

Checklist of the Porcellanidae (Crustacea: Decapoda: Anomura) of India

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ABSTRACT: Although the porcellanid fauna of Indian waters has been studied for more than 150 years, diversity of this family remains underestimated. In order to complement the knowledge on the porcellanid fauna of India, an annotated checklist is herein provided on the basis of published literature. A total of 30 species belonging to 11 genera are currently known from Indian waters. The distribution ranges of two porcellanids *Porcellanella haigae* and *Pseudoporcellanella manoliensis* indicate that they are endemic, as they are, so far, known only from their type locality (Gulf of Mannar, Tamilnadu). The list is arranged alphabetically by genus and species with information on species' distribution and ecology.

INTRODUCTION

The family Porcellanidae is distinguished from other anomuran families by a crab-shaped body with a flattened abdomen. This family includes 30 genera and about 280 species around the world, mainly known from tropical to temperate waters (Osawa and McLaughlin 2010). Species of Porcellanidae generally occur from shore to continental shelf edges (<200 m), being more common in the intertidal and shallow subtidal zones of rocky and coral reefs. The species living in intertidal areas occupy narrow spaces between rocks or dead coral blocks, or on muddy bottoms (Werding and Hiller 2004) whereas, sub-tidal species occasionally live in association with other invertebrates (Werding 1983; Hiller *et al.* 2004; Hiller *et al.* 2006; Osawa and Chan 2010).

The studies on the porcellanids in India have a long history, with the first local report by Heller (1862) from the Nicobar Islands. However, the porcellanid fauna in India has not been satisfactorily explored. Thus, the present initiative was taken to provide an updated checklist on porcellanids of Indian waters with the hope to further contribute to the knowledge on the diversity of this family.

MATERIALS AND METHODS

The present checklist is compiled based on the published records of porcellanids from India between the years 1862 and 2013. Species names mentioned in the checklist follow Osawa and McLaughlin (2010). The list is arranged alphabetically by names of genera and species, with literature on distributional and ecological information. A map of India with the localities cited in the checklist is shown in as Figure 1. The published records from Indian waters include 30 species in 11 genera. In the checklist, species with the mark * have the distribution restricted to the Indian subcontinent (Hiller *et al.* 2010), ** indicates that the species are endemic to type locality. Species with numbers in parentheses refer to additional remarks referring to taxonomic changes (see Table 1).

RESULTS

Additional Remarks

(1) Sankolli (1963a) assumed that *Pachycheles* sp. recorded from the Gulf of Mannar by Gravely (1927) probably belongs to his new species, *Porcellana gravelei*. Later, Haig (1978) established the genus *Ancylocheles* for the latter species.

(2) The records of *Porcellana ornatus* by Gravely (1927) and Sankolli (1968) are referred to those of *Enosteoides ornatus* (Stimpson, 1858), not *Petrolisthes ornatus* (Paulson 1875).

(3) Southwell (1906) firstly recorded this species as *Porcellana quadrilobata* from India. *Porcellana quadrilobata* now belongs to the genus *Lissoporcellana* Haig (1978) as the type species of the genus. Southwell (1909) also described *Porcellana gaekwari* from Gulf of Mannar, India, but it is now considered as a junior synonym of *L. quadrilobata*, which is an associate of sponges.

(4) Sankarankutty (1963) reported this species as *Petrolisthes ohshimai* (Miyake 1937). This species is now considered as a junior synonym of *Neopetrolisthes maculatus* (H. Milne Edwards 1837).

(5) Heller (1862) reported this species from the Nicobar Islands as *Porcellana barbata*.

(6) Gravely (1927) and Sankarankutty (1963) reported/misidentified this species as *Porcellana serratifrons* and *Pisidia spinulifrons* from Gulf of Mannar.

(7) Gravely (1927) reported this species as *Polyonyx tuberculosus* from the Gulf of Mannar.

(8) *P. splendidus* and *P. hendersoni* represented a distinct genus, but taxonomic revision was not undertaken (Werding, 2001).

(9) Only single species was recognized worldwide. Although the year of the issue was printed as "1961," there was a delay in publication and it was actually issued in October 1962 (Low and Ng 2012).

DISCUSSION

Compared to the very exhaustive works on Brachyura by Alcock (1899a, 1899b, 1901) and later workers (Gravely 1927; Chhapgar 1957; Sethuramalingam and Ajmal Khan 1991), Porcellanidae has been less studied as far as Indian region is concerned. Classical contributions

from India are those by Heller (1862, 1865) (6 species), Henderson (1893) (5 species), Gravelly (1927) (8 species), Sankolli (1963a, b, 1965, 1968) (10 species) and Southwell (1906, 1909) (8 species) respectively. Recent studies on porcellanids of Indian waters reported 10 species from Goa (Hiller *et al.* 2010) and 4 species from Lakshadweep (Prakash *et al.* 2013). The published information on this family likely underestimates the biodiversity of the Indian Peninsula. The present checklist indicates that most of the species were collected from the intertidal area and extended up to the deeper waters of 180 m (see Table 1). Most porcellanids are associates of other invertebrates like corals, sponges, hydrozoans, anthozoans and ascidians etc.

From the biogeographical aspect a few species are endemic to the type localities. Two porcellanid species *Porcellanella haigae* and *Pseudoporcellanella manoliensis* as they are, so far, known only from the Gulf of Mannar, Tamilnadu (type locality) and there are certain endemics to Indian subcontinents such as *P. loimicola*, *P. splendidus* and *Raphidopus indicus* are considered to be endemic to the Indian subcontinents. Compared to the species, all genera are evenly distributed on east coast (Gulf of Mannar and Nicobar islands) and west coast (Gulf of Kutch and Okha) of India except *Neopetrolisthes*, *Porcellanella* and *Pseudoporcellanella*, which are restricted to the Gulf of Mannar only. Species richness is higher in the Gulf of Mannar (17 species) and it suggests that the same number of species or more may present from the other reef areas such as Andaman & Nicobar Island, Lakshadweep, Gulf of

Kutch and Ratnagiri due to the presence of similar habitats (rocky intertidal and coral reefs). The Nicobar Islands considered as one of the richest coral biodiversity hotspots (Venkataraman *et al.* 2004), but Heller (1862, 1865) only reported 6 species. A recent report on porcellanids from Goa (Hiller *et al.* 2010) included 10 species belonging to 6 genera collected from the rocky intertidal and sub-tidal shallow waters. Prakash *et al.* (2013) reported only 4 species of porcellanids under the genus *Petrolisthes* from Lakshadweep and the collection are confined to the rocky intertidal region.

Other crustaceans like brachyurans and parasitic isopods (Cymothoidae) have been widely studied and collected throughout the Indian waters (Dev Roy 2008; Trilles *et al.* 2011). Recent checklists on brachyurans from coral reefs and mangrove regions of India include 389 species, in which Andaman & Nicobar Islands holds a high diversity of 196 species followed by the Gulf of Mannar with 156 species, Lakshadweep with 107 species, Gujarat with 50 species and Goa with 17 species and it suggests that the diversity of true crabs is more in coral reefs compared to mangroves as far as Indian region is concerned (Dev Roy, 2008). The checklist on parasitic isopods of the family Cymothoidae includes 36 valid species throughout the Indian waters (Trilles *et al.* 2011). Hence, it is concluded that Porcellanidae has been quite explored and seems to the case for brachyurans and other crustaceans and in future it is necessary that more sampling is required because the diversity of porcellanids in India is probably underestimated.



FIGURE 1. Map of India showing the localities cited in the records of porcellanids.

FIGURE 1. Checklist of Porcellanids of Indian waters.

SPECIES NAME	DISTRIBUTION RANGE	ECOLOGY	LITERATURE SOURCE
<i>Ancylorhynchus graveli</i> (Sankolli, 1963a) (1)	Indian Ocean, Pakistan, Australia. India: Gulf of Mannar (Tamilnadu), West coast of India, Goa	Abundant in lower intertidal area, inhabits interstices of stones and rubbles overgrown by sponges and other fouling organisms	Gravely 1927; Sankolli 1963a; Haig 1965; Siddiqui and Kazmi 2003; Hiller <i>et al.</i> 2010
<i>Enosteoides ornatus</i> (Stimpson, 1858) (2)	Pakistan, Bay of Bengal, Gulf of Thailand, through south China sea, Taiwan strait, Southern Japan and Australia. India: Goa, Gulf of Mannar, Ratnagiri (Maharashtra)	Intertidal to 54 m deep; under rocks, from dead coral bases and sponges	Gravely, 1927; Sankolli, 1968; Haig 1981; Hiller <i>et al.</i> 2010
<i>Lissoporcellana quadrilobata</i> (Miers, 1884) (3)	Indo-west Pacific from Persian Gulf, east coast of Africa, from Indian Ocean to Malay peninsula and Australia. India: Gulf of Kutch and Gulf of Mannar	Shore to 128 m deep; sandy and muddy bottoms; found in association with corals and gorgonians	Southwell 1906, 1909; Osawa and Chan 2010;
<i>Neopetrolithes maculatus</i> (H. Milne Edwards, 1837) (4)	Circumtropical: East coast of Africa to Australia, Taiwan, Marshall and Ryukus islands. India: Gulf of Mannar	Shallow, subtidal water; coral and rocky reefs; associated with large sea anemones and often found in pairs	Sankarankutty 1963; Osawa and Chan 2010
<i>Pachycheles natalensis</i> (Krauss, 1843)	Western Indian ocean to Red sea, eastern Arabian sea, African coast, southward to Mozambique including Madagascar. India: Ratnagiri, Gulf of Mannar; Goa	Found in the deeper intertidal zone inhabiting interstices of stones and rubbles held together by sponges	Sankolli 1968; Hiller <i>et al.</i> 2010
<i>Pachycheles pisoides</i> (Heller, 1865)	Indian Ocean: Madagascar, Seychelles and Western Australia, Taiwan, Ryukus and Hawaiian islands. India: Nicobar Islands	Intertidal to 3.6 m deep; interspaces of branches of dead and living corals (<i>Acropora</i> , <i>Pocillopora</i> etc)	Heller 1865; Osawa and Chan 2010
<i>Pachycheles sculptus</i> (H. Milne Edwards, 1837)	Indo-west Pacific. Indian ocean from Seychelles, Mergui archipelago, Western Australia, Indonesia and Tuamato archipelago. India: Gulf of Mannar	Intertidal to 180 m deep; interspaces of branches of dead and living corals and sponges	Southwell 1906; Osawa and Chan 2010
<i>Pachycheles tomentosus</i> Henderson, 1893	Western Indian ocean, Pakistan, South Africa, Madagascar, Red sea, Gulf of Aden and Persian Gulf. India: Southern India, Western India	In holes and crevices of rocks near low water mark	Mustaqim 1972; Siddiqui and Kazmi 2003
<i>Petrolithes boscii</i> (Audouin, 1826)	Indo-west Pacific. Pakistan, Taiwan, Hong Kong, Gulf of Thailand, Japan, Australia, Red sea and Persian Gulf. India: Rameswaram, Gulf of Kutch, Gulf of Mannar, Okha Mandal, Goa	Shallow water to 18.3 m depth; from rocks, boulders and corals	Henderson 1893; Southwell 1909; Gravely 1927; Sankolli 1968; Siddiqui and Kazmi 2003; Hiller <i>et al.</i> 2010
<i>Petrolithes coccineus</i> (Owen, 1839) (5)	Indo-west Pacific. Japan, south to Indonesia, eastern African, Tuamato archipelago and Hawaiian islands. India: Nicobar Islands, Goa, Lakshadweep Archipelago	Intertidal to 7.2 m deep; under the rocks and boulders	Heller 1862; Osawa and Chan, 2010; Hiller <i>et al.</i> 2010; Prakash <i>et al.</i> 2013
<i>Petrolithes hastatus</i> Stimpson, 1858	Indonesia, Malay archipelago, Singapore to Japan, New Caledonia, Fiji and Samoa. India: Nicobar Islands	Intertidal, under rocks	Heller 1862; Osawa and Chan 2010
<i>Petrolithes lamarckii</i> (Leach, 1820)	Indo-west Pacific, eastern African coast and Red sea and Tuamato island. India: Nicobar Islands, Rameswaram, Gulf of Mannar, Ratnagiri, Goa, Lakshadweep Archipelago	Intertidal, found under rocks	Heller 1865; Henderson 1893; Gravely 1927; Sankolli 1968; Hiller <i>et al.</i> 2010; Prakash <i>et al.</i> 2013
<i>Petrolithes leptocheles</i> (Heller, 1861)	Pakistan, Somalia, Red sea, Gulf of Aden, Oman and Persian Gulf and India	Intertidal under large stones	Mustaqim 1972
<i>Petrolithes militaris</i> (Heller, 1862)	Indian ocean including Red sea, Japan, New Caledonia and Australia. India: Gulf of Mannar, Rameswaram, Nicobar Islands	Subtidal to 180 m deep; often associated with corals on shallower depths	Heller 1862; Henderson 1893; Southwell 1906; Gravely 1927; Haig 1964, 1979; Siddiqui and Kazmi 2003
<i>Petrolithes moluccensis</i> (Man De, 1888)	Indian ocean: Somalia, Red sea, Persian Gulf, Seychelles, Mauritius and Australia. Pacific ocean: Indonesia, China, Ryukus and Chesterfield Islands, India: Lakshadweep Archipelago	Shallow water on coral reefs; rarely found in intertidal region	Osawa and Chan 2010; Prakash <i>et al.</i> 2013
<i>Petrolithes ornatus</i> Paulson, 1875	Pakistan, Sri Lanka, Comoro islands, Madagascar, Mozambique, Zanzibar, Red sea, Gulf of Oman and Persian Gulf. India: Gulf of Kutch	Intertidal under rocks	Mustaqim 1972; Siddiqui and Kazmi 2003
<i>Petrolithes rufescens</i> (Heller, 1861)	Indo-west Pacific, Eastern Africa, Madagascar, Red sea, Gulf of Aden, Somalia and Persian Gulf. India: Nicobar Island, Gulf of Kutch	Intertidal under rocks	Mustaqim 1972; Siddiqui and Kazmi 2003;
<i>Petrolithes tomentosus</i> (Dana, 1852)	Indo-west Pacific, Madagascar, Western Australia, Taiwan to New Caledonia, Chesterfield islands and Tuamato Archipelago. India: Nicobar Islands, Lakshadweep Archipelago	Lower intertidal to 11m deep. Found under rocks, on dead corals and bases of living corals	Heller 1865; Osawa and Chan 2010; Prakash <i>et al.</i> 2013

FIGURE 1. CONTINUED.

SPECIES NAME	DISTRIBUTION RANGE	ECOLOGY	LITERATURE SOURCE
<i>Pisidia dehaniai</i> (Krauss, 1843)	Indian ocean, South Africa, Pakistan, Bay of Bengal, Oman and Persian Gulf. India: Ratnagiri, Goa	Intertidal found among rocks and weeds. Also found in interstices of stones and rubble agglomerated by sponges in the lower intertidal	Sankolli 1968; Haig 1981; Siddiqui and Kazmi 2003; Hiller et al. 2010
<i>Pisidia gordoni</i> (Johnson, 1970)	Indian ocean: Mozambique, Madagascar and Pakistan. India: Goa	Under rocks in the lower intertidal to shallow water up to 50 m deep.	Haig 1966; Hiller et al. 2010
<i>Pisidia serratifrons</i> (Simpson, 1858) (6)	Yellow sea, Korean strait, Taiwan, China sea and Japan. India: Gulf of Kutch, Gulf of Mannar, Ratnagiri	Intertidal to 68 m deep; found on muddy bottom with sea weeds and among ascidians, oysters, dead corals and sheltering under crinoids	Southwell 1906, 1909; Gravely 1927; Miyake 1943; Sankarankutty 1963; Sankolli 1968; Haig 1981; Osawa and Chan 2010
<i>Polyonyx biunguiculatus</i> (Dana, 1852)	Seychelles, Sri Lanka, western Pacific ocean, east Indian Archipelago and Australia. India: Gulf of Mannar	Shallow water to 25.2 m deep	Southwell 1906; Haig 1965
<i>Polyonyx hendersoni</i> Southwell, 1909	Pakistan, Sri Lanka, Japan, Korea, Hong Kong and Australia. India: Gulf of Mannar, Pamban, Ratnagiri, Okha Mandal, Goa	Intertidal to 6 m deep; found in the water ducts of sponge (Demospongiae)	Southwell 1909; Gravely 1927; Sankolli 1968; Siddiqui and Kazmi 2003; Hiller et al. 2010
<i>Polyonyx loimicola</i> * Sankolli, 1965	Pakistan and Gulf of Mannar	Intertidal on muddy bottoms	Sankolli 1965
<i>Polyonyx obesulus</i> Miers, 1884 (7)	Indo-west Pacific, Persian Gulf to Japan, Philippines, Indonesia and Australia. India: Rameswaram, Gulf of Mannar, Okha Mandal	Shallow water to 55 m deep. Found in sponge and crevices of corals.	Henderson 1893; Southwell 1906; Southwell 1909; Gravely 1927; Haig 1965, 1979, 1992
<i>Polyonyx splendidus</i> * Sankolli, 1963b (8)	Ratnagiri (Maharashtra), Goa	Intertidal and associated to sponge	Sankolli 1963b; Hiller et al. 2010
<i>Porcellanella haigae</i> ** Sankarankutty, 1963	Gulf of Mannar	Intertidal and associated to sea pen	Sankarankutty 1963
<i>Porcellanella triloba</i> White, 1852	East coast of Africa and Persian Gulf, Australia, Japan, Zanzibar, Hong kong. India: Rameswaram, Gulf of Mannar	Intertidal to 72m deep; sand and mud bottoms; associated to sea pen	Henderson 1893; Sankarankutty 1961; Osawa and Chan 2010
<i>Pseudoporcellanella manoliensis</i> ** Sankarankutty, 1962 (9)	Gulf of Mannar	Intertidal under rocks	Sankarankutty 1962
<i>Raphidopus indicus</i> * Henderson, 1893	Maharashtra, Chennai	Intertidal to shallow water depths under boulders and rocks	Henderson 1893

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