

New Records of Hermit Crabs (Crustacea: Decapoda: Anomura: Paguroidea) from the Andaman and Nicobar Archipelago in India

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Abstract

The current work presents hermit crab species inhabiting the intertidal and shallow subtidal region on the coast of south Andaman Islands, along with an updated checklist of hermit crabs from Andaman and Nicobar Islands (ANI) and an identification key for surveyed hermit crabs. Five species of hermit crabs representing two families (Coenobitidae and Diogenidae) under the superfamily Paguroidea were recorded in the intertidal and shallow subtidal regions of the south Andaman Islands. Among the five species, one species of the genus *Coenobita*, one species of the genus *Calcinus*, two species of the genus *Clibanarius* and one species of the genus *Dardanus* are reported for the first time from the intertidal habitats of the Andaman Islands. Live coloration and description of several species are described for the first time from this region.

Introduction

The union territory of Andaman and Nicobar Islands comprising of more than 572 islands and is spread over 800 km. The Andaman group is around 6,340 sq. km and the Nicobar group is 1,953 sq. km (Alfred et al. 2002). The Coastal waters of Andaman Island (ANI) are rich in biodiversity due to the presence of highly productive coral reefs and mangrove ecosystems. Hermit crabs are one of the most abundant crustaceans of the intertidal and subtidal regions. Hermit crabs are classified within the Subphylum Crustacea, Class Malacostraca, Order Decapoda, Infraorder Anomura, and Superfamily Paguroidea. Families within the Paguroidea are the Coenobitidae, Diogenidae, Paguridae, Parapaguridae, Pylochelidae, Pylojacquesidae and Pomatochelidae. Hermit crabs are unique among the decapod crustacean species as they require the use of gastropod shells (or some other foreign structure) to protect their soft, un-calcified abdomen except for the coconut robber crab (*Birgus latro*). Hermit crab-occupied shells play an important role as hard structures for the attachment of epi-fauna in soft-bottom benthic communities (Brooks and Mariscal 1986). The empty gastropod shells are likely to be buried in the substrate unless they are used by hermit crabs as protection (Creed 2000; Stachowitsch 1977). Therefore, Hermit crabs serve as ecosystem engineers by using gastropod shells which affect the abundance and distribution of other invertebrates (Gutiérrez et al. 2003; Jones 1994; Williams and McDermott, 2004). Moreover, different species of hermit crab have different salinity tolerance and some species of marine hermit crabs may be useful as indicators of freshwater inundation on tropical shores (Dunbar et al. 2003). The population of certain species increases as salinity decreases whereas in the case of other certain species it may be vice-versa. It is also reported that certain species of hermit crabs are indicators of heavy metal pollution (Lyla and Khan 1996). Therefore, the study of the population, diversity and distribution of these species can be helpful to detect unnatural freshwater flows and salinity fluctuation in coastal water which have great ecological importance.

The present study aims to give a comprehensive checklist of hermit crabs from Andaman waters and also add the new distributional reports of five hermit crabs from the region along with an updated checklist and an identification key for the species encountered during this study.

Materials And Methods

In the present study, six sampling locations comprising both sandy and rocky shores were selected along the coast of south Andaman viz. Marina park (MN; 11.691°N, 92.732°E), Carbyn's Hornbill Nest (CH; 11.646°N, 92.767°E), Brookshabad (BB; 11.624°N, 92.753°E), Burmanallah (BN; 11.554°N, 92.732°E), Kodyaghat (KG; 11.529°N, 92.724°E) and Chidyatapu (CT; 11.499°N, 92.714°E) (Fig. 1). Hermit crab specimens were collected either by snorkeling or hand-picking during low tide from the muddy, sandy, rocky shore and mangrove forests. The live coloration of all the specimens was recorded before they were fixed in preservative, as color pattern also matters for species identification. The shell having hermit crab was kept in a small volume of 5% formalin to bring out the hermit crab from shells. As an alternative, on the failure of this method, animals were cracked from their shells with a vise (Haig and Ball 1988). Then, for each species, habitat types and the most common host shell were recorded. Specimens were identified by using various taxonomic works of literature (McLaughlin 2003, McLaughlin et al., 2010; Alcock 1905; Haig and Ball 1988; Dana 1851; Dana 1852; Forest 1953). The specimens were deposited at the National repository regional center of Zoological Survey of India (ZSI) Andaman and Nicobar Islands for further reference.

Results And Discussion

The present study reports five new distributional records of hermit crabs inhabiting the intertidal and shallow sub-tidal regions of ANI with an updated checklist (Table 1.), compiling all the published species and an identification key for the surveyed hermit crabs. The recorded hermit crabs belong to two families: Coenobitidae and Diogenidae. So far, a total of 114 species of hermit crabs belonging to 27 genera and 5 families have been reported from India and its Islands (Trivedi and Vachhrajani, 2017; Patel et al., 2022). The study of hermit crabs of the ANI archipelago started with the 14 species report by Heller (1865) from the Nicobar Islands. In 1905, Alcock found 14 species and five new varieties/species of hermit crabs. In 1972, Reddy and Ramakrishna reported 20 species followed by Tikader et.al. (1986) who reported 37 species and further Venkataraman et al (2004) reported a few more hermit crabs making a total of 55 species of hermit crabs known from Andaman and Nicobar Islands so far. This study raises the number of known hermit crabs from ANI to 60 species.

Table 1

Checklist of Hermit crab species reported from Andaman and Nicobar Islands. * denotes the first report from India, ** denotes the first report from Andaman & Nicobar Islands

Family and species	References
Coenobitidae	
<i>Birgus latro</i> Linnaeus, 1767	Alcock 1905; Venkataraman et al 2004
<i>Coenobita cavipes</i> Stimpson, 1858	Heller 1865; Alcock 1905; Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Coenobita brevimanus</i> Dana, 1852	Herbst, 1791; McLaughlin & Dworschak 2001; Thomas 1972, 1977; Reddy & Ramakrishna 1972; Tikader et al. 1986; Venkataraman et al. 2004
<i>Coenobita perlatus</i> H. Milne Edwards, 1837	Alcock 1905; Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Coenobita rugosus</i> H. Milne Edwards, 1837	Heller 1865; Alcock 1905; Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Coenobita spinosus</i> * H. Milne Edwards 1837	Present study
<i>Coenobita violascens</i> Heller, 1862	Heller 1862; McLaughlin & Dworschak 2001, Rao 2010.
Diogenidae	
<i>Aniculus ursus</i> Olivier, 1811	Reddy and Ramakrishna 1972; Tikader et al. 1986; Venkataraman et al 2004
<i>Calcinus elegans</i> ** H. Milne Edwards 1836	Present study
<i>Calcinus gaimardii</i> H. Milne Edwards, 1848	Heller 1865; Alcock 1905; Reddy and Ramakrishna 1972
<i>Calcinus laevimanus</i> Randall, 1840	Heller 1865 as Calcinustibicen (Herbst, 1791), see Reddy and Ramakrishna 1972; Alcock 1905; Reddy and Ramakrishna 1972; Thomas 1989
<i>Calcinus latens</i> Randall, 1840	Reddy and Ramakrishna 1972
<i>Calcinus morgani</i> Rahayu and Forest 1999	H. Milne Edwards, 1848; McLaughlin & Dworschak 2001
<i>Ciliopagurus strigatus</i> Herbst, 1804	Alcock, 1905; Venkataraman et al 2004
<i>Clibanarius arethusa</i> De Man, 1888	Reddy and Ramakrishna 1972; Venkataraman et al 2004

Family and species	References
<i>Clibanarius corallinus</i> H. Milne Edwards, 1848	Heller 1865; Alcock 1905; Reddy and Ramakrishna 1972; Thomas, 1989; Venkataraman et al 2004
<i>Clibanarius englaucus*</i> Ball and Haig 1972	Present study
<i>Clibanarius eurysternus**</i> Hilgendorf 1879	Present study
<i>Clibanarius humilis</i> Dana, 1851	Heller 1865; Alcock 1905; Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Clibanarius longitarsus</i> De Haan, 1849	Heller 1865; Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Clibanarius merguensis</i> De Man, 1888	Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Clibanarius olivaceus</i> Henderson, 1915	Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Clibanarius ransonii</i> Forest 1953	Patel et al., 2020
<i>Clibanarius striolatus</i> Dana, 1852	Heller 1865; Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Clibanarius zebra</i> Dana, 1852	Thomas 1989
<i>Dardanus deformis</i> H. Milne Edwards, 1836	Alcock 1905; Reddy and Ramakrishna 1972; Thomas 1989; Venkataraman et al 2004
<i>Dardanus gemmatus**</i> H. Milne Edwards, 1848	Present study
<i>Dardanus guttatus</i> Olivier, 1812	Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Dardanusla lagopodes</i> Forskål, 1775	Alcock 1905; Venkataraman et al 2004
<i>Dardanus megistos</i> Herbst, 1804	Heller 1865; Reddy and Ramakrishna, 1972; Thomas, 1989; Venkataraman et al 2004
<i>Dardanus pedunculatus</i> Herbst, 1804	Alcock 1905; Thomas 1989
<i>Dardanus setifer</i> H. Milne Edwards, 1836	Reddy and Ramakrishna 1972; Venkataraman et al 2004

Family and species	References
<i>Dardanus tinctor</i> Forskal, 1775	Reddy and Ramakrishna 1972; Venkataraman et al 2004; Tikader et al. 1986
<i>Dardanus vulnerans</i> Thallwitz, 1892	Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Dardanus woodmasoni</i> Alcock, 1905	Alcock 1905; Venkataraman et al 2004
<i>Diogenes avarus</i> Heller 1865	Heller 1865; Venkataraman et al 2004
<i>Diogenes custos</i> Fabricius, 1798	Venkataraman et al 2004
<i>Diogenes dubius</i> Herbst, 1804	Alcock 1905
<i>Diogenes merguensis</i> de Man, 1888	Heller 1865 as <i>Diogenes miles</i> Herbst, 1791, see Reddy and Ramakrishna 1972; Venkataraman et al 2004
<i>Paguristes balanophilus</i> Alcock, 1905	Alcock 1905; Venkataraman et al 2004
<i>Paguristes calvus</i> , Alcock, 1905	Alcock 1905; Rahayu and McLaughlin 2006
<i>Paguristes ciliatus</i> Heller, 1862	Heller 1865; Venkataraman et al 2004
<i>Paguristes incomitatus</i> Alcock, 1905	Venkataraman et al 2004
<i>Paguristes longirostris</i> Dana, 1852	Venkataraman et al 2004
<i>Paguristes mundus</i> Alcock, 1905	Alcock, 1905; Venkataraman et al 2004
<i>Paguristes pusillus</i> Henderson, 1896	Herbst, 1791. McLaughlin & Dworschak (2001)
<i>Paguristes puniceus</i> Henderson, 1896	Alcock 1905; Venkataraman et al 2004
Paguridae	
<i>Nematopaguruss squamichelis</i> Alcock, 1905	Alcock 1905; Venkataraman et al 2004
<i>Nematopaguruss indicus</i> Alcock, 1905	Alcock 1905

Family and species	References
<i>Pagurus hirtimanus</i> Miers, 1880	Thomas 1977
<i>Pagurus pergranulatus</i> Henderson, 1896	Alcock 1905
<i>Pylopaguropsis zebra</i> Henderson, 1893	Alcock 1905
<i>Spiropagurus lophomeris</i> Alcock, 1905	Alcock 1905
<i>Spiropagurus profundorum</i> Alcock, 1905	Alcock 1905
<i>Spiropagurus spinosicarpis</i> Alcock, 1905	Alcock 1905
Parapaguridae	
<i>Oncopagurus indicus</i> Alcock, 1905	Alcock 1905
<i>Oncopagurus monstrosus</i> Alcock, 1894	Alcock 1901, Tikader et al. 1986, Venkataraman <i>et al.</i> 2004, Rao 2010
Pylochelidae	
<i>Parapylocheles scorpio</i> Alcock, 1894	Alcock 1905
<i>Xylocheles miersi</i> Alcock & Anderson, 1899	Alcock and Anderson 1899; Alcock 1905

Hermit crabs play a crucial ecological role in the intertidal and mangrove ecosystems. They help in the removal of dead materials in soil by their scavenging nature. Hermit crab species like *Clibanarius longitarsus* can accumulate heavy metals (Lyla and Khan, 2011) making them a proxy for ecotoxicological survey for heavy metal toxicity. So far around 1106 hermit crab species are reported around the world but only 119 species are reported from India which is just ~ 10% of the world's hermit crab species. Therefore, more research on the biodiversity, distribution and behavior of hermit crabs is required from India.

Key for common Hermit Crabs known to Andaman Islands

Key to families of hermit crabs of Andaman Islands

1. Antennules with flagella terminating bluntly, somewhat 'stick-like' (semi-terrestrial).....**Coenobitidae**

Antennules with flagella terminating in tapered filament (marine or estuarine).....2

2. Maxillipeds normally approximate at base; chelipeds equal, sub-equal or unequal, left largest..... **Diogenidae**

Maxillipeds normally widely separated at base; chelipeds unequal or less frequently sub-equal, right largest..... **Paguridae**

Family: COENOBITIDAE

Key to Genera and Species of Coenobitidae of Andaman Islands

1. Rostrum prominent; abdomen well calcified, symmetrical and animal living without shell (except in young crab stages).....*Birgus latro*.

Rostrum almost obsolete; abdomen soft and spirally coiled; animal living in gastropod shell (*Coenobita*)2

2. Propodus of left pereopod 3 with outer surface flattened, this surface marked off from upper surface by a sharp ridg.....3

propodus of left pereopod 3 not separated from dorsal surface by a well-marked longitudinal crest.....*Coenobita spinosus**

3. Coxa of right pereopod 5 moderately produced in males, asymmetrical with short sex tubes.....*Coenobita rugosus*

Coxa of male sub equal, approximate, thick and short; no sex tube; sternal protuberance very small*Coenobita violascens*

Family: DIOGENIDAE

Key to Genera of Diogenidae of Andaman Islands

1. Fingers opening and closing horizontally; chelipeds equal or sub equal.....*Clibanarus*

Fingers opening and closing obliquely or nearly vertical.....2

2. Fingertips corneous and blackened somewhat spooned; left is much larger than right, occasionally sub equal.....*Dardanus*

Fingertip calcareous; left cheliped much larger than right.....3

3. Telson without median transverse constriction; rostrum replaced by intercalary spine or scale between ocular acicles.....*Diogenus*

Telson with median transverse constriction; no intercalary process between ocular acicles.....*Calcinus*

Key to Species of *Calcinus* of Andaman Islands

1. Right chela with upper margin smooth; pereopods 2 & 3 with colored longitudinal stripes on merus and carpus.....*Calcinus laevimanus*

Right chela with upper margin spinous; pereopods without colored stripes.....2

2. Pereopod 3 with dense brush of setae ventrally on dactyl and distal part of propodus.....3

Pereopod 3 without dense brush of setae ventrally.....4

3. Right cheliped with two or more spines on lower outer margin of merus; merus, carpus & propodus of pereopods 2 & 3 with broad colored bands.....*Calcinus elegans**

Right cheliped with one spine on lower outer margin of merus; pereopod 2 & 3 coloured without bands.....*Calcinus gaimardii*

4. Ocular acicles simple; dactyl of pereopods 2 & 3 with colored band at proximal end.....*Calcinus latens*

Ocular acicles with terminal spines; dactyl with white tips; segments frequently with dense brown spots.....*Calcinus morganii*

Key to Species of *Clibanarus* of Andaman Islands

1. Ocular peduncle with longitudinal colored stripes, carapace flattened, coxa of pereopods 4 & 5 broadly separated.....*Clibanarus eurysternus**

No longitudinal colored stripes on ocular peduncle.....2

2. Shield longer than broad; chelipeds asymmetrical; right longer & broader; dactyl longer than propodus.....3

Shield nearly as broad as long; chelipeds sub-equal; dactyl usually shorter than propodus.....4

3. Antennular & ocular peduncles about equal in length. Outer face of pereopods 2 & 3 with median longitudinal stripe, stripe pale with colored margin.....*Clibanarus longitarsus*

- Antennular peduncles shorter than ocular peduncles. Outer face of pereopod 2 & 3 with two longitudinal colored stripes on paler colored background.....*Clibanarus striolatus*

4. Terminal margin of telson with several small spines. Propodus of pereopod 2 & 3 with black band at both dorsal & ventral margin; dactyl pale with longitudinal colored strip only on dorsal margins.....*Clibanarus ransonii*

- Terminal margins of telson unmarked; propodus of pereopods 2 & 3 with pale band at distal end only; dactyl pale, with longitudinal colored streak or patch on dorsal & ventral margins but not on outer face.....*Clibanarus englaucus**

Key to Species of Dardanus of Andaman Islands

1. Cheliped covered with small spines.....2

Cheliped covered with strong corneous spines.....3

2. Left cheliped distinctly longer than right; shield and pereopods covered with pale, ocellate spots.....*Dardanus megistos*

Left cheliped not much longer than right; no ocellation on shield or pereopods.....*Dardanus lagopodes*

3. Cornea occupying less than 0.2 of peduncular length; propodus & dactyl of left pereopod 3 with transverse striations on lateral surface.....*Dardanus guttatus*

Cornea occupying more than one-third of ocular peduncle; propodus & dactyl of left pereopod 3 without transverse striation.....4

4. Left chela with strong spines on inner upper surface; lower margin of chela with a row of tubercles. Propodus of left pereopod 3 with dorsal and lateral faces demarcated by sharp crust on dorsolateral margin.....*Dardanus deformis*

Left chela with small rounded tubercles over entire outer surface. Propodus of left pereopod 3 without sharp crust on dorsolateral margin.....*Dardanus gemmatus**

**The present study.*

List of species reported:

1. *Coenobita spinosus* H. Milne Edwards 1837

2. *Calcinus elegans* H. Milne Edwards 1836
3. *Dardanus gemmatus* H. Milne Edwards 1848
4. *Clibanarius eury sternus* Hilgendorf 1879
5. *Clibanarius englaucus* Ball and Haig 1972

Class-Malacostraca (Latreille 1802)

Order-Decapoda (Latreille 1803)

Infraorder-Anomura (MacLeay 1838)

Superfamily-Paguroidea (Latreille 1802)

Family -Coenobitidae (Dana 1851)

1. *Coenobita spinosus* (H. Milne Edwards 1837) (Fig. 2)

Coenobita spinosus (Haig. J, & Ball. E, 1988:156); *Cenobita spinosa* H. Milne Edwards, 1837 (incorrect spelling of *Coenobita*); *Cenobita brunnea* Dana, 1851 (incorrect spelling of *Coenobita*); *Birgus hirsutus* Hess, 1865

Material examined

2 specimens, 1 male (Shield length 7.0 mm), and 1 female (Shield length 7.0 mm) collected from supra littoral zone of Kodyaghat (11.529°N, 92.724°E), Port Blair, ANI, India. The reference materials were deposited (No.ZSI/ANRC-10150) at ZSI Regional Station, Port Blair, ANI, India.

Color in life

Entire body is red in color with many white corneous spines on claws.

Diagnosis

Left claw is larger than the right claw with many corneous thorns on both. There are no ridges present on the upper part of the big claw. There are some hairs on the inside part of the two claws. Dactylus, carpus and propodus of both claws have many corneous thorns, especially in the inside part of dactylus. Eyes are elongated and with short eyestalks. The last two parts (dactylus & propodus) of their 3rd left pereopod is wider than that of 2nd left pereopod, and the outer surface of the last two parts of their third left pereopod is bulging.

Remarks

This is the first report of this species to mainland India as well as ANI. The specimen examined in the present study shows agreement with the description and illustrations provided by Haig and Ball (1988).

This species is known for its shell shedding behavior (Sasazuka et al., 2019) which was also seen here. The propodus of left pereopod 3 was not separated by any well-marked longitudinal crest from dorsal surface. Most of the specimens were found in the supra-littoral zone of the sandy beaches.

Habitat

Supra littoral; Sandy beaches; frequently found in mangrove forests.

Distribution

West Pacific Ocean, Northern Marina Island of Micronesia and Tuamotu Island.

Family-DIOGENIDAE (Ortmann 1892)

Genus- Calcinus (Dana 1851)

2. Calcinus elegans (H. Milne Edwards 1836)(Fig. 3)

Calcinus elegans (Haig & Ball, 1988:159. Asakura A, 2002 I;40;Fig:8 A-J, Fig:7 A-E. Haig J & Mclaughlin PA:109 key. Miyake S;1956;Fig:12–13:321–322.)

Material examined

4 specimens, 3 males (Shield length 3.0–10.0 mm), and 1 female (Shield length 6.0 mm) collected from the tide pool of Brookshabad (11.624°N, 92.753°E), Port Blair, ANI, India. The reference materials are deposited (No.ZSI/ANRC-10151) at ZSI Regional Station, Port Blair, ANI, India.

Color in life

The carapace has shades of brown and white. Ocular peduncles are bright blue with a dark brown area at the base with a black cornea. Antennules and antennae are orange uniformly. Chelipeds are dark brown with white tubercles on the fingers. Merus and carpus of pereopods 2 and 3 are bright blue in the proximal and dark brown in the distal part. Both ends of propodus are blue, with a broad, dark brown band in the middle. Dactyl is bright blue with dark brown spots and with a narrow white band next to the claw. The ventral part of dactyl and propodus has bright red setae.

Diagnosis

Rostrum is acute. Ocular acicles are simple. The outer face of the palm of the left cheliped is with closely-spaced tubercles and the upper margin sometimes with 4 or 5 more prominent tubercles. The right cheliped has five sharp spines on the upper surface of the palm. The dactyl of the left 3rd pereopod is markedly shorter than propodus. Four to seven tufts of long setae on the ventral margin of dactyl and propodus, which forms a dense brush. Telson is with asymmetrical posterior lobes, where the left lobe is longer.

Habitat

Found in the intertidal region of exposed rocky shore and sub-tidal region on outer edges of reef flats.

Remarks

This species is already reported from Lakshadweep Island of India but is the first report from ANI. This species is famous in the ornamental aquarium business because of its color and uniqueness. The specimen examined in the present study shows agreement with the description and illustrations provided by Miyake (1956), Haig and Ball (1988) and Asakura (2002). This species is characterized by having numerous large low protuberances of irregular geometrical patterns on the upper, outer and inner faces of the distal portions of both chelipeds. *C. elegans* is most distinct from all the other *Calcinus* species.

Distribution

East coast of Africa to Hawaiian Islands and Tuamotu Archipelago, including Maluku region of Indonesia and Taiwan.

3. *Clibanarius eurysternus* (Hilgendorf 1879) (Fig. 4)

Clibanarius eurysternus (Fize & Serene, 1955: 76, 118, Fig. 17. Haig & Ball, 1988: 163. Lewinsohn, 1982: 39. Miyake, 1956: 311, Fig. 4, 312, Fig. 5.)

Material examined

4 specimens, 1 male (Shield length 9.0 mm), 1 ovigerous female (Shield length 4.0 mm) and 2 females (Shield length 3.0–5.0 mm) collected in the intertidal tide pool of Brookshabad (11.624°N, 92.753°E) and Carbyn's Hornbill Nest (11.646°N and 92.767°E), Port Blair, ANI, India. The reference materials are deposited (No. ZSI/ANRC-10157) at ZSI Regional station, Port Blair, ANI, India.

Color in life

Cephalothorax, chelipeds and ambulatory legs are yellow or white with stripes of dark brown, dark blue or black. Ocular, antennular and antennal peduncles are also yellow or white with stripes of dark brown, dark blue or black. Ocular acicles are yellow or white.

Diagnosis

Shield is slightly longer than broad. Cephalothorax, basal segments of chelipeds and pereopods all dorso-ventrally compressed. Ocular peduncles are long and overreach both antennular and antennal peduncles. Each ocular acicle is with 3–5 small spines on the anterior margin. Chelipeds are nearly equal or right slightly larger. Chelae are with dorsal and lateral surfaces armed with spines and often corneous-tipped. Each carpus is with a prominent spine at the dorso-distal margin. Propodus and dactylus of 3rd pereopods of ambulatory legs are nearly equal in length, each flattened ventrally and with some spines

on the dorso-lateral margin. Telson is with asymmetrical posterior lobes separated by shallow median cleft and terminal margins with long setae.

Remarks

This species is already reported from Andhra Pradesh mainland India but is the first report from the ANI. The specimen examined in the present study shows agreement with the description and illustrations provided by Haig and Ball (1988) and Miyake (1956). This species is known to occupy gastropod shells with a narrow aperture (like the Conidae family).

Habitat

Reef or rocky shores and shallow areas, Andaman Islands; intertidal to 5 m, typically occupying gastropod shells of the family Conidae.

Distribution

Southern Africa, Mozambique, eastern Indian Ocean, Singapore, Vietnam, Philippine Islands, Taiwan, Japan, and Polynesia.

4. *Clibanarius englaucus* (Ball and Haig 1972) (Fig. 5)

Clibanarius englaucus (Ball & Haig, 1972: 97, Fig. 5. Haig & Ball, 1988: 163.)

Material examined

16 specimens, 9 males (Shield length 3.0–5.0 mm), and 7 ovigerous females (Shield length 3.0–4.0 mm) collected from intertidal rock crevices of Marina Park (11.691°N, 92.732°E), Port Blair, ANI, India. The reference materials are deposited (No.ZSI/ANRC-10156) at ZSI Regional station, Port Blair, ANI, India.

Color in life

Shield is pale grayish-green to grayish-blue and white. Ocular peduncles are orange to brownish-orange with narrow blue band at base of cornea. Chelipeds are dark brown to bluish-black with spines and tubercles lighter. Ambulatory legs with merus and carpus are uniformly brownish-black to bluish-black and often with scattered small white spots. Propodus is brownish or bluish-black with an irregular white or orange distal patch. Dactylus are white or orange, each with a broad median blue band.

Diagnosis

Shield is nearly as broad as long. Ocular peduncles are moderately short. Antennular and antennal peduncles are not reaching the distal margins of corneas. Antennal acicle is reaching no farther than proximal margin of peduncular segment. Chelipeds are sub-equal. Each palm is with dorsal surfaces covered with corneous stripped, tuberculate spines. Propodus and dactylus of 2nd and right 3rd

ambulatory legs are with convex lateral faces, left 3rd with lateral faces of both segments distinctly flattened. Dactylus are distinctly shorter than propodus. Telson with narrow median cleft separating asymmetrical posterior lobes with unarmed terminal margins.

Remarks

This species is the first report from India as well as ANI. The specimen examined in the present study shows agreement with the description and illustrations provided by Ball and Haig (1972), Osawa and Chan (2009) and Malaya et al., (2018). Ball and Haig (1972) noticed the resemblance of *C. ransoni* to *C. englaucus* but only in color but Rahayu and Komai (2000) reported ocular peduncles stouter in *C. ransoni* and the antennular peduncles do not reach the distal margin of the corneas but slightly overreach the corneas in *C. englaucus*. The *C. boschmai* is also very similar in general appearance to *C. englaucus* but it differs in the armature of the carpi of the chelipeds and the shape of the anterior lobe of the 6th thoracic sternite. The carpi of both chelipeds are unarmed on the distolateral margin in *C. boschmai* but in *C. englaucus* the margins has several small spines or subacute tubercles.

Habitat

Intertidal rocky exposed areas, sub-tidal, shallow seagrass areas; coral reefs and reef platforms.

Distribution

Indonesia, New Guinea, Taiwan, and Japan.

Genus-Dardanus (Paul'son1875)

5. *Dardanus gemmatus* (H. Milne Edwards 1848) (Fig. 6)

Dardanus gemmatus (Rahayu, 1996: 338. Haig & Ball, 1988:164)

Material examined

1 specimen, male (Shield length 3.0 mm) collected from the intertidal tide pool of Burmanallah (11.554°N, 92.732°E), Port Blair, ANI, India. The reference material is deposited (No.ZSI/ANRC-10161) at ZSI Regional station, Port Blair, ANI, India.

Color in life

Normally orange, reddish-orange, or maroon with some regions of violet on appendages, particularly on the upper margins of carpus of chelipeds. Ocular peduncles are red or maroon each with median thin band of white.

Diagnosis

Ocular peduncles are very stout and shorter than antennular and antennal peduncles. Each ocular acicle is with few spinules. The left cheliped is very big. The upper margin of dactyl is without any sharp crest, but with longitudinal rows of tubercles. The outer surface of palm is entirely covered with blunt tubercles, and large tubercles or blunt spines on the upper margin. The upper margin of carpus has 4 or 5 strong and blunt spines. The left 3rd pereopod is with serrated dorsal margin of dactyl. The propodus is short broad and with well-defined angular dorso-lateral margin. Telson is with asymmetrical posterior lobes, left largest. The terminal margins of each are armed with several spines.

Habitat

Found on the outer edges of reefs occupying a variety of gastropod shells, but particularly shells of *Tonna* and *Cronia*.

Remarks

This species is already reported from Andhra Pradesh, India but is the first report from ANI. The specimen examined in the present study shows agreement with the description and illustrations provided by Haig and Ball (1988) and McLaughlin et al., (2010). This species is known for its association with anemones but no such association was noticed in the present study. *D. gemmatus* is similar to *D. pedunculatus* with similar red rings on the ocular peduncles but can be separated by the presence of tubercles over the entire outer face of the big chela.

Distribution

Indian Ocean to French Polynesia including Japan, Taiwan, and Hawaii.

Declarations

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Authors' contributions

Both the authors contributed to the study conception and design. PP: Conceptualization, methodology, sample collection, formal analysis, investigation, writing–draft preparation, review & editing. GT: Conceptualization, resources, data curation, writing–review & editing. All authors read and approved the final manuscript.

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Availability of Data and Material Included in the manuscript.

Code Availability Not applicable.

Ethics Approval Not applicable.

Consent to Participate Both authors participated in the final manuscript.

Consent for Publication Both authors read and approved the final manuscript.

Conflicts of Interest The authors declare they have no conflict of interest.

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Figures

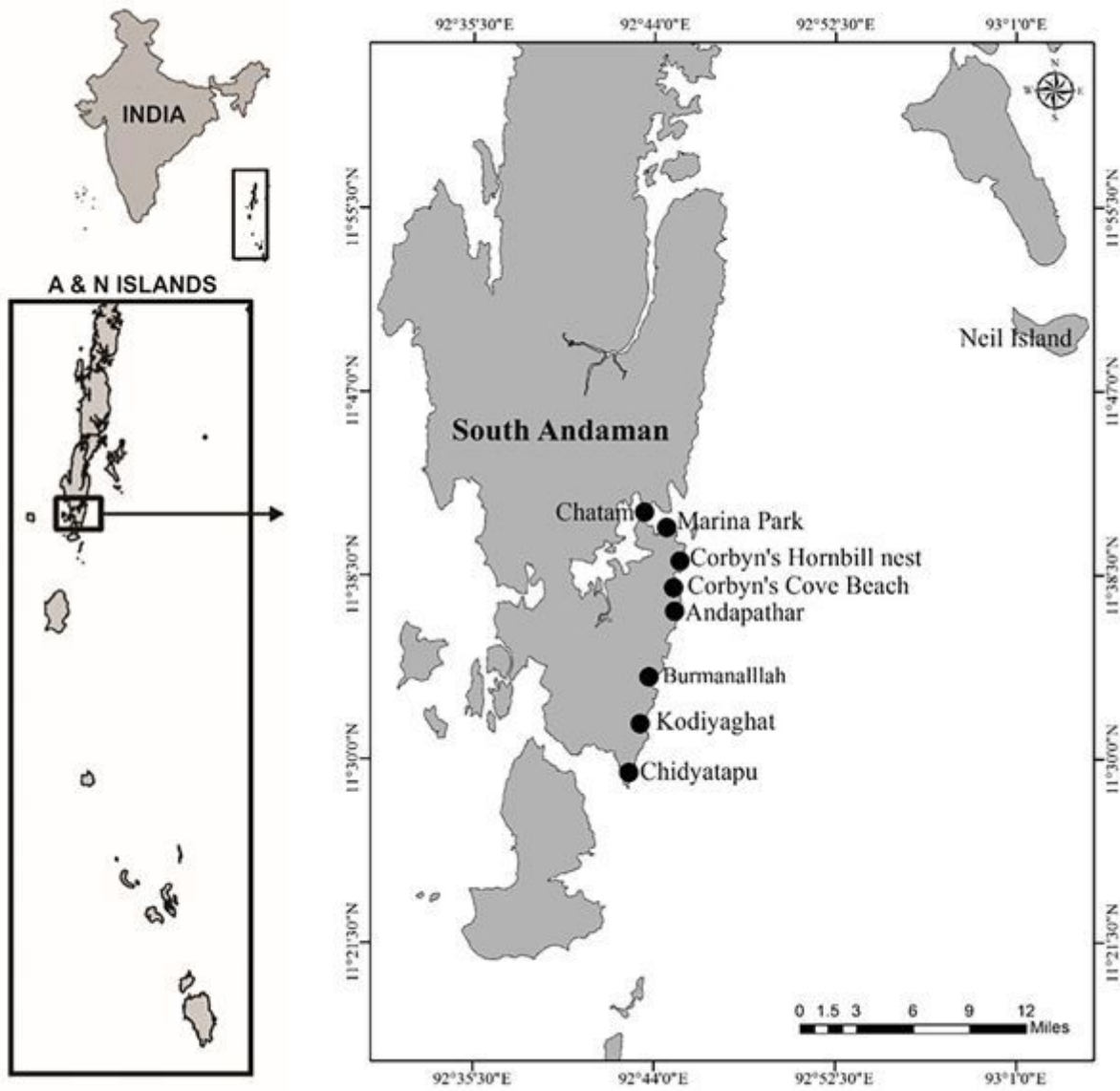


Figure 1

Sampling stations of hermit crabs along the coast of the south Andaman Islands.

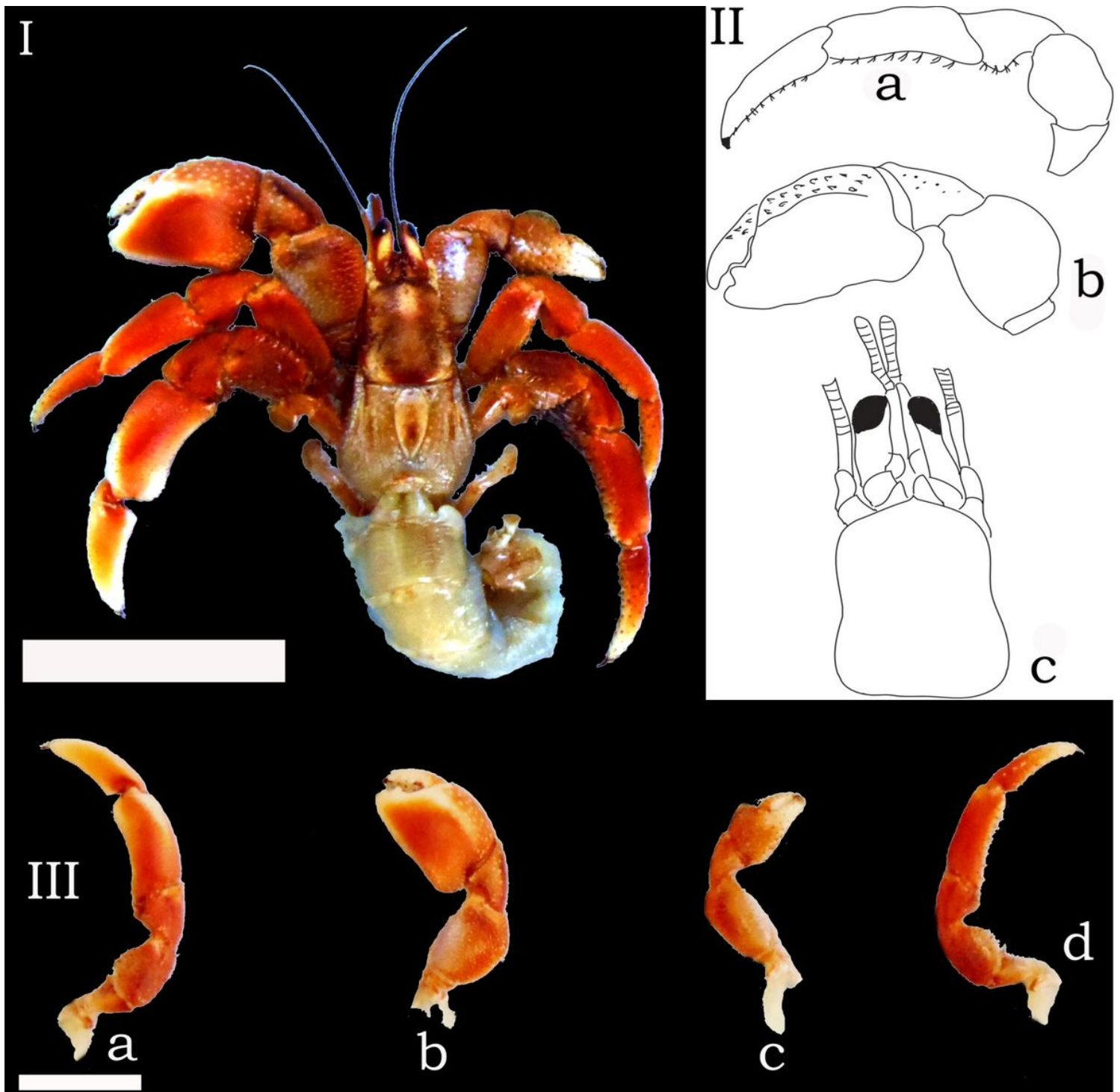


Figure 2

I) *Coenobita spinosus* (H. Milne Edwards 1837), male (ZSI/ANRC-10150) (SL 7mm); II) **a.** left cheliped (dorso-lateral view), **b.** Left chela and carpus (dorsal view) and **c.** Shield and cephalic appendages (dorsal view) (not to the scale) and III) **a.** third pereopod (left), **b.** left chela, **c.** right chela and **d.** third pereopod (right) (all dorsal view; setae omitted) (scale bar: 1cm).

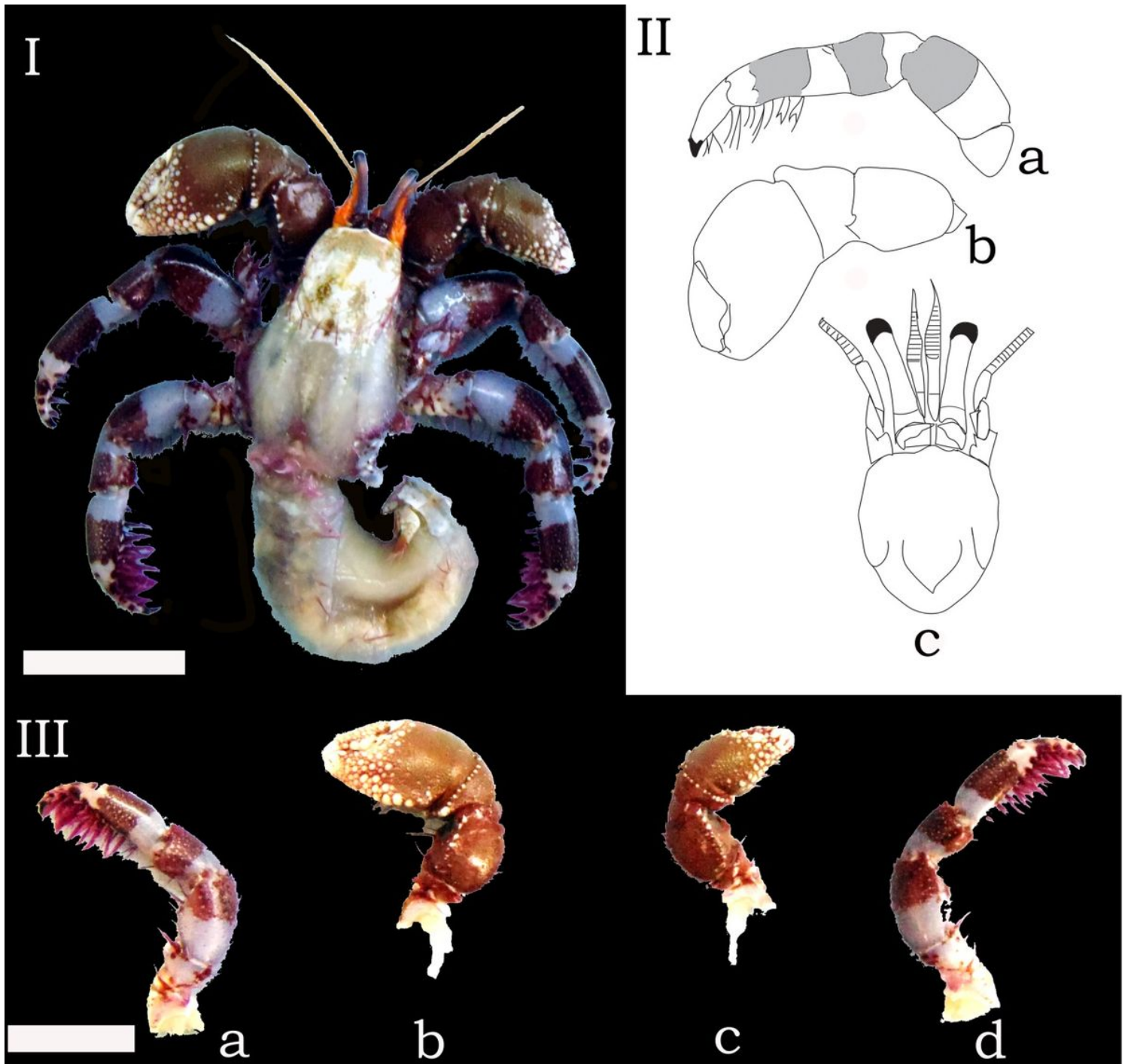


Figure 3

I) *Calcinus elegans* (H. Milne Edwards 1836), male (ZSI/ANRC-10151) (SL 3-10 mm); **II)** **a.** left cheliped (dorso-lateral view), **b.** Left chela and carpus (dorsal view) and **c.** Shield and cephalic appendages (dorsal view) (not to the scale) and **III)** **a.** third pereopod (left), **b.** left chela, **c.** right chela and **d.** third pereopod (right) (all dorsal view) (scale bar: 1 cm).

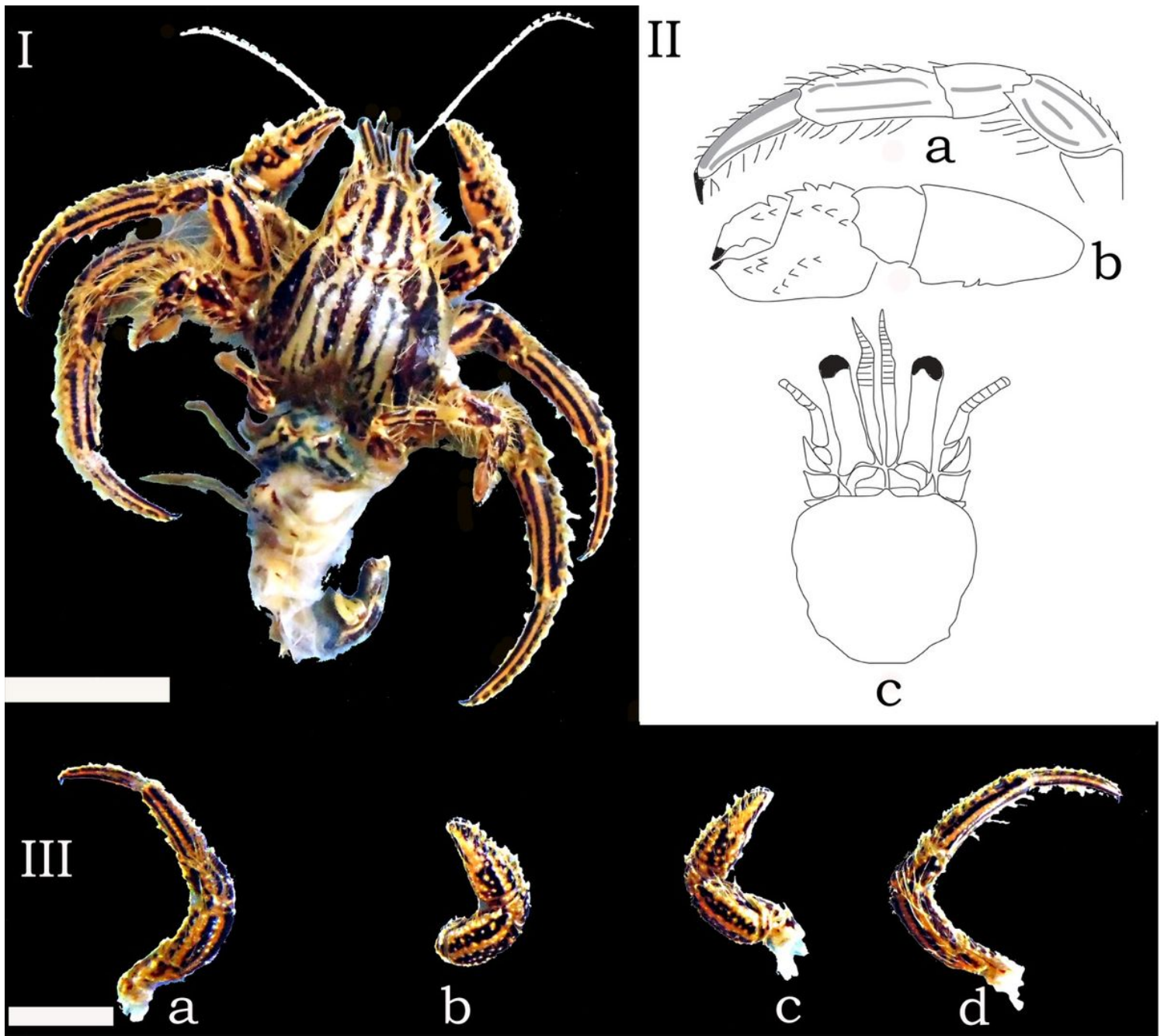


Figure 4

I) *Clibanarius eurysternus* (Hilgendorf 1879), male (ZSI/ANRC-10157) (SL 9 mm); II) **a.** left cheliped (dorso-lateral view), **b.** Left chela and carpus (dorsal view) and **c.** Shield and cephalic appendages (dorsal view) (not to the scale) and III) **a.** third pereopod (left), **b.** left chela, **c.** right chela and **d.** third pereopod (right) (all dorsal view; setae omitted) (scale bar: 1cm).

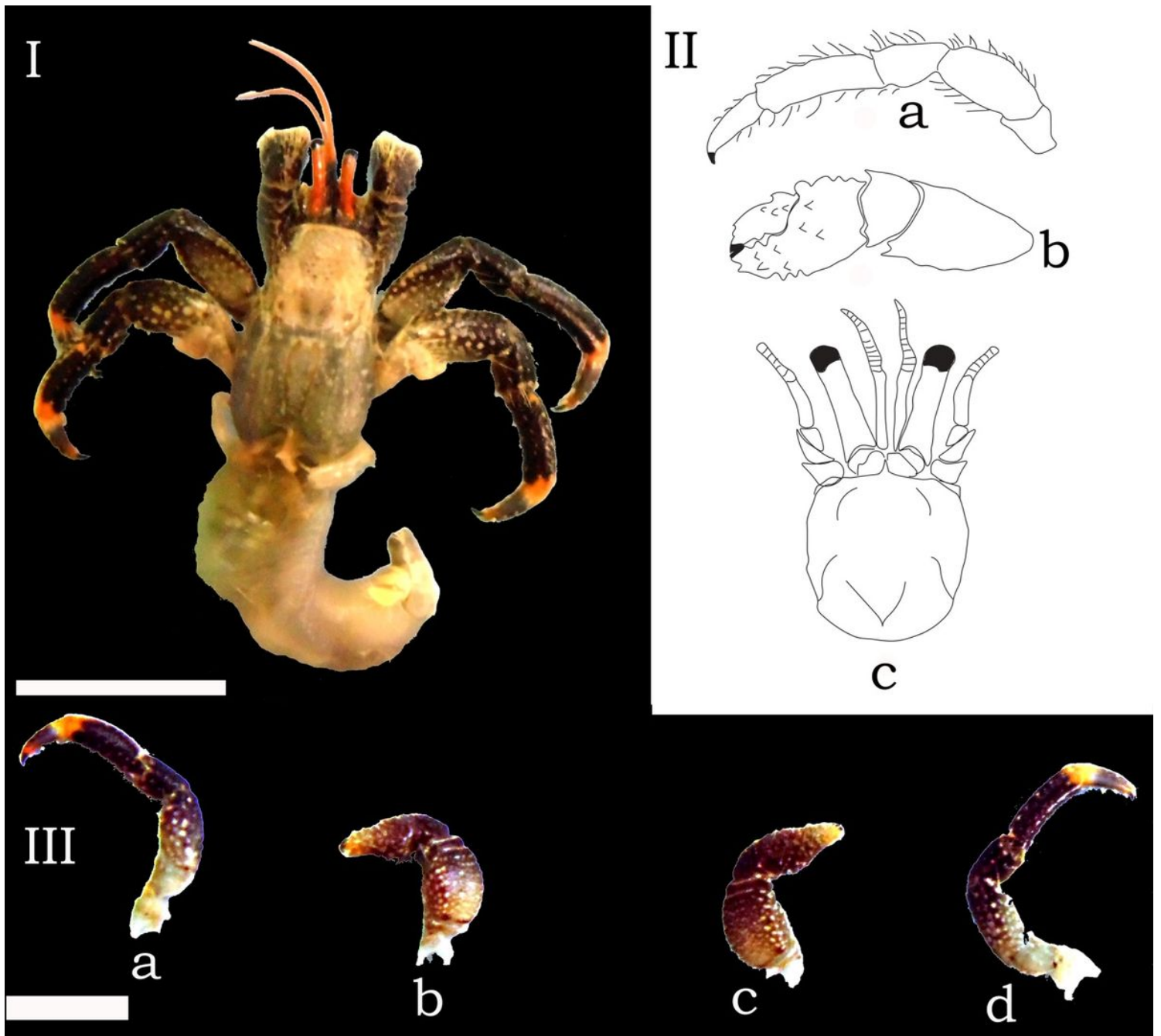


Figure 5

I) *Clibanarius englaucus* (Ball and Haig 1972), male (ZSI/ANRC-10156) (SL 3-5 mm); **II)** **a.** left cheliped (dorso-lateral view), **b.** Left chela and carpus (dorsal view) and **c.** Shield and cephalic appendages (dorsal view) (not to the scale) and **III)** **a.** third pereopod (left), **b.** left chela, **c.** right chela and **d.** third pereopod (right) (all dorsal view; setae omitted) (scale bar: 1cm).

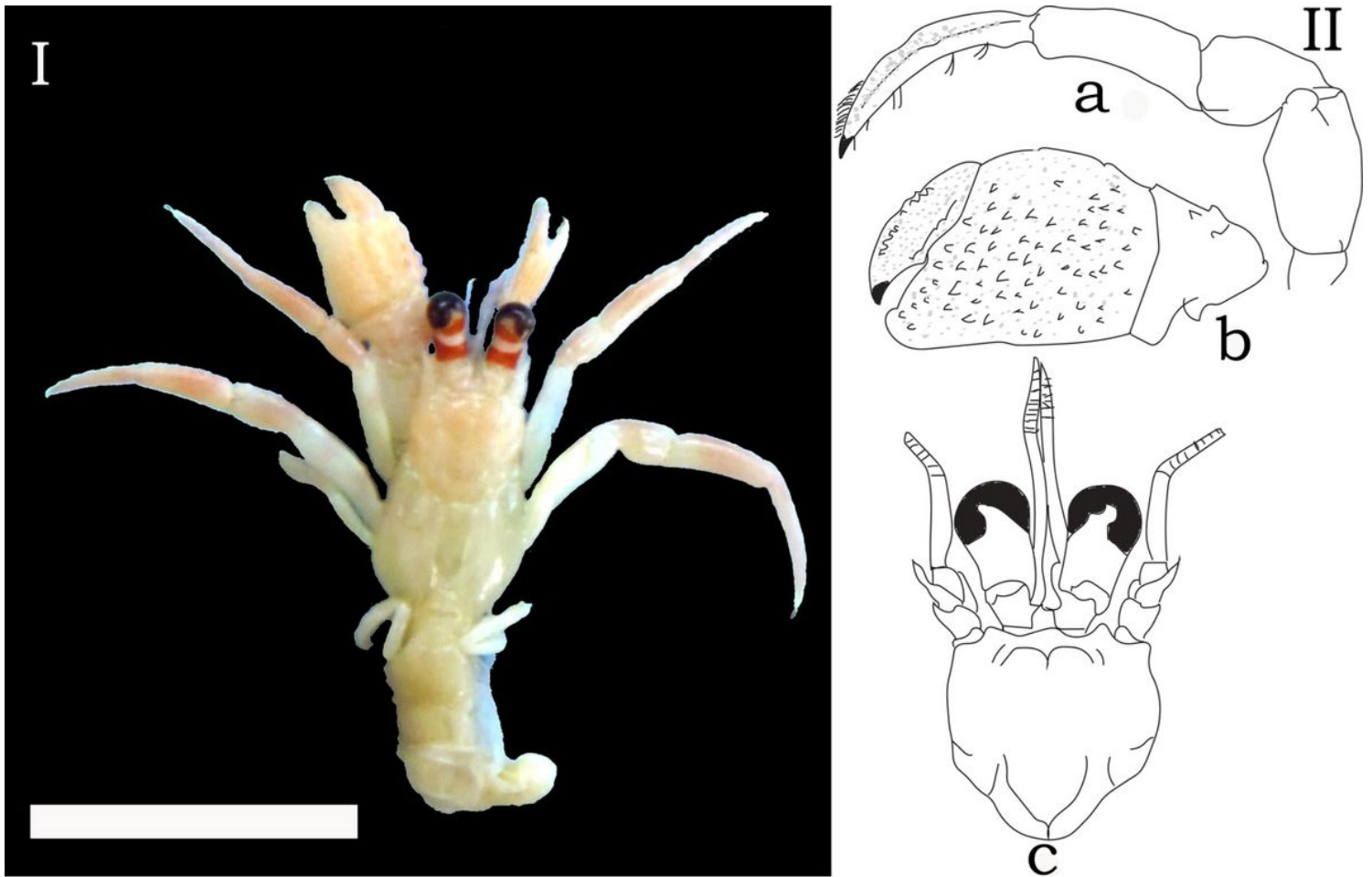


Figure 6

I) *Dardanus gemmatus* (H. Milne Edwards 1848), male (ZSI/ANRC-10161) (SL 3 mm); II) **a.** left cheliped (dorso-lateral view), **b.** Left chela and carpus (dorsal view) and **c.** Shield and cephalic appendages (dorsal view) (not to the scale) (scale bar: 1 cm).