. Owfi, F.; Vali Nesbat, T; Ramin, M.; Mirdar, J.; Behrouzi Rad, B.; Rabbaniha, M.; Shapouri, M., 1387, "The classification and studies of fauna and flora species across the northern and southern coasts of Iran", Integrated coastal zones management (ICZM), and Environmental Management plan (EMP) publication, p.204;
11. Owfi, F.; 1381, "Proposed criteria for classification of coasts and coastal- Marine areas of Iran evaluation in order to managing the sensitive and vulnerable fisheries (Shilat) ecologies , Tehran, Iranian Fisheries Research Institute, p.300;
12. Owfi, F.; Vafaei, F.; Daneh Kar, A; Rabbaniha, M, 1387, "Integrated Coastal Zone Management of Iran", Tehran, Ports and Maritime Organization Press, p.457.
13. Owfi, F.; 1384, "Criteria for classification of coasts coastal ecologies and determining the ecological assessment criteria of coastal–marine ecologies" ,Tehran, Iranian Fisheries Research Institute, p. 66;
14. Karami Khaniki, A; Kermani, A., 1386, "The criteria for determining the limits of coastal areas of Iran (integrated management of coastal areas of the country), Ports and Maritime Organization, p.48.
15. Beatley, T. D. , Brower, J. and Schwab A. K. (2002) An introduction to coastal zone management Second edition,Island press. USA. 329p.
16. Brown, B. (1993) A classification system of marine and estuarine habitats in Maine: An ecosystem approach to habitats. Maine natural areas program Department of Economic and Community Development .
17. Cowardin, L. M. , Carter, F. C. , Golet, E. T. (1979) Classification of wetlands and deepwater habitats of the United States. U. S. Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Washington. 20-24p.

18. Keefer, M. L. , Peery, C. A. , Wright, N. , Diagle, W. R. , Caudill, C. C. , Clabough, T. S. , Griffith, D. W. , Zacharias, M. A. (2008) Evaluating the NOAA Coastal and Marine Ecological Classification Standard in estuarine systems: A Columbia River Estuary case, staudy Estuarine, Coastal and Shelf Science. 89-106p.
19. Kutcher, T. E. , Garfield, N. H. , Raposa, K. B. (2005) A recommendation for a comprehensive habitat and land use classification system for the National Estuaries Research Reserve System. National Estuarine Research Reserve, Estuerine Reserves Division(Draft). Draft report to NOAA/NOS/OCRM, Silver spiring. 26p.
20. Lund, K. , Wilbur, A. R. (2007) Habitat Classification Feasibility Study for Coastal and Marine Environments in Massachusetts. Boston, Massachusetts Office of Coastal Zone Management .
21. Madden, C. J. , Goodin, K. L. , Allee, R. , Finkbeiner, M. , Barnford, D. E. (2008) Coastal and Marine Ecological Classification Standard (Draft). NOAA and NatureServe. 77p.
22. Owfi, F. , Rabbaniha, M. , Shahraki, M. , (2009) New method for classification of Iranian coastal zone by GIS. Turker- Izmir, INOC.
23. Tyrrell, M. C. (2004) Strategic plan for mapping Massachusetts benthic marine habitats. Boston, Massachusetts Office of Coastal Zone Management. 58p.
24. Valentine, P. C. , Todd, B. J. , Kostylev, V. E. (2005) Classification of marine sublittoral habitats, with application to the northeastern North America region. American Fisheries Society Symposium.