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# First Record of Sponge Distribution in the Persian Gulf, (Hengam Island, Iran)

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**Abstract:** The present study is a first attempt to examine sponge distribution in the Persian Gulf (Iranian costs) and suggests that physical and biological factors influence the sponge distribution patterns in Hengam Island. The purpose of this study is to provide patterns of sponges distribution and depth influence on sponge abundance and biomass on the Hengam Island. Surveys of sponge distribution were conducted June 2006 and February 2007 at 5, 10, 15 and 20 m depths sites in two locations: East and West of the Hengam island. Abundance and biomass of sponges species were surveyed at different depths on the Hengam Island in the Persian Gulf. All data on sponges species number and abundance and biomass in each region of Island were taken by SCUBA diving. Transect sampling in this area revealed distribution of sponges species. The sponges species in this area consist of *Callyspongia clavata*, *Callyspongia vasselli*, *Hyrtios erectus*, *Haliclona* sp., *Leucetta* sp., *Ircinia echinata* and *Dysidea cinerea*. Abundance and biomass of sponges in Hengam Island increased at 15-20 m depths.

**Key words:** Abundance, biomass, depth, distribution, Hengam island, Persian Gulf, sponges

## INTRODUCTION

Sponges are an important component in many benthic communities and can dominate the benthos in some regions in terms of biomass and diversity (Schmahl, 1990a; Wilkinson and Cheshire, 1990; Duckworth and Wolff, 2007). Sponges are found from deepest oceans to the edge of the sea (Hooper, 2000). Distribution patterns of sessile organisms such as sponges may vary (Duckworth and Wolff, 2007). Environmental parameters are well known to influence sponges distribution (Diaz *et al*., 1990; Schmahl, 1990b; Alcolado, 1990; Bell and Smith, 2004). Environmental and biological factors can also generate randomness in sponge distribution (Zea, 2001). However, within most habitats a suite of biological and physical factors are likely to be responsible for any individual species abundance and distribution pattern, rather than any particular variable (Bell and Smith, 2004). Wilkinson and Cheshire (1989) and Zea (2001) believed interaction of physical, biological and stochastic factors influencing the distribution and abundance of individual species. The abundance and distribution patterns of sponges can be influenced by water flow and depth (Wilkinson and Evans, 1989; Roberts and Davis, 1996; Duckworth and Wolff, 2007), tidal height (Barnes, 1999), predation (Dunlap and Pawlik, 1996), light (Cheshire and Wilkinson, 1991) and substrate and habitat type (Adjeroud, 1997; Duckworth and Wolff, 2007). The influence or impact of each factor varies among sponge species, often restricting species to specific area or depth (Wilkinson and Evans, 1989; Duckworth and Wolff, 2007). To date, no published reports are available on sponges distribution patterns from Iranian coasts of Persian Gulf. This study is the first report of sponge distribution in this area. Based on the above-mentioned information, purpose of the present study is to examine distribution of sponges and study of depth parameter influence on sponges abundance and biomass in Hengam Island.

## MATERIALS AND METHODS

Hengam Island (Fig. 1) is located in the Hormoz strait mouth on the Persian Gulf waters (at 55°54′40"-55°54′55" E and 26°36′43"-26°41′15" N). Qeshm and Larak Islands are located of the north and northeast of the

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Fig. 1: Map of Hengam island

Hengam Island. Length, width and area of this Island is about 9.8, 3-6 km and 50 km$^2$, respectively. In Hengam Island, major substrates to sponges are sand, respectively rock, sandstone, mud and coral reef (Hafezniya, 2003). Surveys of sponge distributions were conducted in June 2006 and February 2007 at 5, 10, 15 and 20 m depths sites in two locations of Hengam Island (East (55°54′33″ E, 26°38′56″ N) and West (55°51′37″ E, 26°39′29″ N)). Three 20×1 m transects were examined at each depth, with each transect separated by at least 20 m. By SCUBA diving all obvious sponges within each transect were collected and weighed (wet). Number of sponges specimens of each species were recorded in each depth on the East and West of the Hengam Island. Single ANOVA were used to examine different in sponge abundance and biomass data among depths.

## RESULTS AND DISCUSSION

Analysis variance on individual abundance and sponge biomass on two region of Hengam Island shows significant relation to depth. Sponge individual abundance and biomass increase with depth on Hengam Island (Table 1). Abundance of sponge species varied significantly between depths on two regions of Island (Table 1), with more individuals found at 15 and 20 m depths (Fig. 2).

Sponge biomass on the Hengam Island shows a significant relationship to depth at each region (Table 1). Mean wet biomass of individual sponges varies with depth. In two regions of Hengam Island, biomass is greatest at 20 m depth and low at 5 m depth. Mean weight of individuals sponges was 89 g at 5 m and 249 g at 20 m depth (Fig. 3). The sponge fauna on the East and West of the Hengam Island was seven species. Sponge species on Hengam Island consist of *Callyspongia clavata*, *Callyspongia vasselli*, *Hyrtios erectus*, *Haliclona* sp., *Leucetta* sp., *Ircinia echinata* and *Dysidea cinerea*.

Table 1: Results of analysis variance on individual abundance and total sponge biomass on two regions and depth of Hengam Island

| Region | Abundance (No. m$^{-2}$) | Biomass (g m$^{-2}$) |
|---|---|---|
| East | $p<0.05$ | $p<0.05$ |
| | 5<10<15<20 m | 5<10<15<20 m |
| West | $p<0.05$ | $p<0.05$ |
| | 5<10<15<20 m | 5<10<15<20 m |

Sponges are clearly an important component of benthic communities in the Hengam Island. This study is the first one to investigate for sponges distribution within Hengam Island in the Persian Gulf. In this survey sponges fauna on the East and West of this region at 5-20 m depths was seven species. The abundance and biomass of sponges differ with depth on Hengam Island in the Persian Gulf. Biomass and abundance of sponges shows significant with depth (Table 1). The variation in abundance of sponges species at depths could result from biological and physical factors such as degree of physical turbulence, light transmittance (Wilkinson and Cheshire, 1989). Both decrease with depth and both are able to affect sponge populations (Wilkinson and Evans, 1989). Water turbulence and UV radiation can also

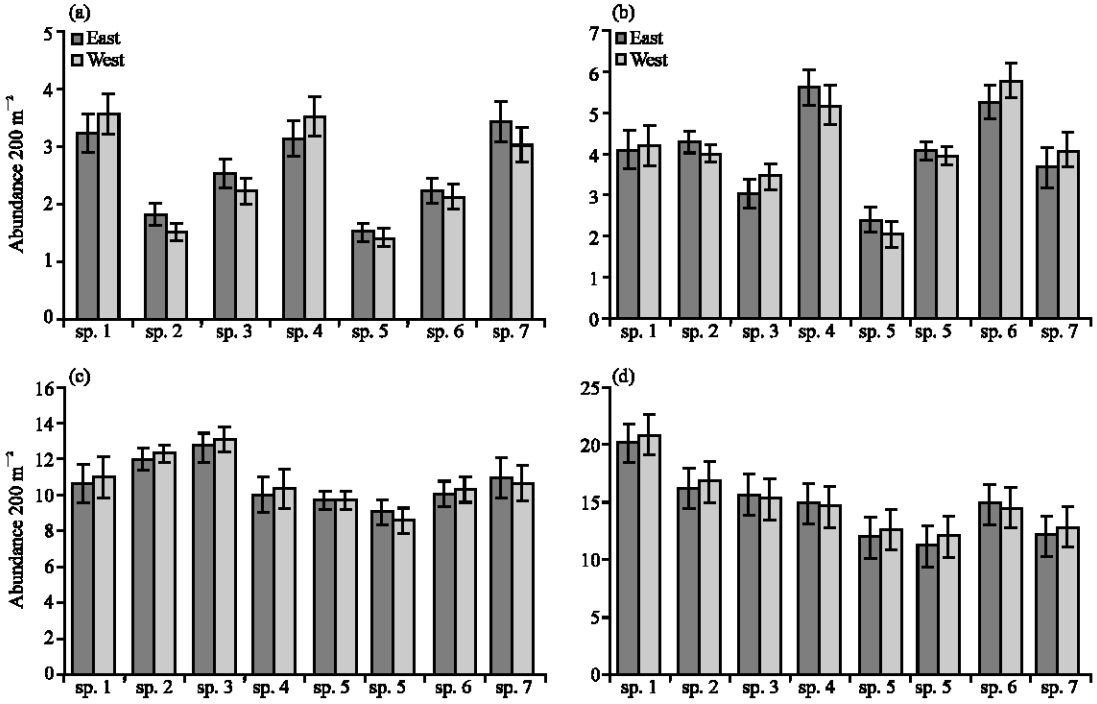


Fig. 2: Mean abundance of sponge species on four depths of East and West on Hengam Island. (A) 5 m, (B) 10 m, (C) 15 m and (D) 20 m. sp. 1: *Callyspongia clavata*, sp. 2: *Hyrtios erectus*, sp. 3: *Ircinia echinata*, sp. 4: *Callyspongia vasselli*, sp. 5: *Leucetta*, sp. 6: *Dysidea cinerea*, sp. 7: *Haliclona* sp.

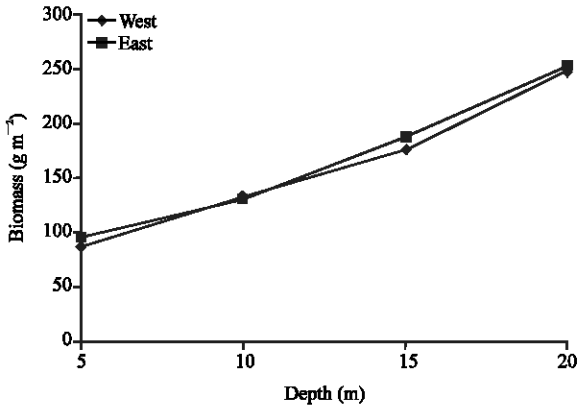


Fig. 3: Sponge biomass at 5, 10, 15 and 20 m depth on the East and West of Hengam Island

influence sponge distribution, restricting some species to less-turbulent area where physical damage is less or to areas where radiation levels are low (Jokiel, 1980; Wilkinson and Trott, 1985; Wilkinson and Evans, 1989; Bell and Barnes, 2003; Duckworth and Wolff, 2007). UV light could inhibit the growth of some sponges within the first 10 m depth, but, growth did occur where the sponges were shielded from UV light (Jokiel, 1980). Over variable depth, this generally results in highest sponge abundance in deeper water where levels of water turbulence and radiation are lower (Wilkinson and Evans, 1989; Diaz *et al*., 1990; Schmahl, 1990a, Roberts and Davis, 1996; Duckworth and Wolff, 2007). Wave-induced turbulence is possibly a factor which limits sponge growth in exposed, shallow water habitats (Palumbi, 1984; Wilkinson and Evans, 1989). Few sponges can withstand strong turbulence and sponge populations increase markedly below 10 m where effects of turbulence are attenuated (Wilkinson and Evans, 1989). Sponges in shallower waters are probably preyed upon by fish and turtles; however, predation was not apparent at greater depths (Wilkinson, 1982). There are Hawksbill turtles (*Eretmochelys imbricata*) in the Persian Gulf (Hengam Island) (Mobaraki and Elmi, 2005). They are major predators of sponges at shallower waters in this Island. This may explain the high abundance of sponges at 15-20 m depths on the Hengam Island. With species surveys at both region of Island, it was distinguished that all species had similar distribution on the West and East of the Hengam Island. This case indicated that similar environmental factors influence on sponges distribution in this Island. In conclusion, sponge distribution on Hengam Island correlates with depth. Turbulence and light decrease with increasing depth and both appear to be important factors in determining sponge abundance

and biomass. Therefore abundance and biomass of sponges increase with increase depth in Hengam Island (Table 1, Fig. 2, 3).

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