

## New and Previous Records of Scleractinian Corals from Chabahar Bay, Sistan & Baluchistan, Iran

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**ABSTRACT** Based on the morphology and corallites structures, seventeen species of scleractinian corals in seven families were described from the Chabahar Bay, fourteen species of which are being reported for the first time from this bay. The identified species include *Acropora valida* Dana, 1846, *Acropora clathrata* Brook, 1891 and *Acropora nausta* Dana, 1846 belonging to Acroporidae, *Favia matthai* Vaughan, 1918, *Favites complanata* Ehrenberg, 1824, *Favites flexusa* Dana, 1846, *Leptastrea purpurea* Dana, 1846, *Faviafusus* Forskal, 1775 and *Cyphastrea microphtalma* Lamarck, 1816 belonging to Favidae, *Acanthastrea hillae* Wells, 1955 and *Scolymia australis* Milne Edwards and Haime, 1849 belonging to Musidae, *Pocillopora damicornis* Linnaeus, 1758 belonging to Pocilloporidae, *Porites solida* Forskal, 1775 and *Porites compressa* Dana, 1846 belonging to Poritidae, *Coscinaraea wellis* Veron & Pichon, 1980 and *Pseudosiderastrea tayami* Yab and Sugiyama, 1935 belonging to Siderastreidae and *Turbinaria peltata* Esper, 1794 belonging to Dendrophylliidae, were identified.

**Key words:** Scleractinian Coral, Identification, New record, Chabahar Bay

### 1 INTRODUCTION

The Chabahar Bay is located in the southeastern part of Iran where the hard corals live in patches under fragile circumstances.

Coral reefs constitute the most diverse and complex marine ecosystem. They are highly productive with annual gross production rates in the range of 2000- 5000g cm through efficient retention and recycling nutrients, Coral reefs of the world cover an estimated area of 600000 km<sup>2</sup> (Smith, 1978; Kleypas, 1977). Over half of this (54%) lies in the Mediterranean India Ocean (Tamal, 2011).

A large part of coral taxonomy is based on the morphology of the skeleton and a few

technical terms need to be introduced and explained. The calcium carbonate skeleton of an individual polyp, called the corallite, is a tube that contains vertical plates radiating from the periphery toward the center. These skeletal divisions, or septa (meaning partition), correspond to the mesenteries or vertical fold of the polyp body stalk. The tube itself is called the wall and the part of the skeleton inside the wall is the calyx. Adjacent tubes are joined by horizontal skeletal structures, secreted by the lower part of the body wall between polyps, called coenosteum. A few species have an additional thin layer of skeleton around the wall called epitheca. The wall and its associated structures include several

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skeletal elements which vary in importance in the different groups of corals.

The studies on taxonomy of coral reefs in the southeast coasts of Iran started as early as 2009 by Maghsoudlou in the Gulf of Oman. During this study, 107 coral species were reported (Maghsoudlou, 2011).

Due to the extremes in water temperature, salinity and anthropogenic factors that are close to the physiological tolerance limits, coral diversity and reef building potential in the south Persian Gulf is less than 40 species (Sadeghi, 2009). According to Maghsoudlou (2008), from 700 identified coral species, only 37 species have been observed in southern waters of Iran. 107 and 200 species of them belong to the Gulf of Oman and the Red Sea, respectively.

The identification of hard coral in the Bay of Chabahar started with Sadeghi (2008), during which three species, viz. *Faviafavirus*, *Acropora valida* and *Cyphostrea microphthalma* were

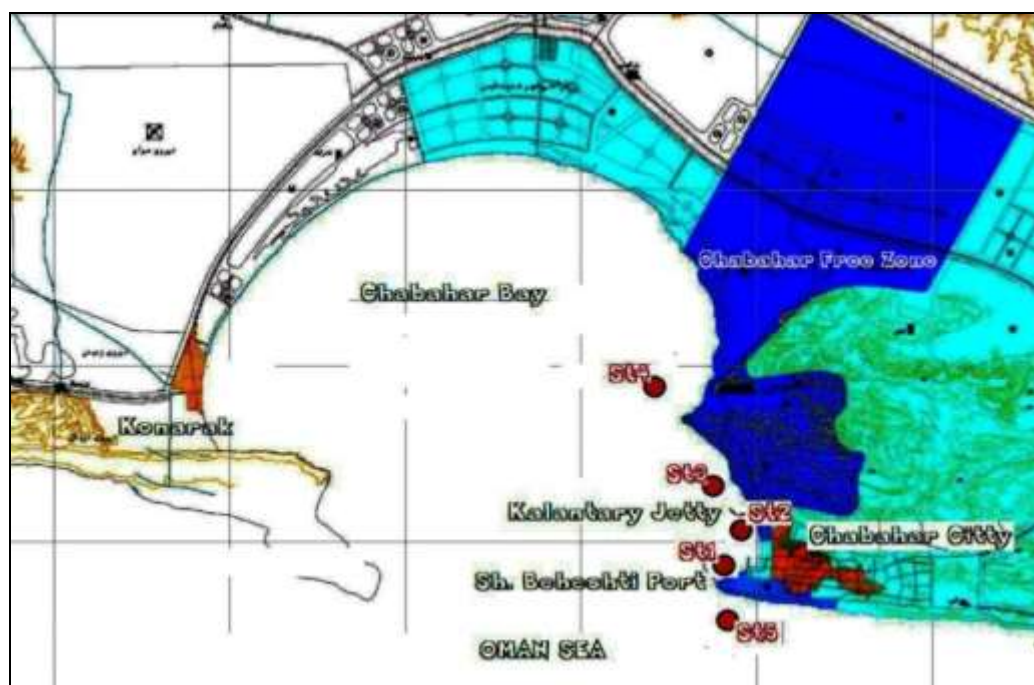
identified, based on the size and morphological characters.

In the present study, hard corals collected from July 2010 to May 2011 in Chabahar Bay are being recorded.

## 2 MATERIAL AND METHODS

The study was conducted at Chabahar Bay in southeastern coasts of Iran ( $25^{\circ} 17' N$  and  $60^{\circ} 37' E$ ) during July 2010 to May 2011 (Figure 1).

Hard corals were studied through direct underwater observation and photographing samples using underwater digital camera (Canon G11, 12 megapixels, equipped with underwater house) as well as sample collection for their detailed morphological features. For collection, a small piece of colony was taken to the laboratory. Identification was confirmed using Veron *et al.* (2000) and Cleareboudt (2006).



**Figure 1** Study Areas of Chabahar Bay (Braulik, 2010)

### 3 RESULTS

Seventeen hermatypic corals (Order: Scleractinia) were identified at five study sites in Chabahar Bay, the following fourteen species of which being new records from the Oman Sea along the southeastern coasts of Iran).

#### 3.1 Systematic

*Acropora valida*, Clareboudt, 2006 (Figure 2a)

Family: Acroporidae (Verrill, 1902)

Genus: *Acropora* (Oken, 1815)

##### Description:

Small rounded corymbose to caespitocorymbose colonies or thick tables. Corymbose to caespitocorymbose branches, 7-20 mm diameter; axial corallites outer diameter 1.6-2.8 mm, inner diameter 0.7-0.9 mm, primary septa to 1/2 R, secondary septa to 1/3 R; radial corallites similar sizes or a mixture of sizes, crowded on branch, appressed tubular or tubonariform, with rounded to slightly elongate openings, primary septa to 2/3 R, secondary septa to 1/4 R; coenosteum reticulate with densely and evenly arranged spinules throughout (Crossland, 1952, Veron and Wallace 1984). The known colors are purple with yellow corallite tips or purple, brown, or green. *Acropora valida* has widely distributed throughout the Indo-Pacific, Persian Gulf and Oman Sea.

**IUCN Red List Category and Criteria:** Least Concern, 2001.

*Acropora khayranensis*, Clareboudt, 2006 (Figure 2b).

Family: Acroporidae (Verrill, 1902)

Genus: *Acropora* (Oken, 1815)

##### Description:

*A. khayranensis* is a table species with colonies exceeding sometimes several meters across. Colonies develop a tabular growth form with loosely anastomosing branches. Colonies are usually dark brown or green with sharp edged

nariform opening. This species is close to *A. downingi*. *A. khayranensis* often grows in mixed communities with *A. downingi* and *A. pharaonis*. Small colonies of the 3 species look similar, but the difference in growth form become more and more apparent in mature colonies. This species has often been referred to as *A. valencinensi* in earlier studies, but it does not have the numerous vertical secondary branchlets of the latter species.

**IUCN Red List Category and Criteria:** Least Concern, 2001.

*Acroporanasuta*, Clareboudt, 2006 (Figure 2c)

Family: Acroporidae (Verrill, 1902)

Genus: *Acropora* (Oken, 1815)

##### Description:

The corymbose colonies usually have a short thick stalk. Corymbose branching, branches up to 12 mm in diameter arising from a central to side attachment; axial corallites outer diameter 2.0-3.0 mm, inner diameter 0.6-1.1 mm, primary septa to 3/4 R, secondary septa to 1/4 R; radial corallites evenly arranged nariform along branches, forming a neat rosette pattern when viewed from the branch tip, primary septa to 2/3 R, secondary septa to 1/4 R; coenosteum densely costate or lines of laterally flattened spinules on radial corallites, reticulate with scattered spinules in intercorallite areas. The known colors are; pale brown with blue tips, blue, purple, or green.

**IUCN Red List Category and Criteria:** Status: Near Threatened, 2001.

*Favia matthai*, Clareboudt, 2006 (Figure 2d)

Family: Faviidae (Verrill, 1902)

Genus: *Favia* (Oken, 1815)

##### Description:

Colonies are massive, rounded, flat or encrusting. Corallites are circular and plocoid, with a diameter of 9-15 mm. Those of colonies from turbid biotopes are wider and shallower. Septa are in three arbitrarily defined orders, with elongated inwardly projecting dentations, which are usually

arranged in one or more concentric circles. Septal sides are granulated, margins are finely serrated. Paliform lobes with prominently serrated margins are only developed on first order septa, usually forming a distinctive paliform crown around the columella. Second order septa do not reach the columella. Costae are equal and prominently beaded. The beads of adjacent costae forms are concentric circles which are clearly distinguishable in living colonies when polyps are contracted. The columella is compact. The living colonies are mostly in uniform brown, grey or mottled, sometimes with walls and oral discs contrasting in color.

**IUCN Red List Category and Criteria:** Status: Near Threatened, 2001.

*Favites complanata*, Clareboudt, 2006 (Figure 2e)

Family: Favidae (Verrill, 1902)

Genus: *Favites* (Oken, 1815)

**Description:**

Colonies are massive, usually with an even surface. Corallites are cerioid or slightly sub-plocoid, slightly angular in shape, with calices 8-12 mm in diameter. Septa are in two alternating cycles, septa of both cycles are finely granulated, and those of the adjacent corallites are usually adjoined.

Primary septa are thick, with 4 or 5 regular and very prominent dentations. Distinct paliform lobe is developed on primary septa. Columella is large and compact. Costae are in two unequal cycles, often forming a three pointed star where three corallites adjoin. The living colonies are usually brown, sometimes with green centers. Septa are in two alternating cycles.

**IUCN Red List Category and Criteria:** Status: Near Threatened, 2001.

*Favites flexuosa*, Clareboudt, 2006 (Figure 2f)

Family: Favidae (Verrill, 1902)

Genus: *Favites* (Link, 1807)

**Description:**

*Favites flexuosa* has a very distinctive colonies in Oman Sea: dark brown walls and light green

oral disk which often appear iridescent. Colonies are massive, and hemispherical or flattened. Corallites are angular with calices 15-20 mm in diameter. Septa are regularly spaced, sub-equal and ornated with large denticles but rarely a paliform lobe. Septa from adjacent corallites are aligned across the wall. The columella is large and shallow.

This species is uncommon but due to its characteristics is rarely missed. It is usually found at intermediate depth between 5 -15 meters in mixed communities.

**IUCN Red List Category and Criteria:** This taxon has not yet been assessed for the IUCN Red List.

*Leptastrea purpurea*, Clareboudt, 2006

(Figure 3a)

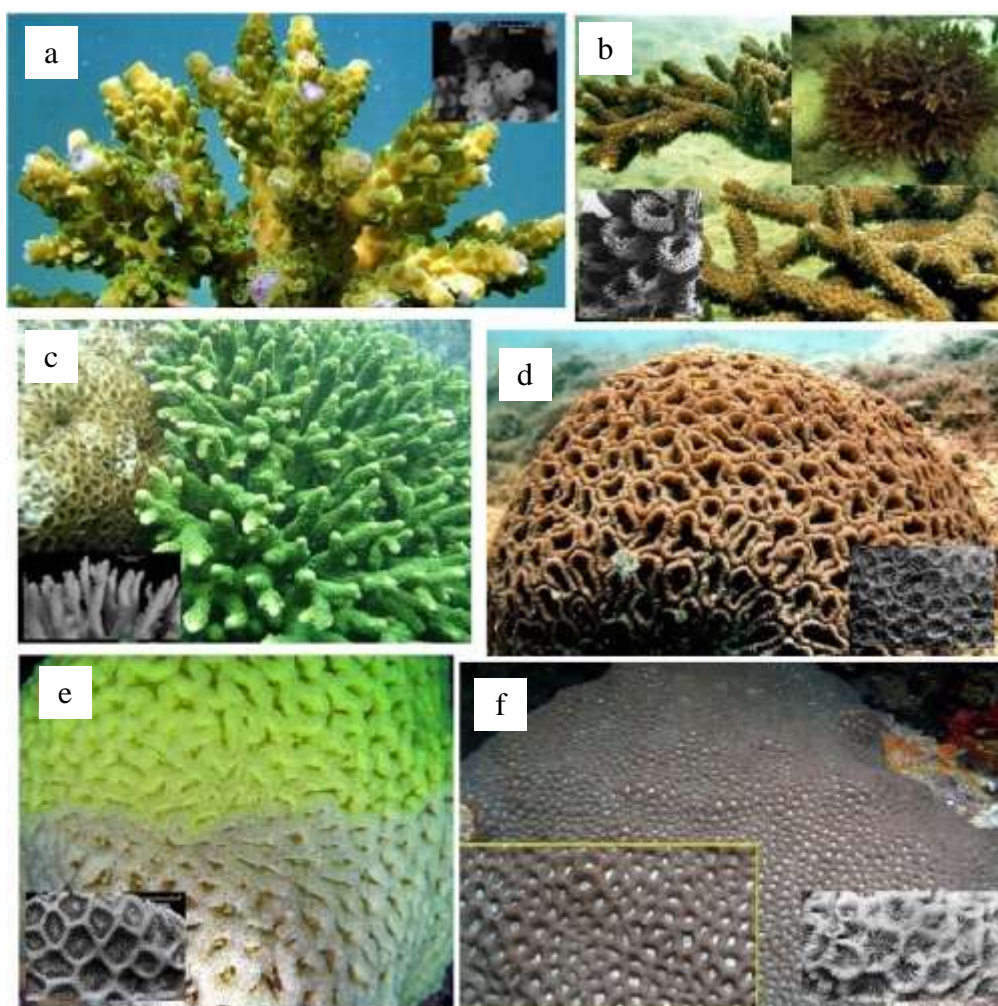
Family: Favidae Verrill, 1902

Genus: *Leptastrea* Dana, 1846

**Description:**

Colonies are irregularly encrusting or massive, which may exceed 1 m in diameter. They may also occur as coralliths up to 15 cm across. Corallites are sub-cerioid, discrete and polygonal, ranging from 2-11 mm in diameter, the smaller calices usually clustered in concave parts. Septa are usually arranged in four incomplete cycles, the lower order ones being more exsert and usually dentate, with larger dentations toward the calice center which eventually form paliform lobes. Septal sides are conspicuously granulated. Columella are well developed, consisting of a few pinnacles intermixed with paliform lobes. Costae are usually poorly developed. The coenosteum is usually a narrow, smooth strip overshadowed by the exsert septa of adjacent corallites. Living colonies are usually pale yellow or cream with dark calices on their upper surfaces; the sides are usually darker in color.

**IUCN Red List Category and Criteria:** Least Concern, 2001.



**Figure 2** *Acropora valida* (a), *Acropora khayranensis* (b), *Acropora anasuta* (c), *Favia matthai* (d), *Favites complanata* (e), and *Favites flexuosa* (f)

***Cyphastrea microphthalma***, Clareboudt, 2006 (Figure 3b) Family: Faviidae Verrill, 1902

Genus: *Cyphastrea* Lamarck, 1816

**Description:**

Colonies are massive, becoming thin encrusting plates where light levels are low. They commonly grow as mobile balls (corallites). Corallites are tall and conical; compact in colonies exposed to strong light, widely spaced in encrusting colonies. They usually have 10 primary septa although this varies among corallites. Colony's colors are different, brown, cream or green, sometimes other colors. Septa

are commonly white. They will find in most reef environments.

**IUCN Red list Category and Criteria:** This taxon has not yet been assessed for the IUCN Red List.

***Favia favus***, Clareboudt, 2006 (Figure 3c)

Genus: *Favia* Yab and Sugiyama, 1935

**Description:**

Colonies are massive, rounded, sometimes flattened. Corallites are plocoid, and may be up to 5 mm exsert with broad bases, with calices 12-20 mm in diameter. Conical corallites are usually circular, though some may be irregular in



shape due to the rapid growth of the colonies. Skeletal structures are very variable both within and between biotopes and to a much lesser extent, within individual coralla. Septa usually have granulation on their sides, and usually do not form distinct orders. They always have elongated, irregular, inwardly sloping dentations, which are finely serrated. The formation of paliform lobes is extremely variable among different colonies; they may be hardly recognizable in some, or form a single, distinct crown in others. Columella is small and trabecular. Costae are equal, always having regular rows of fine dentations; those of adjacent corallites are frequently aligned. Living colonies are usually dull browns, grey and greens. Sometimes the oral disc is more brightly colored than the coenosarcs. Some colonies are mottled brown and light grey. Individual colonies are usually relatively uniform in color and most colonies within the one biotope have similar colors. This is one of the most abundant of the *Favia* species and also one of the most variable, thus it is readily confused with less abundant species in large collections. The great abundance of this species in a wide variety of biotopes greatly facilitates study of intra-biotope growth form variation.

**IUCN Red List Category and Criteria:** Least Concern, 2001.

*Acanthastrea hillae*, Veron, 2000 (Figure 3d)

Family: Musidae Wells, 1955

Genus: *Acanthastrea* Wells, 1955

**Description:**

Colonies are usually small and sub-massive, with irregular, undulating surfaces; sometimes they may be up to 1.5 m in diameter. Corallites are cerioid and angular with a diameter of 1.5-4.3 cm, or sub-plocoid and oval, with an average of 2.5 cm in diameter. Most corallites are mono-centric; occasionally they may form valleys of up to four centers and reaching 12 cm in length. Septa are not arranged in conspicuous orders, with half of the septa being thicker, more exert, with larger and coarser dentations. Septal sides are all granulated. Columella is formed by twisted

trabecular derived from irregularly circled, large dentations of primary septa.

**IUCN Red List Category and Criteria:** This taxon has not yet been assessed for the IUCN Red List.

*Scolymia australis*, Veron, 2000 (Figure 3e)

Family: Musidae Wells, 1955

Genus: *Scolymia* Wells, 1955

**Description:**

Usually solitary but sometimes two to four centers occur in one corallite, or occasionally in separate corallites. Corallites are saucer-shaped and less than 60 millimeters diameter.

Septa are sturdy with blunt saw-like teeth. Color: Colorful, usually mixtures of cream, red, blue and green. They live in reef environments or on rocky headlands in high latitudes.

**IUCN Red List Category and Criteria:** Status: Least Concern 2001.

*Pocillopora damicornis*, Clareboudt, 2006

(Figure 3f)

Family: Pocilloporidae Gray, 1842

Genus: *Pocillopora* Wells, 1955

**Description:**

Colonies are branched, usually less than 30 cm tall. The species is distinguished from other species by having thinner branches and less regular verrucae. While small, regular verrucae exist, most of the protuberances are irregular and, are often not true verrucae at all but are more like incipient branches. As a result, *P. damicornis* exhibits greater branching than does *P. verrucosa*. *P. damicornis* occurs at all depths between the surface and 40 m deep or more, and is particularly abundant between 5 to 20 m. It is equally abundant in lagoonal areas and clear water reef slopes. Commonly forms mono-specific, densely packed stands many tens of meters across in water 5 -10 m deep. The main habitat where it is not common is where exposure is high. It has pale brown, greenish or pink color. Occurs in all shallow-water habitats from wharf piles and mangrove swamps to exposed reef fronts (Veron, 1986).

**IUCN Red List Category and Criteria:** Status: Least Concern 2001.

*Porites solida*, Clareboudt, 2006 (Figure 4a)

Family: Poritidae Gray, 1842

Genus: *Porites* Link, 1807

**Description:**

Colonies are massive and hemispherical, with even or undulating surface, and may reach several meters in diameter. Corallites are cerioid, thin walled with roughly 24 denticles on them, and calices are of 1.5-2.0 mm in diameter. Septa are

usually wedge-shaped, not reaching the upper wall margin, with two to three hirsute-shaped denticles which decrease in height towards the center. No palus is formed, but the inner denticle resembling a poorly developed palus may be mistaken. The lateral pairs of the triplet are usually longer than the dorsal directive septum and the lateral septa. Columella is present.

**IUCN Red list Category and Criteria:** Status: Least Concern 2001.



**Figure 3** *Leptastrea purpurea* (a), *Cyphastrea microphthalma* (b), *Faviafalus* (c), *Acanthastrea hillae* (d), *Scolymia australis* (e) and *Pocillopora damicornis* (f)

***Porites compressa***, Clareboudt, 2006 (Figure 4b). Family: Poritidae Gray, 1842

Genus: *Porites* Link, 1807

**Description:**

Colonies may form large patches of reefs. Branches are cylindrical and commonly fuse. Growth-forms and corallite characters are extremely variable so much so that single reef patches are composites of distinct races. Its color is brown and mostly dull grays. It usually chooses shallow protected reef and lagoon environments as its habitat.

**IUCN Red list Category and Criteria:** Status: Least Concern 2001.

***Montipora cf. aequituberculata***, Clareboudt, 2006 (Figure 4c)

Family: Acroporidae (Verrill, 1902)

Genus: *Montipora*, Bernard, 1907

**Description:**

This species forms flat, overlapping unifacial laminae. Colonies can be several meters across and dominate the upper most section of the reef, in protected environments. Typically, parasite polychaete worms alter the growth of *M. aequituberculata* to the point of giving this species a branching growth form. The worm forces the coral to create a skeletal sheath around the polychaete tube giving an appearance of branches. The opening of the polychaete tube can be seen at the end of every branch. The original laminae can sometimes be seen at the base of these colonies. The identification is tentative as this species differs significantly from Great Barrier Reef type.

This species is common in most communities in shallow water but becomes abundant in very shallow protected reefs where it appears to compete successfully with macro algae. The normal growth form is often seen in slightly deeper water.

**IUCN Red list Category and Criteria:** This taxon has not yet been assessed for the IUCN Red List.

***Pseudosiderastrea tayami***, Clareboudt, 2006 (Figure 4d)

Family: Siderastreidae, Vaughan and Wells, 1943

Genus: *Pseudosiderastrea* Yab and Sugiyama, 1935

**Description:**

*Pseudosiderastrea tayami* is an encrusting to massive colony that is 10-15cm in diameter. Its color is pale brown, gray, or pink. The corallite walls are pale or white, crowded with shared walls, and polygonal (ceroid) in shape. The corallites are 3-5 mm in diameter.

The fossa is shallow. Septa are closely packed and visible as fine lines running between adjacent calices. Septa are numerous and in cycles (30 septa in a 3mm calice or 50 in a larger one). Septa are slightly exsert, dentate, or granulated with no synapticulae joints present. A tiny columella is present (consisting of 1-4 pinnules). It has distribution from western Indian Ocean to western Pacific.

**IUCN Red list Category and Criteria:** This taxon has not yet been assessed for the IUCN Red List, and also is not in the Catalogue of Life.

***Turbinaria peltata***, Clareboudt, 2006 (Figure 4e)

Family: Dendrophylliidae Dana, 1846

Genus: *Turbinaria* Oken, 1815

**Description:**

Colonies are encrusting to foliaceous, the horizontal laminar plates are greatly thickened, and often forming overlapping tiers as colonies reaches several meters in diameter. The upper surface of the unifacial plates may develop into ridges, and subsequently into bifacial fronds or cylindrical columns.

Corallites are dispersed to crowded, immersed towards the colony center, and protrude more on convex surface and near colony margins.

They may protrude up to 2.5 cm, and inclined towards colony margins.

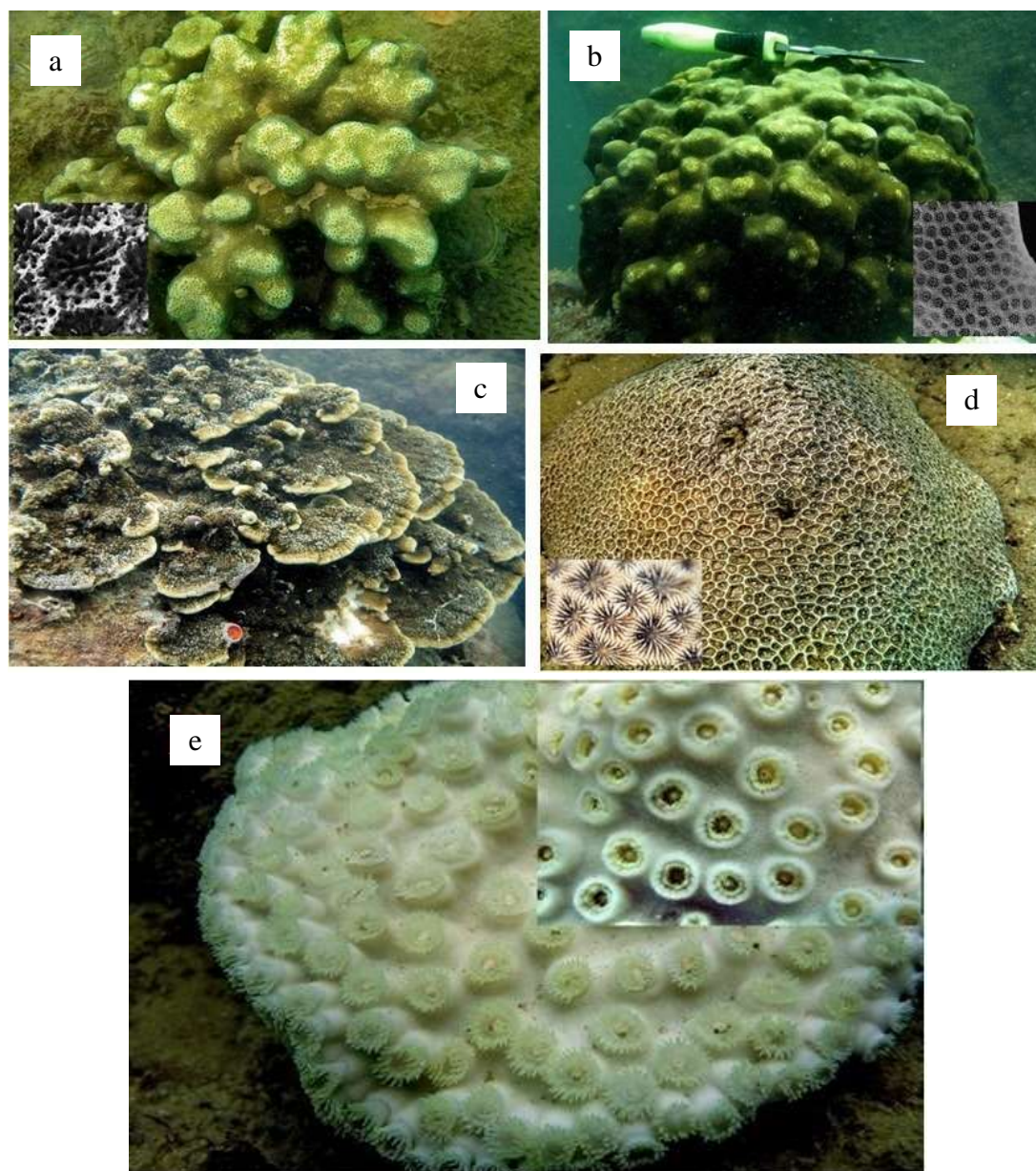
Calices are circular; with a diameter of 3-5 mm. Septa are arranged in three orders, projects inwards 1/4-1/2R, the third cycle being reduced or absent.



Septa are all granulated. Columella is dome-shaped and spongy, or with a compact, central plate. Living colonies are usually grey or brown. It has distributed in most environments, especially protected, turbid biotopes, such as shallow rocky

foreshores and shallow reef slopes. Budding is extra-tentacular. Polyps are extended during the day, with thick tentacles up to 1 cm in length.

**IUCN Red list Category and Criteria:** This taxon has not yet been assessed for the IUCN Red List.



**Figure 4** *Porites solida* (a), *Porites compressa* (b), *Montipora cf. aequituberculata* (c), *Pseudosiderastrea tayami* (d) and *Turbinaria peltata* (e)

#### 4 DISCUSSION

The ability of coral reef ecosystems to exist in balanced harmony with other naturally occurring such as; competing and limiting physico-chemical has been severely challenged in the last decades by the dramatically increased negative impacts from poorly managed anthropogenic activities (Tamal, 2011).

Low coral abundances and diversity in the Persian Gulf and Oman Sea are likely due to the rough condition such as the vast range of temperature changes, high salinities, sedimentation, and oil pollution (Kavousi et al., 2011). The scleractinian corals of Chabahar Bay are generally located on the southeastern side of Beheshti's Jetty at Chabahar Bay. Acroporidae are distributed probably due to availability of hard substrate for larval settlement.

In this study, morphogenesis structural of scleractinian is the most important stage that leads to identify of those (Mondal, 2004). Of about 195km<sup>2</sup> of sea bottom structure in the Bay of Chabahar, 80% has been covered by sand and mud (Sadeghi, 2009). About 80% of coral reefs are located in front of the oil reservoir tanks, where the port constructional activities have been going on there. Thirty one species of both Hexacorallia and Octocorallia were found at Chabahar bay during this study, seventeen of which were identified as hard corals.

*Faviafusus*, *Cyphastrea microphthalma* and *Acropora valida* have already been reported from Chabahar Bay (Sadeghi, 2009) and Kish Island (Maghsoudlou and Egtesadi, 2005). *Acroporavalida* (Dana, 1846) is a common species that can be found in the Persian Gulf, Gulf of Oman and Arabian Sea.

In the last study from Chabahar Bay, *Cyphastrea microphthalma* was specified as one of the rarest species in the Chabahar Bay and Persian Gulf (Sadeghi, 2009). In this study. However, *Montipora cf. aequituberculata* was found to be the rarest species in both Chabahar Bay and Persian Gulf. In fact, it is a new record

from the Iranian waters of the Persian Gulf and Oman Sea.

In conclusion, the study at the Chabahar Bay showed there were more than 50 species of both hexacorallian and octocorallian, of which seventeen species were scleractinianspecies under seven families: four species in Acroporidae, six species in Faviidae, two species in Musidae, one species in Pocilloporidae, two species in Poritidae, one species in Siderastreidae, and one species in Dendrophylliidae.

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## ثبت گونه‌های جدید و قبلی مرجان‌های سخت از خلیج چابهار، سواحل جنوب شرقی ایران

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۱- مرکز تحقیقات شیلاتی آبهای دور، چابهار، ایران

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**چکیده** در این مطالعه، مرجان‌های سخت خلیج چابهار با توجه به ریخت شناسی و ساختار کورالیت‌های آنها مورد شناسایی قرار گرفته است. در مجموع ۱۷ گونه از مرجان‌های سخت در ۷ خانواده شامل *Acropora valida* Dana, 1846، *Favia*، *Acroporidae*، *Acropora nausta* Dana, 1846 و *Acropora clathrata* Brook, 1891، *Leptastrea*، *Favites flexusa* Dana, 1846، *Favites complanata* Ehrenberg, 1824، *matthai* Vaughan, 1918، *purpurea* Dana, 1846، *Faviafavus* Forskal, 1775 و *Cyphastrea microphthalma* Lamarck, 1816 متعلق به خانواده *Scolymia australis* Milne Edwards and Haime, 1849 و *Acanthastrea hillae* Wells, 1955، *Favidae*، *Coscinaraea*، *Poritidae*، *Pocilloporadamicornis* Linnaeus, 1758، *Musidae*، *Pseudosiderastrea tayami* Yab and Sugiyama, 1935 و *wellis* Veron&Pichon, 1980 متعلق به خانواده *Siderastreidae* و در نهایت *Turbinaria peltata* Esper, 1794 متعلق به خانواده *Dendrophylliidae* شناسایی شده است. در این بررسی، از ۱۷ گونه شناسایی شده، ۱۴ گونه آن برای اولین بار گزارش شده است.

**کلمات کلیدی:** شناسایی مرجان‌های سخت، رکورد جدید، خلیج چابهار