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Caption: Large Indian Civet *Viverra zibetha*, Tricoloured Munia *Lonchura malacca* and *Hoya wightii* (Medium—pencil crayon on watercolour paper) © Supriya Samanta.



Atlantic Ocean regions of the world (Veron et al. 2015). Reef-building corals prefer to grow best in shallow, clear waters that are poor in nutrients, annual water temperature ranges from 23°C to 29°C and a stable salinity range of 27–38 ppt (Achtuv & Dubinsky 1990). Because of these strict environmental restrictions, reef-building corals are generally confined to tropical waters. But some coral species are able to tolerate inhospitable environments, sub-optimal extremes and form lower diversity reefs habitats. To a limited extent, corals of those environments can adapt to ambient conditions; consequently, the upper lethal temperature for a species in the tropics will be higher than that of the same species in the subtropics (Camp et al. 2018). Marginalized reefs distribution in the Gulf of Kachchh, along the northwestern coast of India includes sturdy reef assemblages that are adapted to thrive in extreme environmental conditions.

Coral reefs of the Kachchh are scanty and less diverse when compared with other major coral reef regions of India. The meagerness is explained due to the transgression of the sea levels of the Late Pleistocene-Holocene period and the upliftment of tectonic plates of the Gulf (Srivastava 1965). In addition, the prevailing arid climate and the semi-diurnal tidal amplitude fluctuations imply in water quality and heavy sediment depositions on coral reefs hamper their recovery to a healthy state (Michael et al. 2009). Residual coral species living today are quite distinctive in terms of their isolation and their high degree of adaptation to survive in such extreme oceanographic and climatic conditions (Dixit et al. 2010). The water in the Kachchh is murky almost throughout the year and possibilities for exploring sub-tidal reefs is only hardly possible. The distribution of corals in the Gulf is restricted mostly to fore-reefs, edges of reef flats along with the low-tide marks and, inter-tidal pools to reef flats for some extend. So, most studies on coral species diversity and distribution in the Gulf carried out so far were from the low-tide exposed reefs only. A total of 63 hard coral species belonging to 28 genera, under 11 families have been recorded so far from the Gulf of Kachchh (Satyanarayana et al. 2018). Among them, the genus *Psammocora* is represented by only one species, *P. digitata*. *Psammocora* (Dana, 1846) is an Indo-Pacific coral genus, presently comprised of 11 nominal species in the monotypic family Psammocoridae (WoRMS 2020). Species of this genus have highly plastic branching growth forms and exhibit considerable structural complexity in skeletal features (Benzoni et al. 2007). This report confirms the first occurrence of another species of *Psammocora* in the Gulf of Kachchh reefs.

MATERIALS AND METHODS

Gulf of Kachchh is an East-West oriented, funnel shaped indentation along the Gujarat coast, approximately 125 km long and 75 km wide. The southern shore of the Gulf is fringed by some 42 islands and islets. Seaward side edges and low-tide marks and of these islands are predominantly inhabited by a rich coverage of coral reef. During a regular coral reef health monitoring survey in the Islands of Gulf of Kachchh Marine National Park area, the occurrence of *Psammocora contigua* was recorded on August 2020, a zero low-tide day from an intertidal reef flat of Narara Island (22.455°N 69.671°E) (Figure 1). A recently bleached colony was collected for taxonomic identification. The collected specimen was treated with 10% sodium hypochlorite solution to remove all soft parts, after that washed in freshwater and dried for recording corallites morphology and morphometry. The largest corallites from different parts of branch surface and valleys, which were not visibly undergoing any budding process, were selected for morphometrical analysis. Likewise, average branch variables were measured from different branches of the coral colony with a vernier caliper. The specimen was identified up to species level following published original and synonymized taxonomic descriptions of Stefani et al. (2008) and Venkataraman & Satyanarayana (2012). After taxonomical analysis, the same specimen was deposited as a voucher specimen (MNP/Coel/2020-01) at the Marine Biodiversity Museum, Marine National Park (Gujarat Forests), Jamnagar, India.

RESULTS

Diagnosis

Colony is sub-massive or ramous (Image 1a, 2a) but some younger colonies observed with encrusting growth forms (Image 1c). Live colony was pale brown in colour. Total diameter of the examined colony was 12.82 cm and height measured 6.24 cm. Branches short, stout, tend to be flattened and often anastomosed. Branch tip acute with irregular foliose ends and also form pits at many places (Image 1c). At the base of the colony, branches form valleys. Maximum height of the branch measured up to 2.89 cm and the maximum height of the distal part of the branch measured 1.22 cm. Maximum distance between distal portions of the branches measured up to 2.3 cm. The surface of the colony is smooth.

Corallites are very small, shallow, without any prominent walls and, give a smooth surface appearance to the colony (Image 2b,c). An average number of 26 corallites per cm² was measured. The arrangement of septa in each corallite gives a flower-like appearance.

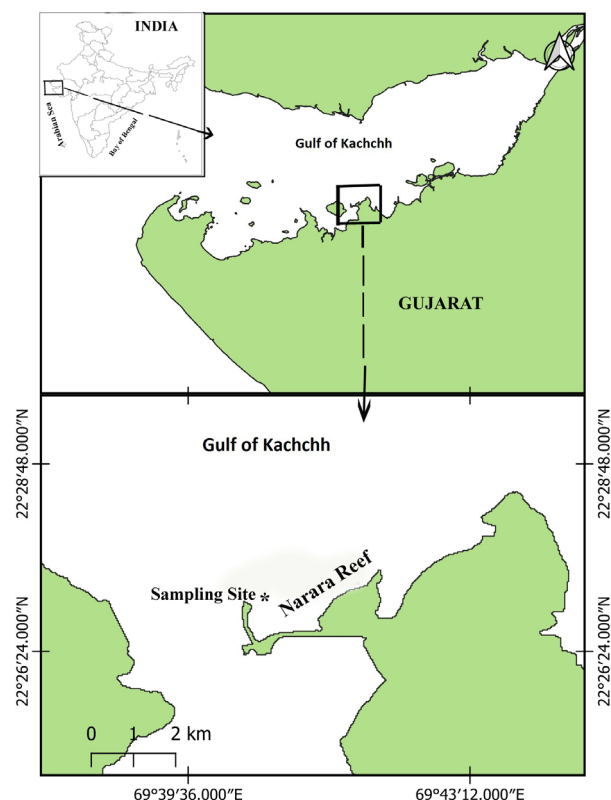


Figure 1. The location from where the coral species recorded in the Gulf of Kachchh MNP area.

Corallite walls are indistinct. Calice diameter measured up to 0.789 mm and fossa diameter up to 0.184 mm. Columella was made of a group of pinnules (Image 2d) and measured maximum up to 0.131 mm in diameter. Septal margins with spiny process tend to arrange in whorls along their length. In most of the corallites, eight septa reach the fossa and four of them are petaloid. Maximum length of the petaloid septa reaching the fossa up to 0.302 mm and width up to 0.118 mm. Non-petaloid septa reaching the fossa measured up to 0.105 mm wide. Likewise, enclosed petaloid septa measured up to 0.235 mm wide and 0.392 mm long.

Series of calices often form and can be up to more than 25 calices long even in diameter and following the branch growth direction. Distance between two calices within the same row ranges 0.9–1.2 mm.; the nearest calices of two parallel rows were 2–2.7mm apart from each other. Up to eight rows of enclosed petaloid septa were found between series of corallites. In most of the corallite, one triplet septa (three septa fusing together) and two duplets (two septa fusing together) reaching fossa were observed. Synapticulothecal wall surrounds calices and rows of enclosed septa were seen in many places of the colony surface. Recorded taxonomic



Image 1. In situ colonies of *P. contigua*: a—ramous | b—encrusting growth forms | c—branch-tips of the colony. © Marine National Park, Jamnagar.

characters of the specimen (Table 1) agreed with the description of *Psammocora contigua* (Esper, 1794).

DISCUSSION

Psammocora Dana, 1846, is an Indo-Pacific coral genus, presently comprised of 11 nominal species in the monotypic family Psammocoridae (WoRMS 2020). Geographical distribution of the genus extending to 'high latitudes' in both south and north hemispheres, and from the Red Sea and eastern Africa to eastern Pacific shores (Stefani et al. 2008). The Gulf of Kachchh is also located in a marginalized region and proximate to the Red Sea and Arabian Gulf, as their distribution range. Species of this genus have highly plastic branching growth forms and exhibit considerable structural complexity in skeletal features (Benzoni et al. 2007).

All the taxonomical characters of the examined coral colony, in fact, are agreed with the species *P. obtusangula*. The species *P. obtusangula* was considered a valid species by Glynn & Wellington (1983), Veron (2000), and Reyes-Bonilla (2002). Some studies also claimed it a close synonym of *P. contigua* (Veron & Pichon 1976; Faure 1982; Scheer & Pillai 1983) mentioning phenotypic plasticity as the main factor for their morphological variability. But, Stefani et al. (2008) demonstrated the overlapping morphological and molecular characters of *P. obtusangula* and *P. contigua* and synonymized the earlier with later. Hence the Kachchh specimen examined is identified as the species

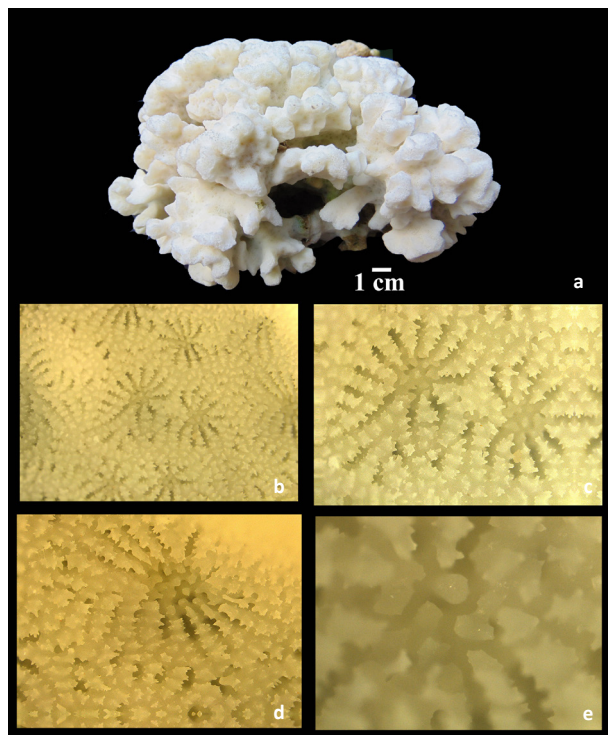


Image 2. a—Examined colony of *P. contigua* | b, c & d—Corallites arrangement and septal characters | e—Collumella. © Marine National Park, Jamnagar

P. contigua. Variation in branching morphology is the main character for considering them as two different species. Branches of *P. obtusangula* are small flattened whereas, in *P. contigua*, the branches are flat and larger. But the variation in branching may be due to the habitats they inhabit. A coral transplantation experiment also suggested that *P. obtusangula* is likely to be a shallow, agitated water form of *P. contigua* only (Hoffmeister 1925). Corals of the Gulf of Kachchh are always a puzzle to taxonomists, as the morphology and growth forms vary due to the existing sedimentation, tidal amplitude, and water current. The same might be the reason for variation in the growth form of the present specimen.

Among the recorded coral species so far from the Kachchh waters, *Pocillopora damicornis*, *Acropora humilis*, *A. squarrosa*, *A. microphthalma* are the species having ramose or branching growth forms (Satyanarayana & Ramakrishna 2009). But all these species are presently considered locally extinct with not even a single live colony recorded since the recent past. So, *P. contigua* is the only living species with somewhat ramose growth form recorded so far from the Kachchh waters.

A total of eight species of corals belonging to the genus *Psammocora* have been recorded so far from India

Table 1. Recorded morphometrical characters of the examined specimen, *P. contigua* from Gulf of Kachchh.

	Morphological Characters of Corallites & branches	Morphometry (in mm)
1	Calice diameter	0.750–0.789
2	Fossa diameter	0.157–0.184
3	Columella diameter	0.105–0.131
4	Maximum width of petaloid septa Reaching the fossa	0.118
5	Maximum length of petaloid septa Reaching the fossa	0.302
6	Maximum thickness of non-petaloid septa	0.105
7	Maximum width of enclosed petaloid septa	0.235
8	Maximum length of enclosed petaloid septa	0.392
9	Total branch height	Up to 28.92
10	Height of the distal portion of the branch	12.27
11	Minimum distance between the distal portions of the branch	1.14–2.51
12	Maximum width of the basal part of the branch (m-12)	23.0
13	Minimum width of the basal part of the branch perpendicular to m12	4.97
14	Maximum width of the distal portion of the branch (m-14)	46.40
15	Maximum width of the distal portion of the branch perpendicular to m14	19.20–25.0
16	Minimum width of the distal portion of the branch perpendicular to m14	2.78

Table 2. List of coral species belonging to the genus *Psammocora* reported so far from Indian waters.

	Species	Location of report	Reference
1	<i>Psammocora contigua</i>	Lakshadweep	Pillai 1967
		Gulf of Mannar	Pillai 1986
		Andaman & Nicobar	Venkataraman et al. 2012
2	<i>P. digitata</i>	Gulf of Kachchh	Satyanarayana & Ramakrishna, 2009; Pillai & Patel 1988
		Lakshadweep	Pillai & Jasmine 1989
3	<i>P. explanulata</i>	Andaman & Nicobar	Venkataraman et al. 2012
4	<i>P. haimiana</i>	Lakshadweep	Pillai 1971
		Andaman & Nicobar	Venkataraman et al. 2012
5	<i>P. nierstraszi</i>	Lakshadweep	Suresh 1991
	<i>P. obtusangula</i>	Andaman & Nicobar	Raghuraman et al., 2012
6	<i>P. profundacella</i>	Lakshadweep	Pillai & Jasmine 1989
		Andaman & Nicobar	Venkataraman et al. 2012
7	<i>P. superficialis</i>	Andaman & Nicobar	Venkataraman et al. 2012
8	<i>P. vaghani</i>	Andaman & Nicobar	Mondal et al. 2015

(Table 2). A maximum of seven species were recorded from Andaman & Nicobar followed by Lakshadweep Islands (five species). *P. contigua* has been previously reported from the Gulf of Mannar (Pillai 1986), Lakshadweep (Pillai 1967), and Andaman & Nicobar Island (Venkataraman et al. 2012). But *P. obtusangula* was only listed out in a checklist of coral species from Andaman & Nicobar Islands by Raghuraman et al. (2012). Among the recorded 64 coral species so far from Gulf of Kachchh, the genus *Psammocora* is represented by only one species, *P. digitata* (Pillai & Patel 1988; Satyanarayana & Ramakrishna 2009). The present study adds one more species of corals to the Gulf of Kachchh corals biodiversity. This species distribution was recorded previously from Australia, Indonesia, Singapore, Malaysia, Taiwan, Papua New Guinea, Viet Nam, Thailand, Philippines, Micronesia, Palau, Marshall Islands, Mayotte, Maldives, Japan, New Caledonia, Réunion, Iran, Guam, Yemen, Bahrain, Vanuatu, French Polynesia, Kenya, Ecuador, Kuwait, Seychelles, Fiji, Christmas Island, American Samoa, Pitcairns, Kiribati, USA, and Madagascar (Veron et al. 2016). Veron et al. (2016) also strongly predicted the distribution of *P. contigua* all along the western coast of India, including the Gulf of Kachchh. The present study confirmed their prediction by recording the species in the Gulf of Kachchh.

This species is also classified under 'IUCN Near Threatened' category (IUCN 2020). In the Gulf of Kachchh, the species distribution was rarely encountered at a low-tide exposed reef edge in the eastern side of Narara Island, and their distribution is recorded nowhere else in the Gulf of Kachchh reefs. Even at the recorded reef site also, a small patch of around 8–10 colonies was only observed. A detailed study needs to be carried out along the Kachchh reefs to record their actual distribution. Attempts with the aid of the latest technologies to explore the sub-tidal reefs may yield a greater number of coral species from the isolated reefs of the Gulf of Kachchh.

REFERENCES

- Achituv, Y. & Z. Dubinsky (1990). Evolution and Zoogeography of Coral Reefs, pp. 1–9. In: Dubinsky, Z. (ed.). *Ecosystems of the World, 25 Coral Reefs*. Elsevier Science Publishing Company, Inc. Amsterdam, The Netherlands, 550pp.
- Benzoni, F., F. Stefani, J. Stolarski, M. Pichon & P. Galli (2007). Debating phylogenetic relationships of the scleractinian *Psammocora*: Molecular and morphological evidences. *Contributions to Zoology* 76(1): 35–54. <https://doi.org/10.1163/18759866-07601004>
- Camp, E.F., V. Schoepf, P.J. Mumby, L.A. Hardtke, R. Rodolfo-Metalpa, D.J. Smith & D.J. Suggett (2018). The Future of Coral Reefs Subject to Rapid Climate Change: Lessons from Natural Extreme Environments. *Frontiers in Marine Science* 5(4): 1–21. <https://doi.org/10.3389/fmars.2018.00004>
- Cairns, S.D., B.W. Hoeksema & J. van der Land (1999). Appendix: List of extant stony corals. *Atoll Research Bulletin* 459: 13–46.
- Dixit, A.M., P. Kumar, K.D. Pathak & M.I. Patel (2010). *Economic valuation of coral reef ecosystem in Gulf of Kachchh*. Gujarat Ecology Commission, Gandhinagar, 158 pp.
- Faure, G.F. (1982). Recherche sur les Peuplements de Scleractiniaires des récificoralliens de l'Archipel des Mascareignes (*Océan Indien Occidental*). PhD Thesis, Université d'Aix-Marseille II, 246 pp.
- Glynn, P.W. & G.M. Wellington (1983). *Corals and Coral Reefs of the Galapagos Islands*. University of California Press, Berkeley/Los Angeles, 330 pp.
- Hoeksema, B.W. & S. Cairns (2019). World List of Scleractinia. <http://www.marinespecies.org/scleractinia>. Electronic version accessed 20 October 2020.
- Hoffmeister, J.E. (1925). Some corals from American Samoa and the Fiji Islands. *Papers from the Department of Marine Biology of the Carnegie Institution of Washington* 22: 1–90.
- Michael, L., D.G. Rao, K.S. Krishna & K.H. Vora (2009). Late Quaternary seismic sequence stratigraphy of the Gulf of Kachchh, Northwest of India. *Journal of Coastal Research* 25: 459–468. <https://doi.org/10.2112/07-0873.1>
- Mondal, T., C. Raghunathan & K. Venkataraman (2015). Report of newly recorded eight scleractinian corals from middle and south Andaman Archipelago, India. *Global Journal of Science frontier research C: Biological Science* 15(2): 19–26.
- Pillai, C.S.G. (1967). Studies on Corals. PhD Thesis, Department of Aquatic Biology & Fisheries, University of Kerala, XXIV+338 pp.
- Pillai C.S.G. (1971). The distribution of shallow water stony corals at Minicoy Atoll in the Indian Ocean with a check-list of species. *Atoll Research Bulletin* 141: 1–12.
- Pillai C.S.G. & M.I. Patel (1988). Scleractinian Corals from the Gulf of Kutch, *Journal of Marine Biological Association of India* 30(1&2): 54–74.
- Pillai C.S.G. & S. Jasmine (1989). The Coral fauna of Lakshadweep. *Central Marine Fisheries Research Institute Bulletin* 43: 179–195.
- Pillai C.S.G. (1986). Recent corals from the southeast of India, pp. 107–201. In: James P.S.B.R. (ed.). *Recent Advances in Marine Biology*. Today and Tomorrow Printers and Publishers, New Delhi, 591 pp.
- Raghuraman R., C.R. Sreeraj, C. Raghunathan & K. Venkataraman (2012). Scleractinian coral diversity in Andaman & Nicobar Island in comparison with other Indian reefs, pp. 75–92. In: Uttar Pradesh Biodiversity Board (ed.) *Marine Biodiversity: One Ocean – Many words of life*. Uttar Pradesh State Biodiversity Board, Lucknow, 193 pp.
- Reyes-Bonilla, H. (2002). Checklist of valid names and synonyms of stony corals (Anthozoa: Scleractinia) from the eastern Pacific. *Journal of Natural History* 36: 1–13.
- Satyanarayana, C. & Ramakrishna (2009). *Handbook on Hard Corals of Gulf of Kachchh*. Published by the Director, Zoological Survey of India, Kolkata, 114 pp.
- Satyanarayana, C., T.S.C. Roy, R. Chandran, C. Sivaperuman, C.R. Sreeraj & K. Chandra (2018). *Status of coral resources of India and Strategies for their protection and management*, Published by the Director, Zoological Survey of India, Kolkata, 100 pp.
- Scheer, G. & C.S.G. Pillai (1983). Report on the stony corals from the Red Sea. *Zoologica* 45(3): 1–198.
- IUCN (2020). The IUCN Red List of Threatened Species. Version 2020-2. <https://www.iucnredlist.org>. Electronic version accessed 22 October 2020.
- Srivastava, P.K. (1965). A note on the Quaternary geology of Saurashtra Peninsula. *Quaternary Journal of Geology, Mineralogy and Metallurgical Society of India* 1: 55–63.
- Spalding, M.D., C. Ravilious, E.P. Green (2001). World atlas of coral reefs. The University of California Press, Berkeley, U.S.A., 424pp.
- Stefani, F., F. Benzoni & M. Pichon (2008). A multidisciplinary approach to the definition of species boundaries in branching species of the coral genus *Psammocora* (Cnidaria, Scleractinia). *Zoologica Scripta*



37: 71–91. <https://doi.org/10.1111/j.1463-6409.2007.00309.x>

- Suresh V.R. (1991).** Studies on the coral reefs of Lakshadweep. PhD Thesis. Cochin University of Science and Technology, Kochi, 123 pp.
- Tenjing, S.Y., P. Krishnan, V.D. Samuel & R. Purvaja (2019).** *Truncatoflabellum madrasensis* sp. nov. - a new ahermatypic coral species from India and a checklist of species of the genus *Truncatoflabellum* from the Indian Ocean. *Vie et milieu - Life and Environment* 69(2–3): 89–93.
- Venkataraman, K. & C. Satyanarayana (2012).** *Coral Identification Manual*. Zoological Survey India, Kolkata, 136 pp.
- Venkataraman, K., C. Raghunathan, R. Raghuraman, C. Sivaperuman, C.R. Sreeraj, T. Immanuel & J.S.Y. Kumar (2012).** *Scleractinia of Andaman and Nicobar Islands*. Records of Zoological Survey of India, Zoological Survey India, Kolkata, 304 pp.
- Veron, J.E.N. (1995).** Corals in space and time: the biogeography and evolution of the Scleractinia. Cornell University Press, Ithaca, London, 321 pp.
- Veron, J.E.N. (2000).** *Corals of the World*. Volumes 1–3. Townsville,

Darwin, Perth: Australian Institute of Marine Science, Townsville, Australia, 1382 pp.

- Veron J.E.N. & M. Pichon (1976).** Scleractinia of Eastern Australia. I Families Thamnasteriidae, Astrocoeniidae, Pocilloporidae. *Australian Institute of Marine Science Monograph Series* 1: 1–86.
- Veron, J.E.N., M. Stafford-Smith, L. DeVantier & E. Turak (2015).** Overview of distribution patterns of zooxanthellate Scleractinia. *Frontiers in Marine Science* 1(81): 1–19.
- Veron, J.E.N., M.G. Stafford-Smith, E. Turak & L.M. DeVantier (2016).** Corals of the World. http://www.coralsoftheworld.org/species_factsheets/species_factsheet_distribution/psammocora-contigua/. Electronic version accessed 22 October 2020.
- Wallace, C.C. (1999).** *Staghorn corals of the world: a revision of the coral genus Acropora (Scleractinia; Astrocoeniina; Acroporidae) worldwide, with emphasis on morphology, phylogeny and biogeography*. CSIRO Publishing, Melbourne, Victoria, 422 pp.
- WoRMS (2020).** World Register of Marine Species. Available from <http://www.marinespecies.org> at VLIZ. Electronic version accessed 17 October 2020.



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