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Habitat Mapping of Mazandaran Coast, from Bablsar until Amir Abad's Behshahr's Port (South Caspian Sea)

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Abstract: Natural resource managers and environmental planners are faced with multiple problems in making decision for coastal-Marine ecologies protection, sustainable utilizing of valuable resources and the Integrated Coastal Zone Management (ICZM). Habitat classification provides an important tool for nature conservation. The Coastal Marine Ecological Classification Standard (CMECS) was developed to meet this need and provide a universally accepted standard classification for coastal and marine habitats.The biological cover (Biotic Cover Component, BCC) is the biotic aspects of substrate at different spatial scales.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).Benthic organisms and vegetative cover of Babolsaruntil Amir AbadBehshahr coastal are for classification of biotic cover were sampled, identified, classified and mapped using GIS approach. Faunal bed, aquatic bed and emergent wetland with different biotopes and biotic groups were observed. This study implemented in two seasonal field studies (summer and winter 2011) with aim to identify,classify and coding the coastal ecologies ofBabolsar-Amir AbadBehshahr regions in Mazandaran province based on the ecological standard of CMECS model.

Key words: Ecological Assessment % Coastal Ecologies % CMECS Model % Iranian Coasts % Mazandaran Province % Caspian Sea

INTRODUCTION

Classification is a prerequisite to structuring knowledge and developing our understanding of the natural world. Classification also provides an important tool for nature conservation. Habitat classification schemes generally assess biotic and abiotic variables and allocate names to a combination of habitat characteristics [1]. The number of habitats that will be identified and classified in a region depends on the heterogeneity of the seabed in physical and biological aspects, data availability and scale [2].‘‘Benthic habitat’’ is a particular environment defined by both the living (biotic) components such as infauna and epifauna and their relationship with the non-living (abiotic) components such as substrate, water depth and bottom topography [3]. The location of boundaries between and composition of habitats is highly dependent on the approach taken to integrate abiotic and biotic information.As a result, habitats are often geology-centric [4] and often defined without any test of the specificityofthe biological assemblages to the abiotic habitat, even when the reported purpose of the mapping is driven by the management of biological

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resources [5,6]. Many classification systems have been developed for regional or local applications [7,8].

In the US, the National Oceanic and Atmospheric Administration (NOAA) initiated the formation of a Coastal and Marine Ecological Classification Standard (CMECS) to serve as the national standard marine classification scheme and to document and describe ecologically meaningful units in a format that uses a common terminology for science, resource management and conservation [9].

The Coastal Marine Ecological Classification Standard (CMECS) was developed with the input of over 40 coastal and 20 marine habitat experts and presents a universally accepted standard classification for coastal and marine habitats [10].The domain of CMECS includes tidal splash zone in the coast to the deepest part of the oceans encompassing all continental and oceanic waters [11].

Though acoustic methods are typically used to identify geological formations, biological formations have also been identified in this way (e.g. coral reefs, [12]; mussel beds, [6]; oyster beds, [12]; worm reefs, [13]; submerged aquatic vegetation, [14], but rarely in soft sediments [15]. CMECS provides a uniform protocol for identification and characterizing ecological units which is intended to allow monitoring, protection and restoration of unique biotic assemblages, endangered species, critical habitats and important ecosystem components [9]. Numerous studies have identified patterns in species-environment relationships in soft sediments [16-20], but fewer have mapped these patterns in order to predict the occurrence of fauna.

CMECS Version III classifies the coastal and marine environment to broadly describe an aquatic setting, called a system and provides additional detail through five underlying components that describe different aspects of the relevant ecology. The CMECS components are SGC (Surface Geology Component) BCC (Biotic Cover Component), GFC (GeoFormComponent), SBC (Sub Benthic Component)and WCC (Water Column Component). The Biotic Cover Component (BCC) is a hierarchical classification that identifies the biological composition and cover of the coastal and marine substrate at different spatial scales.Seafloor habitat maps will be inadequate for management, assessment and preservation of biological resources unless they go beyond simply documenting abiotic and biotic patterns and attempt to accurately represent the relationships between the abiotic and biotic components of the environment.

The goal of this study is identifying, classification and mapping biotic cover in the Babolsar untilport of Amir AbadBehshahr coastal areas using Coastal and Marine Ecological Classification Standard and GIS approach.

MATERIALS AND METHODS

Iran has 873 km coastlines in Caspian Sea and 487 km of coastline belong to Mazandaran province. This province located between 35°47′ and36°35′ North latitude and50°34′ and54°10′ East longitude of Greenwich meridian.Sediment is sand. Bablrod River Estuary, ShazdehRiver Estuary,Telar River Estuary,SiahrodRiver Estuary,Tjan River Estuary and NekaRiver Estuary are unique and important ecosystems in this coastal area.

Study Method: During an information-gathering phase for this study, we made primary field visits toidentify overall descriptions of coastal habitats then performed a detailed coastal survey to more precise habitat mapping and incorporated these units into CMECS structure.Biotic Cover Component of CMECS in different part of the study area identified and mapped. The BCC framework in CMECS is complete and all types from System through the Biotic Group level have been identified and described (Table 1).

Component Units comes in CMECS VIII organized into a branched hierarchy of four nested levels (Figure 1) [19]. It includes class, subclass, biotic group and biotope. Classes and Subclasses are determined by the dominant, in terms of percent cover, biotic cover of the substrate. Biotic groups are functional descriptions of biology intended for widespread applicability, e.g. Oyster Reef, Poly/Euryhaline Sea grass Bed.Biotopes are repeatable and characteristic assemblages of organisms together with the physical habitats that support their existence. BCC biotopes are identified by dominant or diagnostics pecies and provide a detailed reporting of the biological and physical components that form close associations in specific geographic regions [9].While the BCC terms the biota what is currently living in the substrate, sampling for determining the BCC was carried out in summer and winter in 2011. Plant species were collected from all study sites (Figure 1) for identification. Field notes on plants and their habitats with photographs were made.

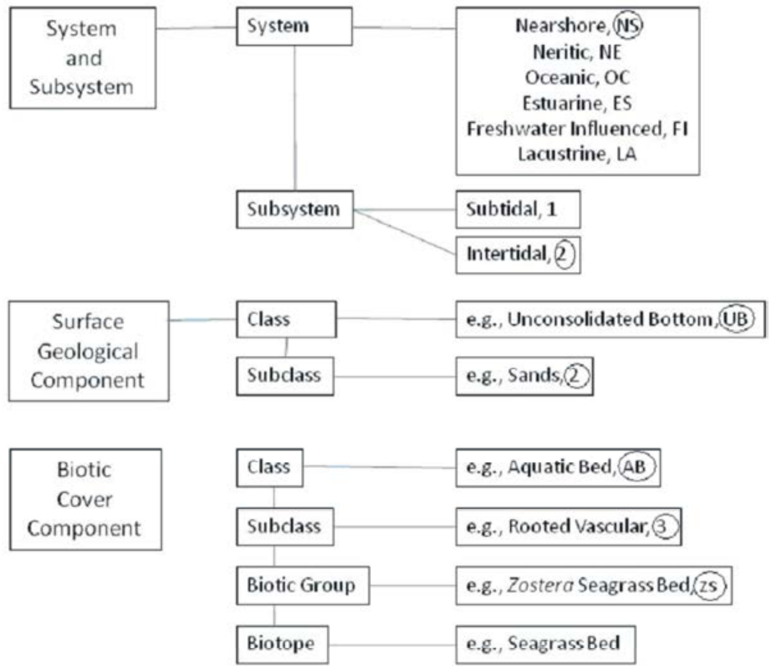

Fig. 1: Component and structure of BCC (Biotic Cover Component) and SGC (Surface Geological Component)in the CMECS III model

Table 1: Biotic cover coding of Mazandaran Coastal waters between Amir Abad until Babolsar

Macro habitat	BCC Code
Sandy-Rock shore	FI1-b:AB1,FI1-b:FB3,ES1- NS1-b:FB3
Sandy Shore	NS1-b:FB3, ES1- b:EM1,FI1-b:AB3

RESULTS

Coastal survey showed that two macrohabitae and two types coastal areas can be distinguished in the study area:Sandy shore and Rocky-sandy shore.Rocky-sandy shore located Babolrodestuary till near MirodVillage. Sandy shore islocated near MirodVillage tillport of AmirAbadBehshahr (Figure 2).

The results of the classification showed that three class of biotic cover present in this three habitats: faunal bed, emergent wetland and aquatic bed.

In Sandy -Rock Shore

Faunal Bed: With dominant cover of sessile, infaunal or slow moving animals (mobile epifauna) was classified and coded.

Emergent Wetland: That is characterized by erect, rooted, herbaceous hydrophytes present for most of the growing season in most years was observed.

Aquatic Bed: Which distinguished by vegetated or microbially-dominated bottoms and greater than 10% cover of vascular plants dominated by submerged rooted vascular species such as sea grasses sub classes determined.

DISSCUTION

CMECS classification approved in north of US shore for the first time base on component of previous classification methods for made a national classification with various applications [10]. According to kind of bottom coastal area is divided to 3 groups: Sandy shore, Muddy shore and Rocky shore. These are having high value [21]. This result indicates that an acoustic in terpretation of broad-scale geologic features likely influenced the composition of biological assemblages, but perhaps did not reflect the more fine-scale abiotic and biotic factors affecting habitat preferences. There are two kinds of shore in this study: Sandy shore. Generally coast was sandy bottom but rock and great boulder taken by human on sandy shore in some parts of shore. Sandy-rocky shore:rock and great boulder taken by human on coast.Most port of Amir Abad Behshahrtill Babolsar coast was sandy shore. Coast was natural sandy in Babolrod estuary that boulder and rock take by human

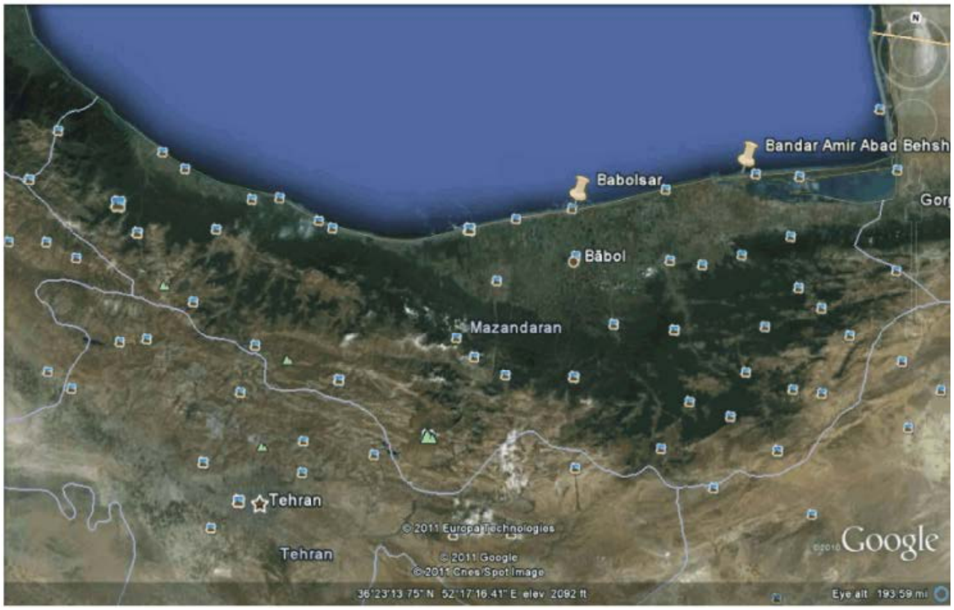

Fig. 2: The study area (Babolsar until port of Amir AbadBehshahr)

on coast.Artificial construction is important part of coastal developing.They consecutive by jetty, breakwater and other human buildings construction.They provide one surface attached for plant and fauna and absorb mobilefauna.This structure also provides shelters apposite predator and dominant current and it can support biotic assemblages that biotic diversity develops by it[9].End of this study and according to Biotope definition from CMECS we determine 9 Biotope and 9 habitats with 9 code and map was provided.We found that a parallel structure for at least the SGC and BCC would improve our ability to directly compare abiotic and biotic constituents of ecosystems at each level. We determined in limit Babolsar Pelazh 1 until Arabkheil Village (Kashtisazy station) with 9.55 km distance, 7 code; Siahrod estuary till Arabkheil Village (Kashtisazy station) with 17.79 km distance, 2 code; Nozarabad Gohabaran till Siahrod estuary with 21.405km, 3 code and port of Amir AbadBehshahrtill NozarabadGohabaran with 17.69 km, 3 code. More than 77% of habitats that identified were located in western half and other habitats were in eastern half.This difference is reasonable with heterogeneity's shore in western half, becausenumbers habitat relevant to heterogeneity of biological and physical properties of sea floor [2].

The habitats we defined using the bottom-up method showed that patterns in macrofauna composition were linked to changes in sediment class and water depth, as has been commonly observed [22-25].

Final Result: According to two kind of ecosystem (Sandy and Sandy-Rocky)in south of Caspian sea (Babolsar till port of Amir AbadBehshahr)and considering to result of this study,clear that habitat dispersion was heterogeneity and patchy in this area and it need to bettermanagement.

REFERENCES

1. Lund, K. and A.R. Wilbur, 2007. Habitat classificationfeasibility study for coastal and marine environments in Massachusetts.Massachusetts Office of Coastal Zone Management. Boston, MA. 31 pages + appendices.
2. Valentine, P.C., B.J. Todd and V.E. Kostylev, 2005. Classification of marine sublittoral habitats, with application to the northeastern North America region. American Fisheries Society Symposium, 41: 183-200. Available at: http://wood shole.er.usgs.gov/project pages/ stellwagen/ index. html.
3. ICES, 2006. Report of the Working Group on Marine Habitat Mapping (WGMHM),
4. Greene, H., M. Yoklavich, R. Starr, V. O'Connell, W. Wakefield, D. Sullivan, J. McCrea and G. Cailliet, 1999. A classification scheme for deep water habitats.Oceanol. Acta, 22: 663-678.
5. Diaz, R., M. Solan and R. Valente, 2004. A review of approaches for classifying benthic habitats and evaluating habitat quality. J. Environ. Manage., 73: 165-181.

6. Kenny, A., I. Cato, M. Desprez, G. Fader, R. Schuttenhelm and J. Side, 2003. An overview of seabed-mapping technologies in the context of marine habitat classification. ICES J. Mar. Sci., 60: 411-418.
7. Allee, R.J., M. Dethier, D. Brown, L. Deegan, G.R. Ford, T.R. Hourigan, J. Maragos, C. Schoch, K. Sealey, R. Twilley, M.P. Weinstein and M. Yoklavich Mary, 2000. Marine and Estuarine Ecosystem and Habitat Classification.NOAA Technical Memorandum.NMFS-F/SPO-43.
8. Cowardin, L.M., V. Carter, F.C. Golet and E.T. LaRoe, 1979, habitats of the United States. U.S. Fish and Wildlife Service.FWS/OBS-79/31 GPO 024-010-00524-6. Classification of wetlands and deepwater Washington DC, pp: 103.
9. Madden, C., K. Goodin, R. Allee, G. Cicchetti, C. Moses, M. Finkbeiner and D. Bamford, 2009. Coastal and marine ecological classification standard. NOAA and Nature Serv. 107pp. Available online: http://www.csc.noaa.gov/benthic/cmecs/ CMECS _ v3 _ 20090824.pdf, Last accessed 12/10/09.
10. Madden, Christopher, J.m Dennis H. Grossman and Kathleen L. Goodin, 2005. Coastal and Marine Systems of North America: Framework for an Ecological Classification Standard: Version II. Nature Serve, Arlington, Virginia.
11. Gandomi, Y., A. Shadi and A. Savari, 2011. Classification of Gomishan Lagoon (Caspian Sea,Iran) by Using the Coastal and Marine Ecological Classification Standard (CMECS). Middle-East J. Scientific Res., 8(3): 611-615.
12. Taylor, C., 2001. Remote acoustic habitat assessment techniques used to characterize the quality and extent of oyster bottom in the Chesapeake Bay. Mar. Geodesy, 24: 171-189.
13. Tomlinson, J., 2006. Mapping and sampling the subtidalhabitat of *Sabellaria vulgaris* in Delaware Bay. Master thesis, University of Delaware, USA.
14. Lefebvre, A., C. Thompson, K. Collins and C. Amos, 2009. Use of a high-resolution profiling sonar and a towed video camera to map a Zostera marina bed, Solent, UK. Estuarine, Coastal Shelf Sci., 82: 323-334.
15. Eastwood, P., S. Souissi, S. Rogers, R. Coggan and C. Brown, 2006. Mappingseabed assemblages using comparativetop-down and bottom-upclassification approaches. Can. J. Fish. Aquat. Sci., 63: 1536-1548.
16. Anderson, J., D. Van Holliday, R. Kloser, D. Reid and Y. Simard, 2008. Acousticseabed classification: current practice and futuredirections. ICESJ. Mar. Sci., 65: 1004-1011.
17. Ellingsen, K., 2002. Soft-sediment benthic biodiversity on the continental shelf in relation to environmental variability. Mar. Ecol. Prog. Ser., 232: 15-27.
18. Ellis, J., T. Ysebaert, T. Hume, A. Norkko, T. Bult, P. Herman, S. Thrush and J. Oldman, 2006. Predicting macro faunal species distributions in estuarine gradients using logistic regression and classification systems. Mar. Ecol. Prog. Ser., 316: 69-83.
19. Hewitt, J., S. Thrush, V. Cummings and S. Turner, 1998. The effect of changing sampling scales on our ability to detect effects of large-scale processes on communities. J. Exp. Mar. Biol. Ecol., 227: 251-264.
20. Thrush, S., J. Hewitt, A. Orkko, P. Nicholls, G. Funnell and J. Ellis, 2003. Habitat change inestuaries: predictingbroad - scaleres ponses of inter tidalmacr of auna to sedimentmud content. Mar. Ecol. Prog. Ser., 263:113-125.
21. Littler, M.M. and S.N. Murray, 1975. Impact of sewage on the distribution, abundanceand community structure of rocky intertidal macro organisms. Marine Biology, 30: 277-291.
22. Kostylev, V., B. Todd, G. Fader, R. Courtney, G. Cameron and R. Pickrill, 2001. Benthic habitat mappingon the Scotian She lf base donmulti beam bathy metry, surficial geology and sea floor photo graphs. Mar. Ecol. Prog. Ser., 219: 121-137.
23. Verfaillie, E., S. Degraer, K. Schelfault, W. Willems and Van V. Lancker, 2009. A protocol for classifying ecologically relevant marine zones, a statistical approach. Estuarine, Coastal Shelf Sci., 83: 175-185.
24. Zajac, R., R. Lewis, L. Poppe, D. Twichell, J. Vozarik and M. DiGiacomo-Cohen, 2000. Relationships among sea-floor structure and benthic communities in Long Island Sound at regional and benthoscape scales. J. Coastal Res., 16: 627-640.
25. Zajac, R., R. Lewis, L. Poppe, D. Twichell, J. Vozarik and M. DiGiacomo-Cohen, 2003. Responses of infaunal populations to benthoscape structure and the potential importance of transition zones. Limnol. Oceanogr., 48: 829-842.