

# Diversity and distribution of porcelain crabs of Gujarat, India

Beleem, I.<sup>a</sup>; Poriya, P.<sup>b</sup>; Gohil, B.<sup>a\*</sup>

<sup>a</sup> Department of Life Sciences, Maharaja Krishnakumarsinhji Bhavnagar University, Bhavnagar-364002, India

<sup>b</sup> Department of Marine Science, Maharaja Krishnakumarsinhji Bhavnagar University, Bhavnagar-364002, India

(Received: 16 September 2016; Accepted: 14 May 2017)

Present paper reports four species of porcelain crabs in three genera from the Gujarat coast, India. *Ancylocheles gravelei* (Sankolli, 1963), *Pisidia dehaanii* (Krauss, 1843), *P. gordonii* (Johnson, 1970) and *Polyonyx hendersoni* Southwell, 1909 are reported from the Gujarat coast for the first time. Twelve porcellanid species are known from the Gujarat coast, including four species reported in this paper.

**Key words:** Crustacea; Anomura; Porcellanidae; distribution; Gujarat

## INTRODUCTION

Porcelain crabs are cosmopolitan in distribution, found throughout the world's oceans from deep water habitat to intertidal zones and coral reef, they are commonly found clinging to the undersides of intertidal rocks or boulder, in rock crevices, mussel beds and live in association with other invertebrates (Denny & Gaines, 2007). The family porcellanidae includes around 280 species in 30 genera from tropical to temperate waters of the world (e.g., Osawa & McLaughlin, 2010; Osawa & Uyeno, 2013; Dolorosa & Werding, 2014).

Porcelain fauna of the Indian waters have been studied by various authors (e.g. Heller, 1862; 1865; Henderson, 1893; Southwell, 1906, 1909; Gravely, 1927; Sankarankutty, 1961a, b, 1963; Sankolli, 1963a, b; 1966; Mustaquim, 1972; Ahmed & Mustaquim, 1974; Haig, 1981; Siddiqui and Kazmi, 2003; Kazmi & Siddiqui, 2006; Hiller et al., 2010; Prakash et al., 2013a, b; Kumaralingam et al., 2015a, b; Kumaralingam & Raghunathan, 2017). A checklist of 30 porcelain species from India was recently compiled by Prakash et al., (2013a). Subsequently, Kumarlingam et al. (2015a, b) added five species to Indian Ocean porcelain fauna. Thus thirty five species of porcelain fauna are distributed in Indian Ocean. Porcelain fauna of Gujarat coast were studied by few authors like Southwell (1909), Ramanandan (1966), Trivedi and Vachhrajani (2013) and Beleem et al., 2014, 2016.

Previously Southwell (1909), Haig (1964), Ramanandan, (1966) and Trivedi & Vachhrajani (2013) reported six species of porcelain crabs from Gujarat coast, India.

Recently we have reported two species, *Enosteoides ornatus* (Stimpson, 1858) and *Pachycheles tomentosus* (Henderson, 1893), from the Gujarat coast (Beleem et al. 2016). Now, we further add four species of porcelain crabs with their habitat and distribution in the Gujarat coast, India. Thus twelve species of porcelain crabs are given with their distribution status for Gujarat coast, India (Table 1).

## MATERIAL AND METHODS

Gujarat has the longest coastline of about 1600 km in India. The Intertidal zone of Gujarat has diverse coral reefs and mangrove ecosystem in the Gulf of Kutch and has rocky muddy habitat with mangrove ecosystem in the Gulf of Khambhat. In the present study, intertidal zones of ten different locations of Gujarat coast were surveyed for the diversity of porcellanidae fauna (Fig. 1). These locations are Diu ( $20^{\circ}42'16.74''\text{N}$ ,  $70^{\circ}58'44.18''\text{E}$ ), Veraval, ( $20^{\circ}54'48.33''\text{N}$ ,  $70^{\circ}20'55.48''\text{E}$ ), Dhamlej ( $20^{\circ}46'49.59''\text{N}$ ,  $70^{\circ}35'23.82''\text{E}$ ), Chorwad ( $21^{\circ}0'5.65''\text{N}$ ,  $70^{\circ}13'28.94''\text{E}$ ), Mangrol ( $21^{\circ}6'54.14''\text{N}$ ,  $70^{\circ}5'24.91''\text{E}$ ), Dwarka ( $22^{\circ}14'32.41''\text{N}$ ,  $68^{\circ}57'20.81''\text{E}$ ), Mithapur ( $22^{\circ}25'11.86''\text{N}$ ,  $68^{\circ}59'28.52''\text{E}$ ), Shivrajpur ( $22^{\circ}19'59.56''\text{N}$ ,  $68^{\circ}56'28.07''\text{E}$ ) and Okha ( $22^{\circ}28'42.60''\text{N}$ ,  $69^{\circ}4'7.55''\text{E}$ ) and Sikka ( $22^{\circ}27'34''\text{N}$ ,  $69^{\circ}48'23''\text{E}$ ). Collections were made during lowest tide by hand picking method. Preservation of specimens was done in 90-95% alcohol. Collected voucher specimens are deposited in the Museum of the Department of Life Sciences, Maharaja Krishnakumarsinhji Bhavnagar University, Bhavnagar, under the registration LSAIAA. Taxonomic identification was done through the scientific literatures such as Southwell (1909), Sankoli (1963a), Mustaquim (1972), Kazmi and Siddiqui (2006), Hiller et al., (2010), and personnel communication with experts. Taxonomic characters, habitat and distribution of each species are given. The sizes of specimens mentions in the text pertain to carapace length (CL) and carapace width (CW) in mm. The present checklist is compiled based on the previous published records of porcelain crabs from Gujarat coast (Table 1).

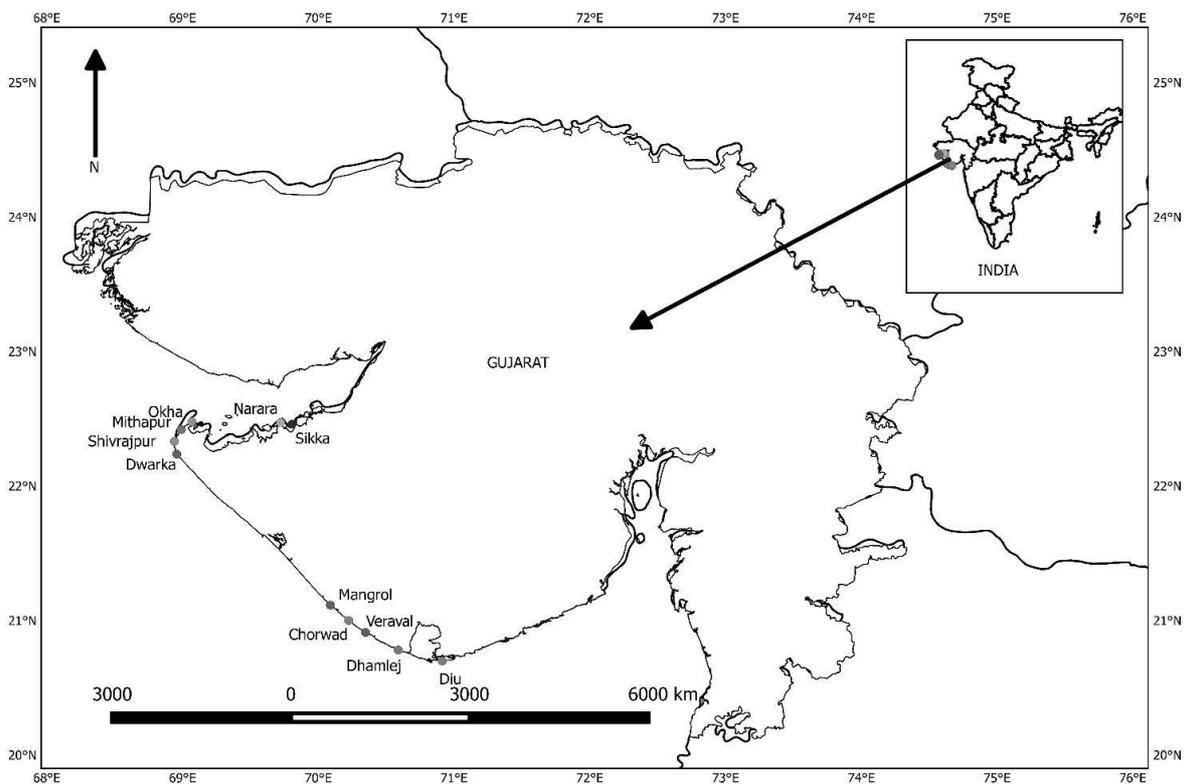


FIGURE 1. Map of the studied area.

**TABLE 1.** Distribution of Porcelain crabs in different coastal area of Gujarat, India.

Scientific names	1	2	3	4	5	6	7	8	9	10	11	12	13	14	References (Gujarat coast)
<i>Ancylocheles gravelei</i> (Sankolli, 1963)	+	+	+	+	+	-	-	+	+	-	-	-	-	-	Present study
<i>Enosteoides ornatus</i> (Stimpson, 1858)	-	-	-	-	-	+	+	-	-	+	+	-	-	-	Beleem et al. 2016
<i>Pachycheles tomentosus</i> (Henderson, 1893)	-	-	+	-	-	-	-	-	-	-	-	-	-	-	Beleem et al. 2016
<i>Petrolisthes boscii</i> (Audouin, 1826)	+	+	+	+	+	-	+	+	+	+	+	-	-	-	Southwell (1909); Trivedi & Vachhrajani (2013); Beleem et al. 2016
<i>Petrolisthes lamarckii</i> (Leach, 1820)	+	+	+	+	+	+	+	+	+	+	+	-	-	-	Trivedi & Vachhrajani (2013); Beleem et al. 2016
<i>Petrolisthes rufescens</i> (Heller, 1861)	+	-	-	-	-	-	+	+	+	+	+	-	-	-	Haig (1964); Beleem et al. 2016
<i>Pisidia debaanii</i> (Kraus, 1843)	-	-	-	-	-	-	-	+	-	+	+	-	-	-	Present study
<i>Pisidia gordonii</i> (Johnson, 1970)	-	-	-	-	-	-	-	-	-	+	+	-	-	-	Present study
<i>Pisidia serratifrons</i> (Stimpson, 1858)	-	-	-	-	-	-	-	-	-	-	-	+	-	-	Southwell (1909)
<i>Polyonyx hendersoni</i> Southwell, 1909	-	-	-	-	-	+	-	+	-	+	-	-	-	-	Present study
<i>Polyonyx obesulus</i> (Miers, 1884)	-	-	-	-	-	+	-	-	-	-	+	-	-	-	Southwell (1909)
<i>Porcellanella triloba</i> (Stimpson, 1858)	-	-	-	-	-	+	-	-	-	-	-	-	+	+	Ramanandan (1966)

First rows indicates: 1. Diu, 2. Dhamlej, 3. Veraval, 4. Chorwad, 5. Mangrol, 6. Sikka, 7. Narara, 8. Dwarka, 9. Shivrajpur, 10. Mithapur 11. Okha, 12. Hanuman dandi, Beyt Dwarka 13. Dabdaba Island 14. Pindra reef.

\* Indicate the new record in Indian Ocean checklist

## RESULTS

*Ancylocheles gravelei* (Sankolli, 1963), *Pisidia debaanii* (Krauss, 1843), *Pisidia gordonii* (Johnson, 1970) and *Polyonyx hendersoni* Southwell, 1909 are reported from the Gujarat coast for the first time. Checklist of porcelain crab species of Gujarat coast with their occurrence sites are shown (Table 1).

## Systematics

Order DECAPODA Latreille, 1802

Infraorder ANOMURA MacLeay, 1838

Family PORCELLANIDAE Haworth, 1825

**Genus** *Ancylocheles* Haig, 1978

***Ancylocheles gravelei* (Sankolli, 1963)** (Fig. 2)

### Material examined

2♂, (1) CL: 5.3 mm, CW: 5.6 mm; (2) CL: 3.4 mm, CW: 3.4mm; 3♀, (1) CL: 4.2mm, CW: 4.3mm; (2) CL: 4.3 mm, CW: 4.0 mm (3) CL: 3.8 mm CW: 3.4 mm, LSAIAA01.

### Description

Carapace as long as broad; front slightly depressed; triangular with shallow median groove; dorsal surface smooth; regions well marked. No epibranchial spine. Eyes moderately large. Chelipeds unequal in size and armature; merus with denticulate lobe on anterodistal margin; carpus granulated on dorsal surface, with two or three blunt teeth on dorso-anterior margin; outer margin convex; chela broad, granular with a broad longitudinal ridges on dorsal surface, outer margin convex, ventral surface smooth, large chela with wide gap when closed, tip of dactylus bent underside tip of immovable finger; dactyl of smaller chela twisted out of plane with manus. Ambulatory legs slender, with scattered setae; meri unarmed; carpi each with one sharp spine at anterodistal end, only carpus of fourth pereopod with one spine at posterodistal end; propodi each with four spines on posterior margin; dactyli each with four movable spines on posterior margin.

### Colour

Carapace entirely reddish, with white spots (Fig. 2a, b) or pale brown (Fig. 2c); brown spots on branchial region. Ambulatory legs with distinct white bands on propodi and dactyli.

### Habitat

This species was usually observed in lower intertidal zone, under large pebbles and calcareous algae, sometime in crevices of dead corals.

### Distribution

Indian Ocean, Pakistan, Western Indian coast and West Australia (Sankoli, 1963; Kazmi & Siddiqui, 2006; Hiller et al., 2010). *Ancylocheles gravelei* is reported for the first time from the Gujarat coast (Table 1).

### Remarks

The specimens examined shows intraspecific variation in shape and coloration of the carapace and carpus, carapace circular (Fig. 2a), carapace as long as broad (Fig. 2b, and 2c), carpus at anterior margin with two (Fig. 2b and 2c) or three blunt teeth (Fig. 2a), variation in gap size and dactylus shape of chela (Fig. 2g1, 2g2, 2g3). *Ancylocheles gravelei* was firstly reported from the Gulf of Mannar as *Pachycheles* sp., by Gravely (1927), and later it was formally described as *Porcellana gravelei*, by Sankoli (1963a). Haig (1978) established the genus *Ancylocheles* for that species. Later it is known as *Ancylocheles gravelei*. It is a very common species occurring in the lower intertidal zone of the Saurashtra and Kutch coasts, Gujarat, India.

**Genus** *Pisidia* Leach, 1820

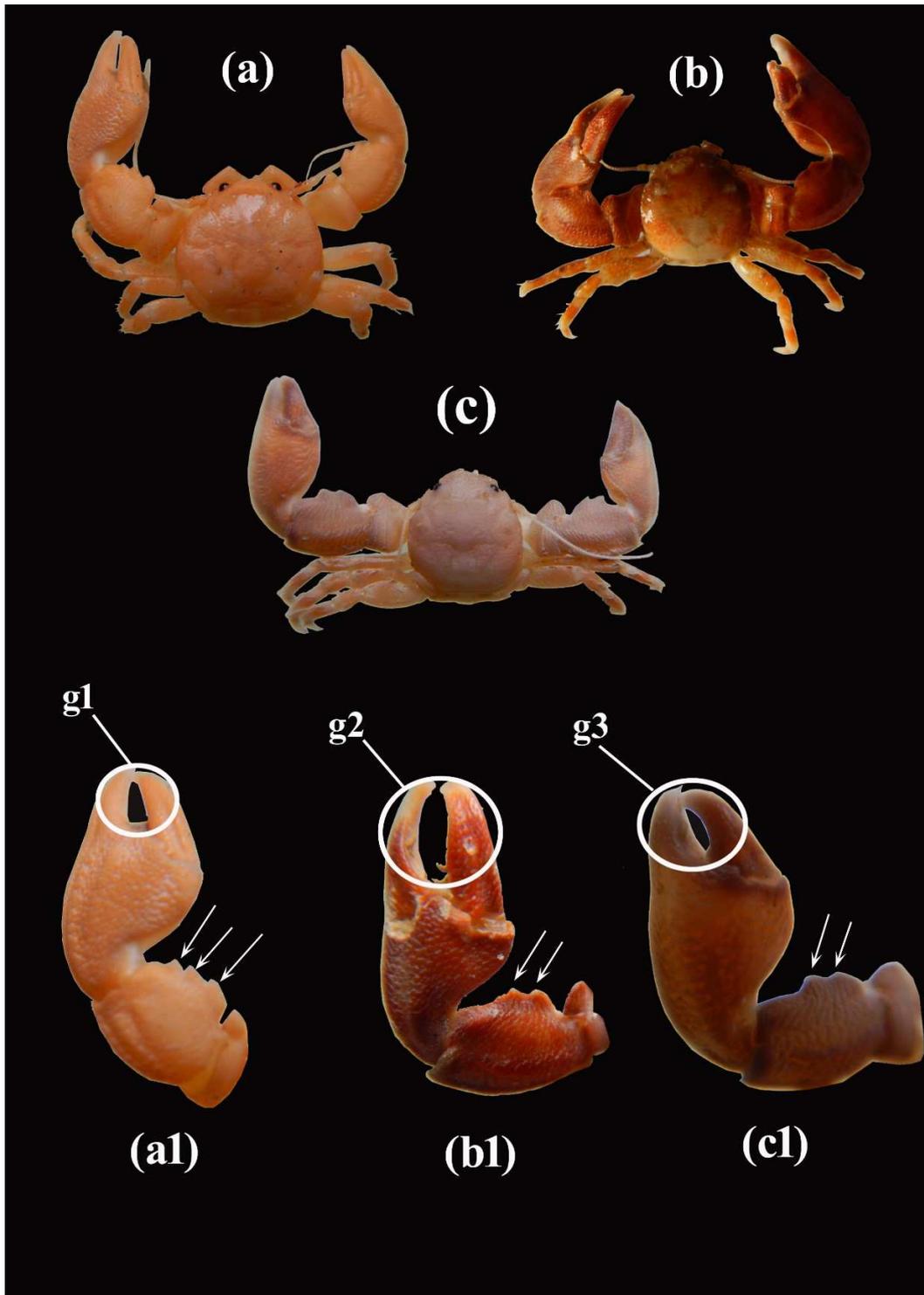
***Pisidia dehaanii* (Kraus, 1843)** (Fig. 3a)

### Material examined

1♂, (1) CL: 3.0 mm, CW: 3.1 mm; (2) CL: 3.4 mm, CW: 3.4mm; 2♀, (1) CL: 3.3 mm, CW: 2.9 mm; (2) CL: 3.9 mm, CW: 3.9 mm, LSAIAA07.

### Description

Carapace as long as broad; front with three lobes, median lobe longer than lateral lobes; dorsal surface rough, regions well-marked, protogastric ridges covered with tufts formed by feathered setae; no epibranchial spine, two mesobranchial spines present, external orbital angle terminating into small spine, supra-ocular spine present. Chelipeds nearly identical in size and armature; merus with denticulated trapezoid lobe on anterodistal edge; carpus unarmed with anterior and posterior margin convex; large chela broad, outer margin convex; smaller chela similar with slightly concave outer margin and dactyl twisted out of plane with manus. Ambulatory legs moderately long, slender with scattered setae; meri and carpi unarmed; propodi each with two spines on posterodistal end; dactyli each with four movable spines on posterior margin.



**FIGURE 2.** Morphological forms (a, b, c) of *Ancylocheles gravelei*. Cheliped Carpus of each forms (a1, b1, c1) indicating difference in gap (g1, g2, g3) between dactylus and propodus.

**Colour**

Carapace with light orange stains on cervical groove and white spots on entire carapace in few fresh specimen, in most of the specimen's entire carapace white in colour. Ambulatory legs with distinct orange bands on propodi and dactyli.

**Habitat**

This species was usually observed in middle and lower intertidal zone, under large pebbles covered with algae and sometime found in association with zoantharian colonies.

**Distribution**

Pakistan (Mustaquim, 1972; Kazmi & Siddiqui, 2006); Mandapam, Bay of Bengal (Haig, 1981); Goa, South African coast, Persian Gulf (Hiller et al. 2010). *Pisidia dehaanii* reported for the first time from the Gujarat coast (Table 1).

**Remarks**

This species is an Indian Ocean endemic (Hiller et al., 2010), it range from South Africa to Pakistan. It differs from *Pisidia streptocheles* (Stimpson, 1858), (western Indian Ocean) in having naked carapace, longer front with a prominent median tooth, and denticulated superantennary margin (Stebbing, 1910). It is a very common occurring species in the middle and lower intertidal zone of the Gulf of Kutch, Gujarat, India.

***Pisidia gordonii* (Johnson, 1970) (Fig. 3b)****Material examined**

1♀, (1) CL: 5.5 mm, CW: 4.0 mm; 2♂, (1) CL: 5.7 mm, CW: 4.9 mm; (2) CL: 6.8 mm, CW: 5.2 mm, LSAIAA08.

**Description**

Carapace longer than broad; front depressed with three lobe separated by notch; median lobe much broader than lateral ones, outer margin of lobes spine-tipped; dorsal surface rough, regions well marked; epibranchial region fringed with three to four small spinules.

Eyes moderately large, orbits well-defined, outer orbital angle produced into two sharp spines. Chelipeds nearly identical in size and armature; merus with spiny trapezoid lobe on anterodistal edge; carpus serrated with five to seven unequal sized sharp spines on dorso-anterior margin, posterior margin with two unequal sized spines; palm serrated with three longitudinal crest with rows of acute spines; dactyl of smaller chela twisted out of plane with manus. Ambulatory legs long and slender, with scattered long setae; meri unarmed; carpi each with one sharp spine at anterodistal end; propodi each with three spines at posterodistal end; dactyli each with five movable spines on posterior margin.

**Colour**

Carapace entirely pale orange or sometimes with white spots on branchial region. Ambulatory legs with distinct orange bands on propodi and dactyli.

**Habitat**

This species usually observed in lower intertidal zone, specifically in pools and puddle under large pebbles and under dead corals.

**Distribution**

Delagoa Bay, Mozambique, Madagascar, Red Sea, Gulf of Aden and Gulf of Iran, West coast of the Indian subcontinent to the Gulf of Mannar, Hong Kong, Singapore, Java, Sri Lanka and tropical Australia (Haig, 1981), Pakistan (Kazmi and Siddiqui, 2006), Goa, India (Hiller et al., 2010). *Pisidia gordonii* reported for the first time from the Gujarat coast (Table 1).

**Remarks**

This species is an Indian Ocean endemic (Hiller et al., 2010). It is a very common occurring species in the middle and lower intertidal zone of the Gulf of Kutch, Gujarat, India.

***Polyonyx hendersoni* Southwell, 1909 (Fig. 3c)****Material examined**

1♀, Ovigerous female (1) CL: 6.4 mm, CW: 6.8 mm; 2♂, (1) CL: 5.1 mm, CW: 6.0 mm; (2) CL: 3.7 mm, CW: 3.7, LSAIAA09.

**Description**

Carapace as long as broad; longitudinally convex; dorsal surface smooth, rostrum broad inclined anteriorly; regions well marked; epibranchial edges rounded, no epibranchial spine. Cheliped unequal in size and identical armature, dorsally granulated; merus with granulated lobe at anterodistal edge; carpus with two or three blunt or sharp teeth (young specimen) on dorso-anterior margin, major chela with small gap when closed, tip of dactylus bent upward tip of immovable finger; outer border of larger chela slightly concave, covered with rows of minute teeth, no setae (except in smaller specimens in small cheliped covered with feathery setae); dactyl of smaller chela twisted out of plane with manus. Ambulatory legs covered with dense feathery setae on carpus, propodus and dactylus; meri unarmed; carpi each with a blunt spine on anterodistal end; propodi each with four spines on posterior margin; dactyli each with two spines on posterior margin and two strong bifurcated spines at posterodistal end.

**Colour**

Carapace entirely brick red or pale orange.

**Habitat**

This species was usually observed in lower intertidal zone, inhabit exclusively in the cavities of yellow sponges, under dead coral and rock. *P. hendersoni* sometimes found with *P. obesulus*.

**Distribution**

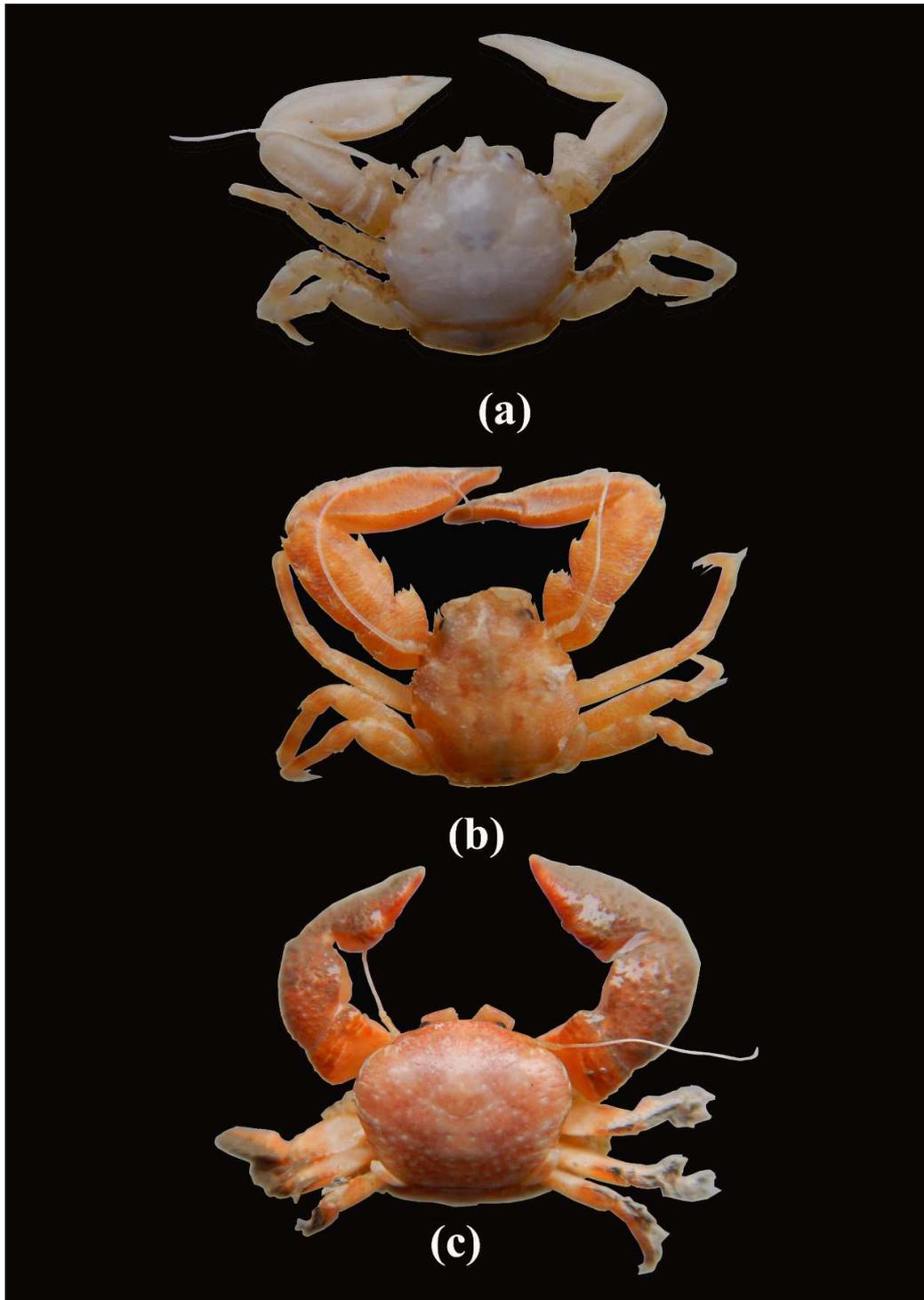
Andaman, Sri Lanka, Gulf of Mannar, India (Southwell, 1909; Gravely, 1927), Pakistan (Kazmi & Siddiqui, 2006), Goa (Hiller et al. 2010). *Polyonyx hendersoni* reported for the first time from the Gulf of Kutch, Gujarat India (Table 1).

**Remarks**

This species is endemic to Indian Ocean and closely resemble to *Polyonyx splendidus* (Sankolli, 1963), which also seen in the ducts of sponges. *P. splendidus* differs from *P. hendersoni* by smooth meral lobe of cheliped, carpus unarmed, carpi and chelae of both the chelipeds covered with feathery setae (Hiller et al., 2010).

**Acknowledgments**

Authors are thankful to the head, of the Department of Life Sciences, Maharaja Krishnakumarsinhji (Bhavnagar University, Bhavnagar). First author (IB) is thankful to the University Grant Commission for providing financial support as Maulana Azad National Fellowship (MANF scheme). Authors are greatly thankful to Dr. Masayuki Osawa (Shimane University, Japan), for their help and suggestions in identification of all the porcelain crabs. We are thankful to Dr. Javed Mustaqim (Former Professor at Centre of Excellence in Marine Biology University of Karachi, Pakistan) for providing useful literatures of porcelain crabs. Lastly first author thankful to Mr. Bhavik Vakani (Ph.D. Research Scholar, Saurashtra University, Rajkot) and Mr. Piyush Vadher (Senior Research Fellow, Sikka, Gujarat, India) for helping in field survey of Gulf of Kutch, Gujarat, India.



**FIGURE 3.** Entire animal dorsal view (a) *Pisidia debaani*, male, CL: 3.0 mm, CW: 3.1 mm. (b) *Pisidia gordonii*, male, CL: 5.5 mm, CW: 4.0 mm (c) *Polyonyx hendersoni*, female, CL: 6.4 mm, CW: 6.8 mm

**LITERATURE CITED**

- Ahmed, M., Mustaqim, J., 1974. Population structure of four species of porcellanid crabs (Decapoda: Anomura) occurring on the coast of Karachi. *Marine Biology* 26, 173–182.
- Beleem, I.B., Yogesh Kumar, J.S., Satyanarayana, Ch., Venkataraman, K. and Kamboj, RD., 2014. Distribution of Marine Crabs from the Marine National Park, Gulf of Kutch. *Scholars Academic Journal of Biosciences* 2 (7), 419-427.
- Beleem, I., Poriya, P., Gohil, B., 2016. Porcelain crabs (Crustacea: Decapoda: Anomura) of western coast of India. *Marine Biodiversity Records* 9(43), 1-7.
- Denny, M., Gaines, W., Steven, D., 2007. *Encyclopedia of Tidepools and Rocky Shores*. Berkeley, CA: University of California Press, 735 pp. 736 illustrations.
- Dolorosa, RG., Werding, B., 2014., A new mangrove-inhabiting porcelain crab of the genus *Enosteoides* (Crustacea: Decapoda: Anomura) from Puerto Princesa Bay, Palawan, the Philippines. *Bulletin of Marine Science* 90 (3), 865–72.
- Gravely, F.H., 1927. The littoral fauna of Krusudai Island in the Gulf of Mannar, orders Decapoda (except Paguridae) and Stomatopoda. *Bulletin of the Madras Government museum* 1, 135-155, pls. 19-26.
- Haig, J., 1964. Porcellanid Crabs from the Indo-West Pacific, Part I, papers from Dr. Th. Mortensen's Pacific Expedition 1914–1916. 81. *Videnskabelige Meddelelser Dansk Naturhistorisk Forening i Kjøbenhavn* 126, 355–86.
- Haig, J., 1978. Contribution toward a revision of the porcellanid genus *Porcellana* (Crustacea: Decapoda: Anomura). *Proceedings of the Biological Society of Washington* 91(3), 706-714.
- Haig, J., 1981. Porcellanid crabs from the Indo-West Pacific, Part II. *Steenstrupia, Zoological Museum University of Copenhagen* 7 (12), 269-291.
- Heller, C., 1862. Neue Crustaceen, gesammelt während der Weltumseglung der k. k. Fregatte Novara. Zweiter vorläufiger Bericht. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* 12, 519-528.
- Heller, C., 1865. Reise der österreichischen Fregatte «Novarra» um die Erde, in den Jahren 1857, 1858, 1859, unter den Befehlen des Commodore B. von Wüllerstorff-Urbair. *Zoologischer Theil*, 2, part 3. Wien: Kaiserlich-königlichen Hof- und Staatsdruckerei. 280 pp.
- Hiller, A., Harkantra, S., Werding, B., 2010. Porcellanid crabs from Goa, eastern Arabian Sea (Crustacea: Decapoda: Porcellanidae). *Journal of Bombay Natural History Society* 107(3), 201-212.
- Henderson, J.R., 1893. A contribution to Indian Carcinology. *Transactions of the Linnean Society of London* 5: 325–458, pls. 36–40.

- Kazmi, Q.B., Siddiqui, F.A., 2006. An illustrated key to the Malacostraca (crustacean) of the Northern Arabian Sea, Part VI: Decapoda, Anomura. *Pakistan Journal of Marine Science* 15(1), 11-79.
- Kumaralingam, S., Raghunathan, C., Venkataraman, K., 2015a. First record of the commensal porcelain crab, *Neopetrolisthes spinatus* (Crustacea: Decapoda: Anomura: Porcellanidae) from India. *Marine Biodiversity Records* 8; e90; 201, 1-3.
- Kumaralingam, S., Raghunathan, C., Venkataraman, K. 2015b. An account of new records of reef associated crabs of Andaman and Nicobar Islands. *Records of Zoological Survey of India*. 115 (3), 255-171.
- Kumaralingam, S., Raghunathan, C., 2017. First report on *Neopetrolisthes maculatus* (H. Milne Edwards, 1837) (associated with *Stichodactyla haddoni* (Saville-Kent, 1893) from Grub Island, Andaman Islands. *Proceedings of the International Academy of Ecology and Environmental Sciences* 7(1), 20-24.
- Mustaquim, J., 1972. Species of porcellanid crabs from Karachi. *Pakistan journal of zoology* 4(2), 153-159.
- Osawa, M., McLaughlin, P.A., 2010. Annotated checklist of anomuran decapod crustaceans of the world (exclusive of the Kiwaioidea and families Chirostylidae and Galatheidae of the Galattheoidea) Part II - Porcellanidae. *Raffles Bulletin of Zoology Supplement* 23, 109- 129.
- Osawa, M., Uyeno D.A., 2013. New subtidal species of the genus *Petrolisthes* Stimpson, 1858 (Crustacea: Decapoda: Porcellanidae) from Okinawa, with an account of species of the genus known from the Ryukyu Islands, southwestern Japan. *Zootaxa* 3670 (3), 329–38.
- Prakash, S., Kumar, TTA., Gopi, M., Balasubramanian, T., 2013b. First record of four species of *Petrolisthes* (Crustacea: Decapoda: Anomura: Porcellanidae) from Lakshadweep, India. *Marine Biodiversity Records* 6 (e47), 1-5.
- Prakash, S., Thangappan, T., Kumar, A., Khan, S.A., 2013a. Checklist of the Porcellanidae (Crustacea: Decapoda: Anomura) of India. *Check List* 9(6), 1514-1518.
- Ramanandan, R., 1966. On the occurrence of *Porcellanella picta* Stimpson (Decapoda: Anomura) in the Gulf of Kutch. *The Journal of the Bombay Natural History Society* 63 (3), pp 770-771.
- Sankarankutty, C., 1961a. On the porcellanid crab, *Porcellanella triloba* White (Crustacea -Anomura) a commensal on sea pen, with remarks on allied species. *Journal of the Marine Biological Association of India* 3, 96-100.
- Sankarankutty, C., 1961b. On a new genus of Porcellanidae (Crustacea - Anomura). *Journal of the Marine Biological Association of India* 3, 92-95.
- Sankarankutty, C., 1963. On three species of porcellanids (crustacea-anomura) from the Gulf of Mannar. *Journal of the Marine Biological Association of India* 5 (2), 273-279.

- Sankolli, KN., 1963a. On a new species of porcellanid crab (Decapoda, Anomura) from India. *Journal of the Marine Biological Association of India* 5(2), 280-283.
- Sankolli, KN., 1963b. On a new species of porcellanid crab (Decapoda, Anomura) from India. *Journal of the Zoological Society of India* 15(1), 79-84.
- Sankolli, KN., 1966. On the Porcellanidae (Crustacea: Anomura) of Ratnagiri along the west coast of India. In *Proceedings of symposium on Crustacea. Journal of the Marine Biological Association of India Mandapam camp Part I* pp 295–313.
- Siddiqui, F.A., Kazmi, Q.B., 2003. A checklist of marine anomurans (Crustacea: Decapoda) of Pakistan, northern Arabian Sea. *Memoirs of Museum Victoria* 60(1), 87-89.
- Southwell, T., 1906. Report on the Anomura collected by Professor Herdman, at Ceylon, in 1902. Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Mannar. Supplementary report 5, 211-224.
- Southwell, T., 1909. Report on the Anomura collected by Mr. James Hornell at Okha Mandal in Kattiawar in 1905-6, pp. 105-123, In J. Hornell (ed.), Report to the Government of Baroda on the marine ecology of Okha Mandal in Kattiawar. Part I. London.
- Stebbing, TRR., 1910. General Catalogue of South African Crustacea, Part V of S.A. Crustacea for the Marine Investigations in South Africa. *Annals of the South African Museum*. 6 (4), 361-362.
- Trivedi, J.N., Vachhrajani, K.D., 2013. First record of two porcellanid crabs from Gujarat state, India (Crustacea: Decapoda: Porcellanidae). *Journal of the Marine Biological Association of India* 55:55–8.