Review: A comparative study of Seagrasses species in the regional seas and QMZ

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Abstract

Seagrasses are submerged flowering monocot green plants and are primary producers of food for numerous marine animals. Seagrasses are of worldwide distribution, encountered at the lower intertidal zone and may be found at lower depths if the seawater is clear. The numbers of seagrass species worldwide was estimated to be approximately 60-72 known species of seagrasses. It is now evident that the number of seagrasses is almost 200 species comprising 25 genera and 5 families. Of these, 10 are on the Red List; counted as risking extinction of which 3 are considered as endangered. The Western Indo-Pacific realm encompasses 13 species in two families; the Cymodoceacae with 4 genera and the Hydrocharitaceae with 3 genera. Twelve (12) species extend into the Red Sea, 4 occur in the Arabian/Persian Gulf and 4 in the Arabian Sea.

Introduction

Seagrasses are special amongst flowering plants being adapted marine life completely immersed in seawater. The distinction between seagrass species is based on the mode of the plant growth, the leaf morphology and the characteristics of the floral parts. The keys to the families, genera and species presented are based on a number of contributions focusing on the identity of seagrasses.

Seagrasses are found across the world, from the tropics to the arctic (Figure 1) and are by the coastlines, with a global area of 300,000-600,000 km2 and have declined in area by 29%. In recent times, seagrasses are continuously declining with a yearly rate of 1.5% and continue to decline. Their areas are being replaced by muddy and sandy soils (Short et al., 2007). Regional waters are comparatively saline particularly the Gulf where the salinity gradient is variable from one location to another. The seagrass species reported in the Gulf are known to be tolerant of higher salinities (Erftemeijer and Shuail, 2012).

Seagrasses belong to 5 families: Cymodoceaceae Hydrocharitaceae , Posidoniaceae, Zosteraceae and Ruppiaceae (Species List, 2013). The risk of extinction is indicated for ten out of the 60 plus accepted species of which 3 are given as endangered (Short et al., 2011).

The Arabian Gulf a semi-enclosed shallow sea in a subtropical arid region. It is about 1000 km long, with maximum width of 340km. The volume is approximately 8,400 km3. The two rivers Tigris, the Euphrates, and the Karun at the delta of the Shatt al Arab feed the sea with freshwater. The Arabian/Persian coastline covers eight countries: Iraq, Kuwait, Saudi Arabia, Kingdom of Bahrain, Qatar, United Arab Emirates (U.A.E.), Oman on the western coastline of the Gulf, and Iran on it eastern coastline. According to Sheppard et al. 1992; 2010, a density gradient is the driving force of water circulation in the Gulf. Water of normal oceanic salinity enters through the Strait of Hormuz at the surface and there is a compensating outflowing current of high salinity water along the bottom. The general circulation pattern is counterclockwise, where there is a water movement northwards along the Iranian coast and a corresponding one southwards along the Arabian coast. The tides vary from 3-4 m to 1m from north to south respectively (Siddeek et al., 1999). The Gulf is known to be a sea with the highest salinity, highest seawater temperature and is the smallest in size .Gulf encompasses a surface water body of 214 x 105km2 and compared to world oceans and seas, it has the least area (Ansari, 2009).

Material and methodology

The information was selected from articles and ref. were included indexed in the period 1977-2016., World Atlas of Seagrasses, Seagrass habitats in the Arabian Gulf, ESC 2008-2014 Baseline survey, FAO 1982, SCENR 2004, Global seagrass distribution and diversity. A biological model. Diversity of seagrasses in worldwide and other reference. The following uniterms were used: Arabian gulf, Seagrasses Monitoring, Ecology, Physiology, Management, Atlas, seagrass beds, Biological Diversity, Field Guide, Environmental Impact Assessment, habitats, Baseline survey , Taxonomy and biogeography of seagrasses, Distribution, abundance, and species composition Global seagrass distribution and diversity and other reference.

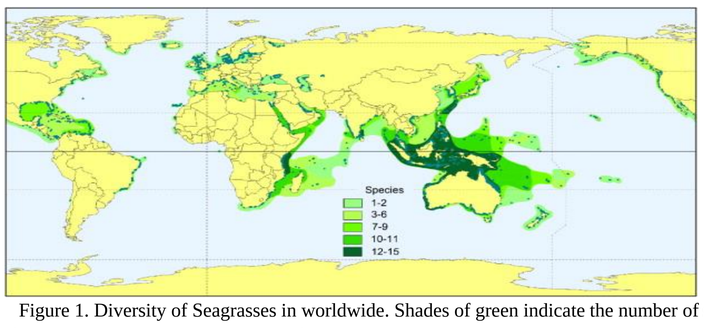

Figure 1. Diversity of Seagrasses in worldwide. Shades of green indicate the number of species reported for a given area. The darker shades of green indicate more species are present. Source: (Short et al., 2007).

Halophila ovalis. *Halodule uninervis.* *Halophila stipulacea.*

Figure 2. Species are known to occur in Qatar marine zone

Seagrass communities

It is established that seagrasses consolidate and stabilize bottom sediments, create and maintain good water quality (clarity), produce oxygen, provide food, and nursery ground for many animals (Figure 3). Seagrasses form dense meadows in healthy locations. The seaweeds has been proven to be very important in GHG emissions. Studies carried out by Greiner et al. (2013) proved the value of seagrass ecosystem as a storage of carbon and nutrients. The "blue carbon" in marine sediments is now a focus of many recent studies.

Figure 3. Seagrass bed with fish, turtle, sponges, brittle starfish and bivalves.

Results

*Distribution of seagrasses along the coastline of the Red Sea

The Red Sea is a long narrow basin approximately 2,000km long. Twelve (12) seagrass species belonging to the seven accepted genera have been reported to occur in the Red Sea and the Gulf of Aden (UNEP, 1997; Hariri et al., 2000; Lipkin, 2003; Gaiballa, 2005; Gladstone et al., 2006; EL Shaffai, 2011) (Table 1).

Country	Family Cymodoceaceae					Family Hydrocharitaceae							Total
	Cymodocea rotundata Asch. & Schweinf.	*Cymodocea serrulata* (R.Br.) Asch. & Magnus	*Halodule uninervis* (Forssk.) Boiss.	*Syringodium isoetifolium* (Asch.) Dandy	*Thalassodendron ciliatum* (Forssk.) den Hartog	*Enhalus acoroides* (L.f.) Royle	*Halophila decipiens* Ostenf.	*Halophila minor* (Zoll.) den Hartog	*Halophila ovalis* (R. Br.) Hook.f.	*Halophila pinifolia* (Miki) den Hartog	*Halophila stipulacea* (Forsskål) Ascherson,	*Thalassia hemprichii* (Ehrenb. ex Solms) Asch.	
Egypt	+	+	+	+	+	+	+	+	+	+	+	+	12
Sudan	+	+	+	+	+	+		+	+		+	+	10
Eretria	+		+	+	+	+			+		+	+	8
Saudi Arabia	+		+	+	+	+		+	+		+	+	9
Yemen	+	+	+	+	+	+			+		+	+	9

Table 1. Distribution of seagrasses species along the Red Sea coastline.

AREA	Iran	Iraq	Kuwait	Kingdom of Bahrain	Qatar	U.A.E.	Oman	Saudi Arabia
Halophila ovalis (R. Brown) Hook. f	*		*	*	*	*	*	*
Halophila stipulacea (Forsskal.) Ascherson.				*	*	*		*
Halodule uninervis (Forsskal.) Ascherson.	*		*	*	*	*	*	*
Syringodium isoetifolium Ascherson. Dandy				*			*	
Thalassodendron ciliatum (Forsskal) den Hartog							*	
∑ species	2	0	2	4	3	3	4	3

Table 2. Occurrence of seagrass species in the Arabian/ Persian Gulf countries.

*Distribution of seagrasses along the coastline of the Gulf

Seagrass meadows in the Gulf occur in nearshores and shallow waters less than 10m as underwater meadows or pastures. The largest areas of seagrass beds occur off the coasts of the UAE and between the Kingdom of Bahrain and Qatar with an estimated area of 5,500 and 1,000km ^{2}, respectively. (Table 2) shows occurrence of seagrass species in the Arabian/ Persian Gulf.

*Distribution of seagrasses along the coastline of Qatar

Qatar is a small low-lying limestone peninsula situated midway along the western coast of the Gulf, including a number of small offshore islands. The total coastline including the islands is over 750km approximately 23% of the coasts of the Gulf with numerous bays and undulations and protrusions seawards.

The total area of Qatar marine zone (EEZ) is approximately 35,000km ^{2} almost 15% the Gulf area.

Three species are known to occur in Qatar marine zone at many locations on the eastern coastline. Records for the western coastline are few in limited studies (Figure 4a, b & c).

These are *Halophila stipulacea*, *Halophila ovalis is* fairly common and *Haplophila ovalis* is relatively rare and *Halodule uninervisis* the most Common (Figure 2) .

A fourth species *Syringodium isoetifolium* reported to occur on the western coastline (Qatar – Bahrain) apparently does not exist.

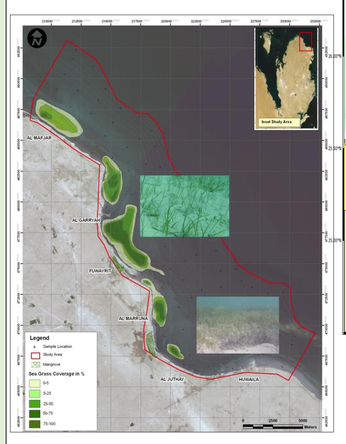

Figure 4b. Distribution and cover of seagrasses along the eastern coastline from N Raslaffan to S Al Mafjar.
Source: (ESC, 2010-2011).

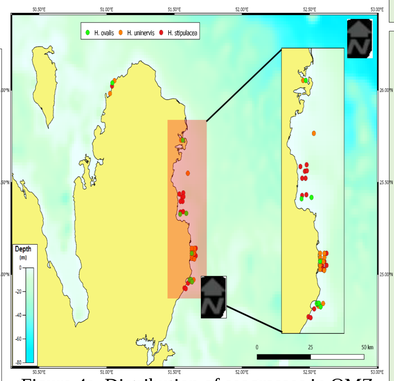

Figure 4a. Distribution of seagrasses in QMZ based on GPS locations.
Source: Dr. Sinan Husrevoglu, ESC.

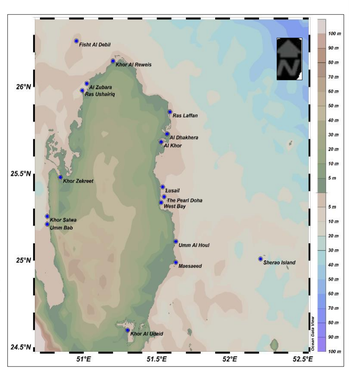

Figure 4c. Distribution of seagrasses in QMZ based on location records.
Source: Dr. Sinan Husrevoglu, ESC.

Conclusion & Recommendations

*The three seagrass species reported to occur in Qatar Marine Zone and generally in the Gulf are tolerant of salinity. *Halodule univernis* is the most tolerant and it is the most common of the 3 species.

*Qatar is a fish-based diet nation similar to other Gulf countries, has the second largest population of the endangered dugongs, the engendered marine turtles feed in its waters, the Hawksbill turtles nest on Qatari coastlines.

*Both seagrasses and seaweeds are primary producers, play an important role in the control of GHG emissions.

*They are an essential habitat for a number of marine organisms and most importantly their role in food security.

*The global estimate of loss is 2-5% floating masses of seagrass and seaweed detritus were observed and are most likely a result of dredging operations. The irresponsible net-fishing in some areas impact negatively on marine vegetation which is essential for the survival of marine organisms and the Gulf waters suffer from an anthropogenic impacts like the locations of desalination plants is a major problem for the future of the Gulf. (Figure 5&6) .

*Therefore they are diminishing and are being lost at an alarming rate. According to Short et al. (2011) 10 species are on the IUCN Red List of risk of extinction and 3 are endangered out of the estimated total number of 72 species.

Yet much more is needed to document their exact coverage in the Gulf and evidence of their value as a critical marine habitat.

*Environmentalists must embark on an active program to protect the existing seagrass beds and to increase their diminishing cover.

*This will also be a contribution by Qatar to reduce the negative impact of climate change and towards its commitment to reduce of CO2 emissions from their industrial sources.

Figure 5. Masses of seaweeds and seagrasses in fishermen nets, Al Shamal coastline, Qatar.

Figure 6. Drifting masses of seagrasses and seaweeds possibly due to dredging operations on the seabed. S.QMZ.

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