

## Habitat Mapping of Golestan Coasts (Southeast Caspian Sea), Iran

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**Abstract:** 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. Benthic organisms and vegetative cover of Golestan coastal area 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. The results of this study provide useful data for management purposes and conservation goals.

**Key words:** Coastal Classification % CMECS % Biological Cover % Golestan % Caspian Sea

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### 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]. Many classification systems have been developed for regional or local applications [3-5]. 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 [6]. The domain of CMECS includes tidal splash zone in the coast to the deepest part of the oceans encompassing all continental and oceanic waters [7]. 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 [8]. 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 (GeoForm Component), 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. The goal of this study is identifying, classification and mapping biotic cover in the Golestan coastal areas using Coastal and Marine Ecological Classification Standard and GIS approach.

### MATERIALS AND METHODS

**Study Area:** Golestan province with an area of 20312 km<sup>2</sup> is located in the Northern part of Iran on the south eastern shore of the Caspian Sea. The province located between 36° 44' and 38°05' North latitude and 53°51' and 56°14' East longitude of Greenwich meridian.

Golestan province stretched from international border with Turkmenistan Republic in the North of Gomishan wetland to end of Gorgan bay in south east of Caspian Sea by approximately 90 km length. Topographic slope of coastal is very gentle. Sediment is from fine clay and silty to clay sand sediments. Gomishan international wetland, Gorganroud and Gharasou Rivers estuaries and Gorgan bay are unique and important ecosystems in this coastal area. In general fluctuations of Caspian Sea level in this region are very important and affect the economy and coastal habitats.

**Study Method:** During an information-gathering phase for this project, we made primary field visits to identify 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 parts 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 of Biotic Cover Component Units comes in CMECS V3 organized into a branched hierarchy of four nested levels [8]. It includes class, sub class, 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/Euhaline 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 diagnostic species and provide a detailed reporting of the biological and physical components that form close associations in specific geographic regions [8].

While the BCC terms describe the biota that is currently living on the substrate, sampling for determining the BCC was carried out in summer and winter in 2009. Plant species were collected from all study sites for identification. Field notes on plants and their habitats with photographs were made.

## RESULTS

Coastal survey showed that three homogeneous macrohabitats can be distinguished in the study area: Gomishan wetland, Gorganroud estuary and Gharasou estuary.

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

Table 1: Biotic cover coding of Golestan Coastal waters

Macrohabitat	BCC Code
Gomishan	ES.0_b:FB.2, ES.0_b:EM.1, ES.0_b:AB.3
Gorganroud estuary	ES.0_b:FB.3
Gharasou estuary	ES.0_b:FB.1, ES.0_b:EM.1

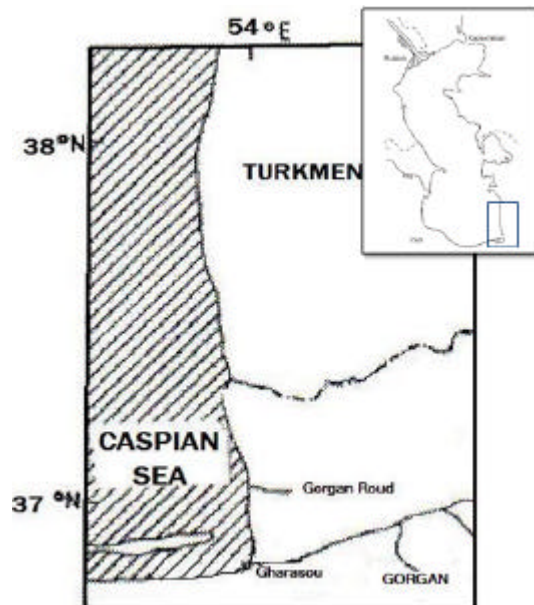


Fig. 1: The study area

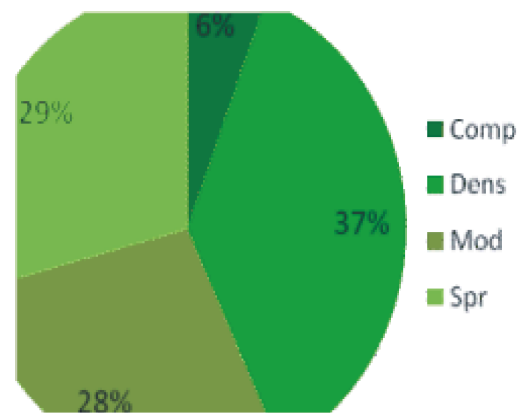


Fig. 2: Golestan Percent Cover Range

### In Gomishan Wetland:

**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 (Fig. 3).



Fig. 3: Classified Map of Gomishan wetland Applying CMECS Biotic Cover Component



Fig. 5: Classified Map of Garasou Estuary Applying CMECS Biotic Cover Component

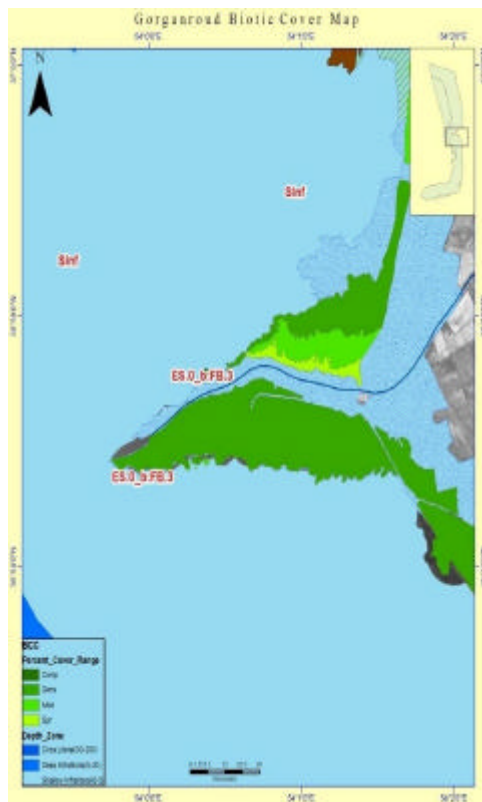


Fig. 4: Classified Map of Gorganroud Estuary Applying CMECS Biotic Cover Component

In Gorganroud estuary faunal bed with evidence of infaunal organisms where distinguished (Fig.4).

In Gharasou estuary faunal bed with sessile epifauna and emergent wetland class by emergent brackish salt marsh subclass were determined (Fig.5).

## DISCUSSION

Even though surface geology along Golestan coastal area is relatively indistinguishable which consist of unconsolidated bottom with mud and in some places sand, relatively divers biotic cover was observed. This heterogeneity of biotic cover may be due to variation in other factors such as currents and sediment and water input of rivers.

Coastal salt marshes are found in low-energy, wave-protected and sedimentary environments near the riverine estuaries [9]. We can see this in Gorganroud and Garasou estuaries. These ecosystems which are rich in nutrients and very productive have important role in biological cycles of commercial fishes such as sturgeons.

Macrobenthic abundance and variation in Caspian Sea is low rather than other marine ecosystems. Difference in benthic abundance and biomass have relationships with other factors such as nutrient abundance, depth, light and physicochemical properties [10].

Coastal and marine managers can benefit from classification and mapping results because it will provide standardized descriptions to identifying and mapping habitats and promote information transmission among scientists and managers [1].

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