Journal of Threatened Taxa | www.threatenedtaxa.org | 26 June 2014 | 6(6): 5900–5904

ISSN
Online 0974–7907
Print 0974–7893

OPEN ACCESS

Additional record of scleractinian corals on Porbandar coast, Gujarat, India

Dishant Parasharya [1] & Geeta Padate [2]

[1,2] Department of Zoology, Faculty of Science, The M.S. University of Baroda, Vadodara, Gujarat 390002, India
[1] dparasharya@gmail.com (corresponding author),
[2] geetapadate@gmail.com

Gujarat State has a 1,750km long coastline, rich in coastal biodiversity (Sengupta & Deshmukhe 2000). Veraval, Jakhau, Mangrol, Porbandar, Okha, Bedi and Dwarka on this coast have a great potential for procuring large quantities of fish, collected from the Arabian Sea, especially for export. The southern coast of the Gulf of Kachchh is one of the richest sources of marine wealth of India, as it provides favourable conditions for breeding and shelter to many marine species (Deshmukhe et al. 2000). It comprises one of the four major coral reefs of India. The history of coral reef research in this area is as old as a century, where Hornell (1909) described the coral reefs and the chank fishery of Okhamandal, also known as Poshitra Bay. Pillai & Patel (1988) gave a detailed account of the hard coral fauna of the Gulf of Kachchh with reference to only 16 locations of the gulf area, which they conducted in 1987, a single year study. Unfortunately, there are very few studies describing the occurrence of corals in the other parts of Gujarat coast, i.e., Saurashtra coast. These studies include corals of Dwarka, Veraval, Diu and Mahuva by Raghunathan et al.(2004) and occurrence of soft coral species off Veraval coast by Bhagirathan et al. (2008). No other locations were explored scientifically to document scleractinian diversity on the Saurashtra coast. This paper describes the occurrence of scleractinian species at Kuchdi reef near Porbandar on the Saurashtra coast facing the Arabian Sea (Image 1).

Study Area: On the western coast of Saurashtra, Kuchdi reef is situated at 21^{0}40'12.6"N & 69^{0}32'36.5"E and is attached to the mainland (Image 2). The area is about 15km north-west from the city of Porbandar. The mean value of high tide is about 3m, with a range of 1–6 m, whereas the mean value of low tide is 0.4m above mean sea level (Sengupta & Deshmukhe 2000). The closest known occurrence of scleractinian diversity is from Dwarka (Raghunathan et al. 2004), which is located 80km north-west of the study area. Due to the steep

Image 1. Kuchdi reef area with shallow water pools

DOI: http://dx.doi.org/10.11609/JoTT.o3317.5900-4 | **ZooBank:** urn:lsid:zoobank.org:pub:4D503963-668C-4C54-A52C-9C56ACADC9A9

Editor: C. Raghunathan, Zoological Survey of India, Port Blair, India. **Date of publication:** 26 June 2014 (online & print)

Manuscript details: Ms # o3317 | Received 22 August 2012 | Final received 31 May 2014 | Finally accepted 03 June 2014

Citation: Parasharya, D. & G. Padate (2014). Additional record of scleractinian corals on Porbandar coast, Gujarat, India. *Journal of Threatened Taxa* 6(6): 5900–5904; http://dx.doi.org/10.11609/JoTT.o3317.5900-4

Funding: None.

Competing Interest: The authors declare no competing interests.

Acknowledgements: The authors are thankful to Dr. Deepak Apte BNHS for permitting collection of Data on corals simultaneous while working on the project All India Coordinated Project on Taxonomy (AICOPTAX) of mollusc - Gujarat at BNHS. The authors are also thankful to other colleagues of BNHS, Vishal Bhave and Rajesh Parmar and colleagues and staff members of Department of Zoology - The M.S. University of Baroda.

Image 2. Google Earth image of Kuchadi-Porbandar in Arabian Sea

slope of the continental shelf, the edge of the intertidal zone is completely exposed only during the negative tides of the year. Such tides come twice in summer (between March and June) and twice in winter (between November and February). The sandy beach of the upper inter-tidal zone is followed by a rocky substratum in the lower-inter tidal zone.

Materials and Methods: The study was carried out on 31 March 2010 and 1 April 2010. The low tide level during the study was 0.04m. The area of coral coverage and their community structure were studied using belt transects (Krebs 1986). Eight transects of 1x20 m were laid parallel to the low tide line using standard measuring tape. The first transect was laid randomly; while all the subsequent transects were laid at an equal distance of 100m to the previous transect and were parallel to the low tide line. All the coral species were identified using standard identification keys (Veron 2000). Coordinates of the site were taken using an E-Trex garmin instrument. Each coral colony was classified in three size class groups 0–5 cm, 5–10 cm and 10–15 cm, depending upon their spherical size. The size of the colony was measured using vernier callipers. As water temperature is one of the key factors for coral growth, it was measured using a standard digital environment thermometer. Various parameters evaluated, follow the methods described by Michael (1986).

$$\text{Density (d)} = \frac{\text{Total number of colonies of x species n(x)}}{\text{Area sampled (a)}}$$

Realative Abundance (RA)

(RA) = [Total number of colonies of x species / Total colonies (N) of all species] * 100

Frequency of Occurrence (*fO*)

F0 = {Occurrence of x species in no. of transects / total transects} * 100

Species diversity index - Shannon-sWeiner formula:

$$H' = \sum Pi \log_e pi$$

Where *Pi* is the proportion of the i^{th} species in the collection *H'*is the diversity of a theoretically infinite population.

$$\text{Evenness } e = \sum Pi \log_e pi / \log N$$

Species similarity Index between the current study area, i.e., Kuchdi and the nearest coral location i.e., Dwarka was calculated using the following formula

$$Js = J / (a+b-J)$$

Where J*s* is the Index of similarity, J is number of species common at both the sites, 'a' is no. of species at one site and 'b' is no. of species at another site.

Results and Discussions: The exposed inter-tidal area from high water line to low water line at lowest low tide was only 110m in width. All the coral colonies observed were present between 0–40 m from the low water line. No corals were found near the shoreward edge. Surface water temperature was 28^0C, whereas the temperature at the bottom of the tidal pool, where water column was more than 10cm, was 27^0C. A total of eight species of hard corals belonging to five families was recorded of which seven occurred in the sampled area (Table 1) while one was outside the sampled area. This is the first record of these species from Porbandar District facing the Arabian Sea. However, these species have been reported earlier from more than one location from the Gulf of Kachchh (Pillai & Patel 1988; Satyanarayana & Ramakrishna 2009). The shallow shelf of rocky substratum entangling vegetative along-with sedentary faunal assemblage can be considered as one of the possible reasons for the settlement of planulae larvae of these cnidarians during the tidal fluctuations. All the coral colonies recorded at the location measured less than 15cm in radial growth and showed a similar pattern in occurrence, i.e., in the shallow water tidal pools having a water depth of 10cm or more during the lowest low tide. Bleaching or disease was not observed in any of the coral colonies. Degradation due to sedimentation on the top of the massive colonies was observed within the sampled transects. However, there was no sign of any mortality. There was no significant trend in the dominance pattern in these corals with reference to their growth forms.

A total of 25 colonies were recorded in eight

Table 1. List of coral species in the area

	Family	Species Name	No. of colonies observed
1	Acroporidae	*Montipora foliosa*	1
2	Faviidae	*Favia favus*	3
3	Faviidae	*Favites* sp.	1
4	Poritidae	*Goniopora minor*	9
5	Poritidae	*Porites lutea*	5
6	Dendrophyllidae	*Tubastrea aurea*	2
7	Dendrophyllidae	*Turbinaria peltata*	4
8	Siderastreidae	*Pseudosiderastrea tayami**	2

* Did not occur in Transects

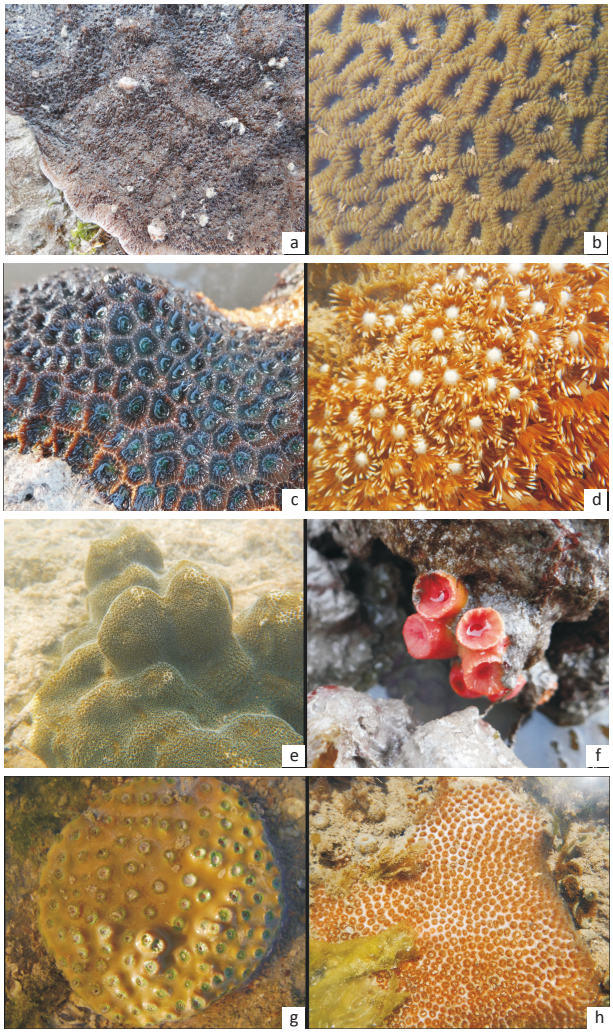

Image 3. Coral species observed from Kuchdi-Porbandar area a - *Montipora foliosa*; b - *Favia favus*; c - *Favites* sp.; d - *Goniopora minor*; e - *Porites lutea*; f - *Tubastrea aurea*; g - *Turbinaria peltata*; h - *Pseudosiderastrea tayami*. © Dishant Parasharya

transects, of which nine were of *Goniopora minor,* with density of 5.6colonies/100 m^2, whereas *Favites* sp. and *Montipora foliosa* recorded the lowest density of 0.62 colonies / 100m^2, with an occurrence of only one colony in eight transects.

Recorded species, their colonies and their distribution in other parts of Gujarat (Table 1, Image 3 a–h).

Montipora foliosa (Pallas), 1766: Only one colony of the species was recorded during the study, falling under the size class of 5–10 cm. The species has been reported from Boria and Paga from the Gulf of Kachchh (Pillai & Patel 1988).

Favia favus (Forskal, 1775): A total of three colonies of the species was recorded, of which two colonies fell under the size class of 0–5 cm and one colony under the size class of 5–10 cm. Pillai & Patel (1988) recorded this species during their expeditions to Okha, Dholiogugar, Dona, Boria, Mangunda, Savajo, Paga, Manmarudi, Langhamarudi, Ajad, Bural, Dhani, Kalubhar, Narara, Goose and Pirotan in the Gulf of Kachchh. Satyanarayana & Ramakrishna (2009) have also confirmed this species in the Gulf of Kachchh. This indicates that this is one of the well distributed species of coral, in this area.

Favites sp.: The genus *Favites* is common in subtropical reefs and in non-reef habitats also (Veron 2000), but the species level variations are sometimes difficult to confirm. This species is more or less similar to *Favites complanata* but needs confirmation. Only one colony falling under the size class of 5–10 cm was recorded during the study. Pillai & Patel (1988) reported *Favites complanata* and *Favites melicerum* from the Gulf of Kachchh, whereas Satyanarayana & Ramakrishna (2009) reported five species of *Favites* genus viz., *F. pentagona, F. chinensis, F. halicora, F. complanata* and *F. flexuosa* from the Gulf of Kachchh.

Goniopora minor (Crossl, 1952): Maximum numbers of colonies were recorded of this species, i.e., nine from Kuchdi during the current study. Out of these nine colonies, six belonged to the size class of 5–10 cm. Pillai & Patel (1988) have also recorded this species from Boria, Paga and Pirotan during their expedition. Further, Satyanarayana & Ramakrishna (2009) have also documented this species from the Gulf of Kachchh.

Porites lutea (Edwards Haime, 1860): A total of five colonies of this species was recorded during the present study, with three colonies falling under the size class of 10–15 cm. Pillai & Patel (1988) recorded this species during their expedition in 1988 to Dholiogugar, Dona, Boria, Paga, Dhani and Pirotan in the Gulf of Kachchh while Satyanarayana & Ramakrishna (2009) have also confirmed its presence in the Gulf of Kachchh. The nearest known occurrence of the species is at Dwarka

(Raghunathan et al. 2004).

Tubastrea aurea (Qouy & Gaimard, 1833): Pillai & Patel (1988) recorded this species during their expedition to Dona & Boria in the Gulf of Kachchh. It has also been reported from Pirotan, Kalubhar, Mungra reef (Sengupta & Deshmukhe 2000) and Dwarka (Raghunathan et al. 2004). Only two colonies were recorded during the present study.

Turbinaria peltata (Esper, 1794): Pillai & Patel (1988) recorded this species during their expeditions in 1979, 1983 and 1988 from Okha, Paga, Boria & Pirotan. Satyanarayana & Ramakrishna (2009) have also reported this species from the Gulf of Kachchh. The closest occurrence of this species is from Beyt Shankhodar island (Deshmukhe et al. 2000). A total of four colonies was recorded during the current study, with two each in the size class of 0–5 cm and 5–10 cm.

Pseudosidraestrea tayami (Yabe Sugiyama, 1935): Pillai & Patel (1988) recorded this species during their expedition in 1988 from Okha, Paga, Manmarodi, Ajad, Bural, Dhani, Kalubhar, Narara, Goose and Pirotan in the Gulf of Kachchh. Satyanarayana & Ramakrishna (2009) have also confirmed its presence in the Gulf of Kachchh. The species was not recorded within the sampled area. However, two colonies were recorded from the reef.

Density and relative abundance (Figs. 1 & 2): The density of the coral colonies was 15.6 colonies/100m^2 with a maximum density of *Goniopora minor*, i.e., 5.6 colonies/100m^2 (Fig. 1). The frequency of occurrence was also calculated to be the highest for *Goniopora minor* (Fig. 3). Hence *Gonipora minor* can be considered the most common / generalist species of the Kuchdi reef near Porbandar on the coast of Saurashtra.

Size class of coral colonies (Fig. 3): A total of eight colonies out of the 25 recorded, fall in the size class of 0–5 cm, twelve colonies, i.e., almost 50% of the total was recorded under the size class of 5–10 cm, five colonies including three of *Porites lutea* and two of *Goniopora minor* have considerable growth and coverage, falling in the size class of 10–15 cm. Life forms of all the colonies falling in the size class of 10–15 cm were of the massive type. These colonies are comparatively smaller in size indicating that they have probably evolved recently, compared to the coral colonies of the Gulf of Kachchh, where the size class reaches upto 1m in species such as *Porites lutea* and *Turbinaria peltata* (Dishant Parasharya 2004–2010 pers. obs.).

Diversity Indices: The Shannon Weiner Index of the data was calculated as 1.7 whereas the evenness calculated was 0.87 indicating moderate diversity and even distribution of the scleractinian fauna.

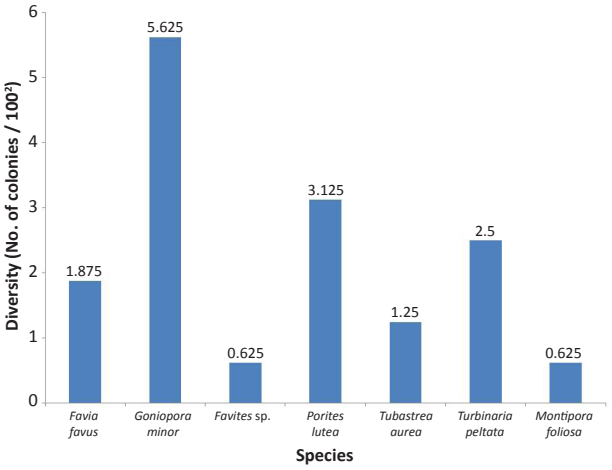

Figure 1. Density of coral colonies/100m² of coral species in Kuchdi-Porbandar area

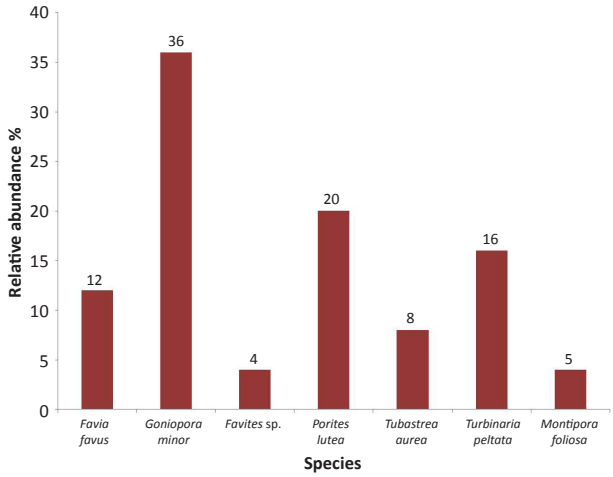

Figure 2. Relative Abundance (%)of coral species in Kuchdi-Porbandar area

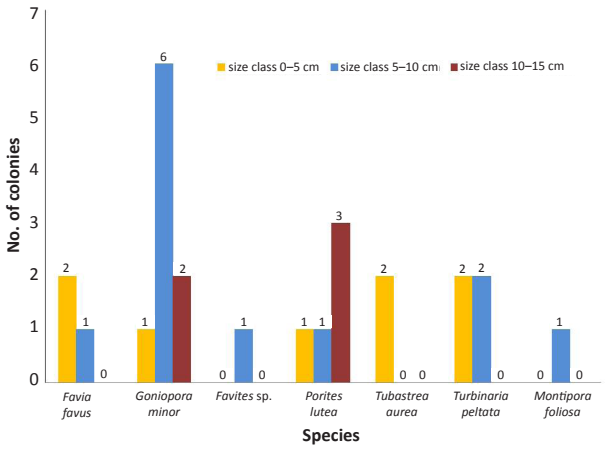

Figure 3. Size class of coral colonies occurring in the sampled area

Raghunathan et al. (2004) documented three species of corals from Dwarka, viz., *Poriteslutea, Tubastreaaurea* and *Turbinaria crater*. The species similarity index between Dwarka & Kuchdi-Porbandar was calculated as 0.22, which indicates a very low similarity between the two sites in terms of scleractinian species occurrence.

Conclusions: Occurrence of scleractinian diversity at the intertidal area of Kuchdi, which is an addition to the list of coral occurrences of Saurashtra coast, has been reported for the first time. All the species of corals recorded in this study have also been reported from the Gulf of Kachchh area very regularly. The size of the colonies of Kuchdi, which hardly reach radially 15cm in length indicates that the colonies are comparatively recent. The stock of planulae may have migrated not only from Dwarka, as the species similarity index is 0.22 and the density and abundance of live corals at Dwarka is very negligible (Dishant Parasharya 2006–2010 pers. obser.), but also from the Gulf along with the water current. Hence, the coral colonies established at Kuchdi can be attributed to sexual reproduction followed by larval dispersal of the colonies present in the southwestern coral locations of the Gulf of Kachchh to the Kuchdi area in Porbandar District.

References

Bhagirathan, U., S.K. Panda, V.R. Madhu & B. Meenakumari (2008). Occurrence of live Octocorals in the Trawling Grounds off Veraval coast of Gujarat, Arabian Sea. *Turkish Journal of Fisheries and Aquatic Sciences* 8: 369–372.

Deshmukhe, G., K. Ramamoorthy & R. Sengupta (2000). On the Coral reefs of the Gulf of Kachchh. *Current Science* 79(2): 160–162.

Krebs, C.J. (1986). *Ecological Methodology.* Published by Harper and Row, New York, 460pp.

Michael, P. (1986). *Ecological Methods for Field Laboratory Investigations.* Published by Tata McGraw-Hill Publishing Company Ltd., New Delhi, 404pp.

Sengupta, R. & G. Deshmukhe (2000). *Coastal and Maritime Environments of Gujarat, Ecology Economics.* Gujarat Ecology Society, Vadodara, 270pp.

Hornell, J. (1909). A report submitted to the Baroda State. Marine Zoology of Okhamal in Kattiawar, Wiliams Norgate, London, 209pp.

Pillai, C.S.G. & M.I. Patel (1988). Scleractinian corals from the Gulf of Kachchh. *Journal of Marine Biological Association of India* 30(1&2): 54–74.

Raghunathan, C., R. Sengupta, U. Wangikar & J. Lakhmapurkar (2004). A record of live corals along the Saurashtra coast of Gujarat, Arabian Sea. *Current Science* 87: 1131–1138.

Satyanarayana, C.H. & Ramakrishna (2009). *Handbook of Hard Corals of Gulf of Kachchh.* Zoological Society of India, Kolkata, 114pp.

Veron, J.E.N. (2000). *Corals of the World - Volumes I-III.* Published by Australian Institute of Marine Sciences, Cairns Australia, 1382pp.