

Short Communication

New distributional records of two hermit crabs of the genus *Diogenes* Dana, 1851 (Decapoda: Anomura: Diogenidae) from the Odisha coast, India

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Hermit crab specimens were collected from the coastal regions of Arjyapalli (Ganjam district) and Penthakata (Puri district) and identified as two separate species under the genus *Diogenes* Dana, 1851, characterised by antennules with upper rami of flagella ending in sharp projections, the approximate bases of third maxilliped, and a larger left cheliped compared to the right. These two left-handed hermit crab species, *Diogenes dubius* (Herbst, 1804) and *Diogenes violaceus* Henderson, 1893, are reported herein for the first time from the coastal waters of Odisha, India. *Diogenes violaceus* and *D. dubius* were distinguished based on bifurcation of antennal auicle. This paper deals with the detailed morphological characters, morphometric analysis, and distributional information of both the species. Previously, ten species of the genus *Diogenes* were recorded in the coastal waters of Odisha. With these reports, the valid left-handed hermit crab species of the genus *Diogenes* ascend to twelve from the state.

[**Keywords:** *Diogenes dubius*, *Diogenes violaceus*, First report, Ganjam, Puri]

Introduction

The intertidal and subtidal areas are home to a diverse array of marine macroinvertebrates, among which hermit crabs, belonging to the superfamily Paguroidea, infraorder Anomura of the decapod crustaceans, are predominant. Hermit crabs significantly impact a wide range of habitats, from terrestrial to deep-sea environments, influencing a large community of associates¹. They are crucial to benthic macroinvertebrate faunal communities, contributing to the oceanic food chain². In India, hermit crab diversity includes 114 species from 27 genera and six families: Coenobitidae, Diogenidae, Paguridae, Parapaguridae, Porcellanidae, and Pylochelidae³. Notably, the family Diogenidae comprises the majority of these species³. With special reference, the state of Odisha recorded a total of twenty-eight species of hermit crabs⁴.

In India, the family Diogenidae is represented by 82 species³, with special reference to the genus *Diogenes* Dana, 1851; twenty-four species have been reported so far^{4,5}. The family Diogenidae is characterised by antennules with upper rami of flagella ending in sharp projections, the approximate bases of maxillipeds 3, and a larger left cheliped compared to the right cheliped⁶. Before this study, the genus *Diogenes* Dana, 1851, included ten species in Odisha⁵. The current study added two new records of the genus *Diogenes* Dana, 1851: *Diogenes dubius* (Herbst, 1804) and *Diogenes violaceus* Henderson, 1893, and documented them for the first time from the coastal waters of Odisha. With this, the number of valid left-handed hermit crab species in the genus *Diogenes* Dana, 1851, from Odisha state increases to 12 (Table 1).

Material and Methods

Hermit crab samples were collected from the coastal regions of Arjyapalli (Ganjam district) at 19°18'21" N, 84°57'54" E, and from Penthakata (Puri district) at 19°48'04"N, 85°51'10"E. Hermit crab specimens were poured in boiled water and then carefully removed by hand picking method from gastropod shells, after which specimens were transferred to the laboratory. A detailed morphometric analysis was done in the laboratory, following the relevant literature^{7,8}, and morphometric measurements (Table 2) were taken in millimeter scale. Morphometric analysis was conducted at an advanced level using DASQUA 1804-1065 0–150Mm/0-6" High Precision Electronic Digital Caliper. The sex of

Table 1 — List of hermit crab species of genus *Diogenes* reported from Odisha

Sl. No	Taxonomic account	Species
1	Phylum:	<i>Diogenes alias</i> McLaughlin & Holthuis, 2001
2	Arthropoda;	
3	Subphylum:	<i>Diogenes avarus</i> Heller, 1865
4	Crustacea;	<i>Diogenes bicristimanus</i> Alcock, 1905a
5	Class:	<i>Diogenes costatus</i> Henderson, 1893
6	Malacostraca;	<i>Diogenes custos</i> (Fabricius, 1798)
7	Order:	<i>Diogenes dubius</i> (Herbst, 1804) **
8	Decapoda;	<i>Diogenes investigatoris</i> Alcock, 1905a
9	Superfamily:	<i>Diogenes merguensis</i> de Man, 1888
10	Paguroidea;	<i>Diogenes miles</i> (Herbst, 1787)
11	Family:	<i>Diogenes planimanus</i> Henderson, 1893
12	Diogenidae;	<i>Diogenes rectimanus</i> Miers, 1884
	Genus:	<i>Diogenes violaceus</i> Henderson, 1893 **
		<i>Diogenes</i>

Table 2 — Detailed and comprehensive morphometric analysis of one specimen of *Diogenes dubius* (Herbst, 1804) and three specimens of *Diogenes violaceus* Henderson, 1893

Morphometric characteristics (mm)	<i>D. dubius</i>	<i>D. violaceus</i>
Right ocular peduncle	0.42	4.73–4.75
Left ocular peduncle	0.44	4.71–4.76
Right antennae length	2.68	30.23–30.26
Left antennae length	2.66	30.32–30.39
Right antennule length	2.37	26.62–27.02
Left antennule length	2.36	26.63–26.78
Right antennal peduncle length	0.78	8.13–8.16
Left antennal peduncle length	0.76	8.09–8.23
Right antennular peduncle length	0.74	6.08–6.14
Left antennular peduncle length	0.76	6.05–6.09
Shield length	1.23	11.12–11.14
Shield width	1.14	7.72–7.89
Carapace length	1.26	11.58–12.22
Carapace width	1.09	10.27–10.36
Right corneal diameter	0.06	0.95–0.99
Left corneal diameter	0.05	0.93–0.94
Right cheliped propodus length	0.58	10.79–10.84
Right cheliped propodus width	0.83	6.82–6.87
Right cheliped dactylus length	0.56	5.83–5.84
Left cheliped propodus length	1.74	18.48–18.54
Left cheliped propodus width	1.12	13.97–14.01
Left cheliped dactylus length	0.98	9.67–9.8
Right portion of the anterior lobe of telson	0.36	2.27–2.28
Left portion of the anterior lobe of telson	0.32	2.29–3.32
Right portion of the posterior lobe of telson	0.26	2.27–2.28
Left portion of the posterior lobe of telson	0.24	2.31–2.34
Total body length	8.32	58.82–59.62

the hermit crab specimens was identified by examining the coxae of the fifth pereopods. Following morphometric analysis, the specimens were preserved in 4 % Formalin for further taxonomic work. Photographs of the preserved specimens, showcasing their distinguishable characteristics, were taken using the Rescholar 80X Stereo Zoom Microscope. A single specimen collected from Arjapalli was identified as *Diogenes dubius* (Herbst, 1804), while three other specimens were identified as *Diogenes violaceus* Henderson, 1893, following consultation with the relevant literature. Specimens were identified down to the species level according to the relevant literature^{9–16}. The preserved specimens are deposited in the National Zoological Collections of the Estuarine Biology Regional Centre, Zoological Survey of India, Gopalpur-on-sea, Odisha, India.

Results

Phylum: Arthropoda von Siebold, 1848

Sub-phylum: Crustacea Brünnich, 1772

Class: Malacostraca Latreille, 1802

Order: Decapoda Latreille, 1802

Infraorder: Anomura MacLeay, 1838

Superfamily: Paguroidea Latreille, 1802

Family: Diogenidae Ortmann, 1892

Genus: *Diogenes* Dana, 1851

1. *Diogenes dubius* (Herbst, 1804)

Materials examined: EBRC/ZSI/CR-17636, 01 specimen, 8.32 mm TL, Aryapalli Fishing harbour, Ganjam, Odisha, 02.1.2025, Dr. Anil Mohapatra and Party (Fig. 1a–g).

Diagnostic characters: The shield (Fig. 1a) has a rostral lobe that is not well developed. The ocular acicles feature a row of very small spinules along the anterior end, with one or two larger spines at the inner angles. The intercalary rostral process extends beyond the inner distal margins of the ocular acicles (Fig. 1a, f). The antennular peduncles are approximately equal to or slightly longer than the antennal peduncles and extend beyond the distal margins of the corneas. Additionally, the antennal acicles are distinctly bifurcated. The outer surface of dactylus of left cheliped with a covering of spinulose tubercles near upper margin (Fig. 1d, g). Fixed finger has an outer surface covered with numerous tiny tubercles. Convex outer surface of the palm is marked by low, tightly packed, small conical tubercles, which are more prominent in the upper half and proximally; they frequently become obsolete in the ventral half medially. Palm's upper margin features two more prominent rows of conical tubercles. Telson has an indistinct median cleft (Fig. 1e)^{14,16}, and the incipient posterior lobes are somewhat asymmetrical (Fig. 1e)^{14,16}.

Colouration: Fresh specimen was generally light cream and yellowish; ocular peduncles, antennular and antennal peduncles, creamish and grey. Intercalary rostral process and ocular acicles grey, tinged with numerous reddish-brown spots. Chelipeds and ambulatory legs are brown with alternative brownish-grey patches. In preservative, the species is light, pale cream overall.

Distribution: India: Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, West Bengal,

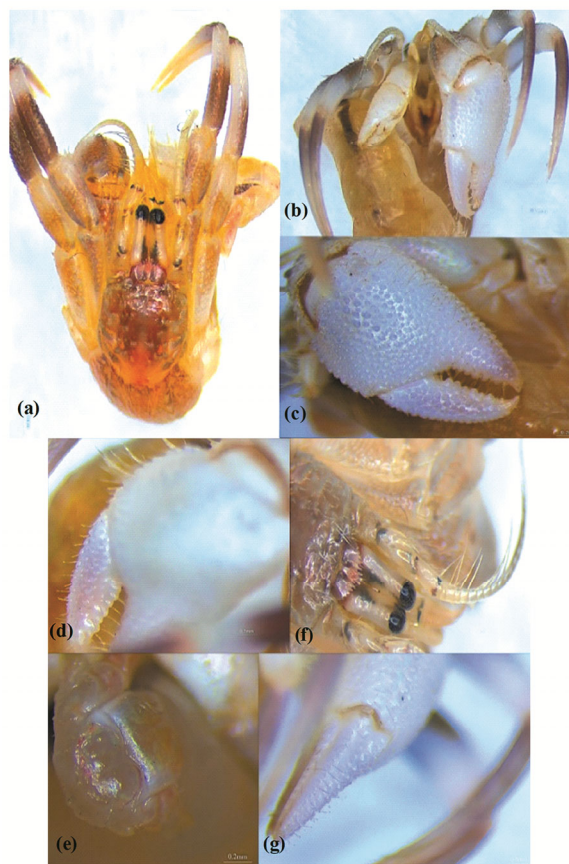


Fig. 1 — a) Shield of *D. dubius* with associated structure like ocular peduncle, ocular acicle, antennular peduncle, antennal acicle; b) Dorsal view of left and right chelipeds with special reference to larger left cheliped; c) Dorsal view of left cheliped; d) Left cheliped with special focus on outer surface of palm of with presence of spinulose tubercles or small spines near upper margin¹⁴; e) Telson; f) *D. dubius* associated structure like ocular peduncle, ocular acicle, antennular peduncle, antennal acicle; and g) Lateral view of left cheliped with special focus on outer surface of palm of with presence of spinulose tubercles or small spines near upper margin¹⁴

Andaman Islands⁵, and Odisha (Present Study) (Fig. 2). *Elsewhere*: Western Thailand, Indonesia, eastern Australia¹⁴.

Remarks: *Diogenes dubius* (Herbst, 1804) is reported here based on a single specimen collected from the Aryapalli Fishing Harbour, Ganjam, Odisha. In this study, the reported specimens align with all the characteristics detailed in the relevant taxonomic literature⁹⁻¹⁶. This report marks the first scientific documentation and record of the presence of *D. dubius* in Odisha.

2. *Diogenes violaceus* Henderson, 1893

Material examined: EBRC/ZSI/CR-17891, 03 specimens, 58.82–59.62 mm TL, Penthakata, Puri

district, Odisha, 24.3.2025, Dr. Anil Mohapatra and Party (Fig. 3a–e).

Diagnostic characters: The intercalary rostral process has numerous marginal spinules (Fig. 3a). Ocular acicles have terminal margins that are either oblique or nearly straight and are covered with spines along their whole length, with the innermost spine occasionally being the largest. Antennular peduncles do not extend beyond the distal margins of the antennal peduncles. Antennal acicle typically has a weak bifurcation (Fig. 3a); the outer process usually does not extend beyond the distal apex of the fourth peduncular segment. Dactyl of the left cheliped bears a row of sub-acute conical spines along the upper margin and a smaller secondary row on the outer face dorsally. A faint dentate line runs along the upper margin of both the dactyl and palm, continuing onto the carpus. Carpus features a subsulcate lower margin. Ambulatory legs do not extend beyond the tip of the outstretched left cheliped and are generally similar in appearance. Dactyls are slightly longer than the propodi and have dorsal ends that carry a prominent row of small yellowish spinules (Fig. 3b). Telson exhibits a faint median cleft; its asymmetrical lobes each have terminal margins equipped with a row of small spines.

Colouration: The overall colour is violet when fresh. The ocular peduncle is cream-coloured with two thin brown stripes. The anterior portion of the shield is brownish-violet in the middle and whitish on the sides. The chelipeds are brownish, while the dactylus of the ambulatory leg is light violet with two deep violet or brownish stripes. The dorsal end of the dactylus features prominent yellow spinules.

Distribution: *India:* Karnataka, Kerala, Tamil Nadu, Andhra Pradesh⁵, and Odisha (Present Study) (Fig. 2). *Elsewhere:* Pakistan, Madagascar¹⁴.

Remarks: *Diogenes violaceus* Henderson, 1893 is described here based on three specimens collected from Penthakata, Puri district, Odisha. In this study, the described specimens align with all the characteristics mentioned in the relevant taxonomic literature⁹⁻¹⁶. This report marks the first scientific documentation of the presence of *D. violaceus* in Odisha. Further, this is to record here that the specimens were collected from the gill nets operated in the area.

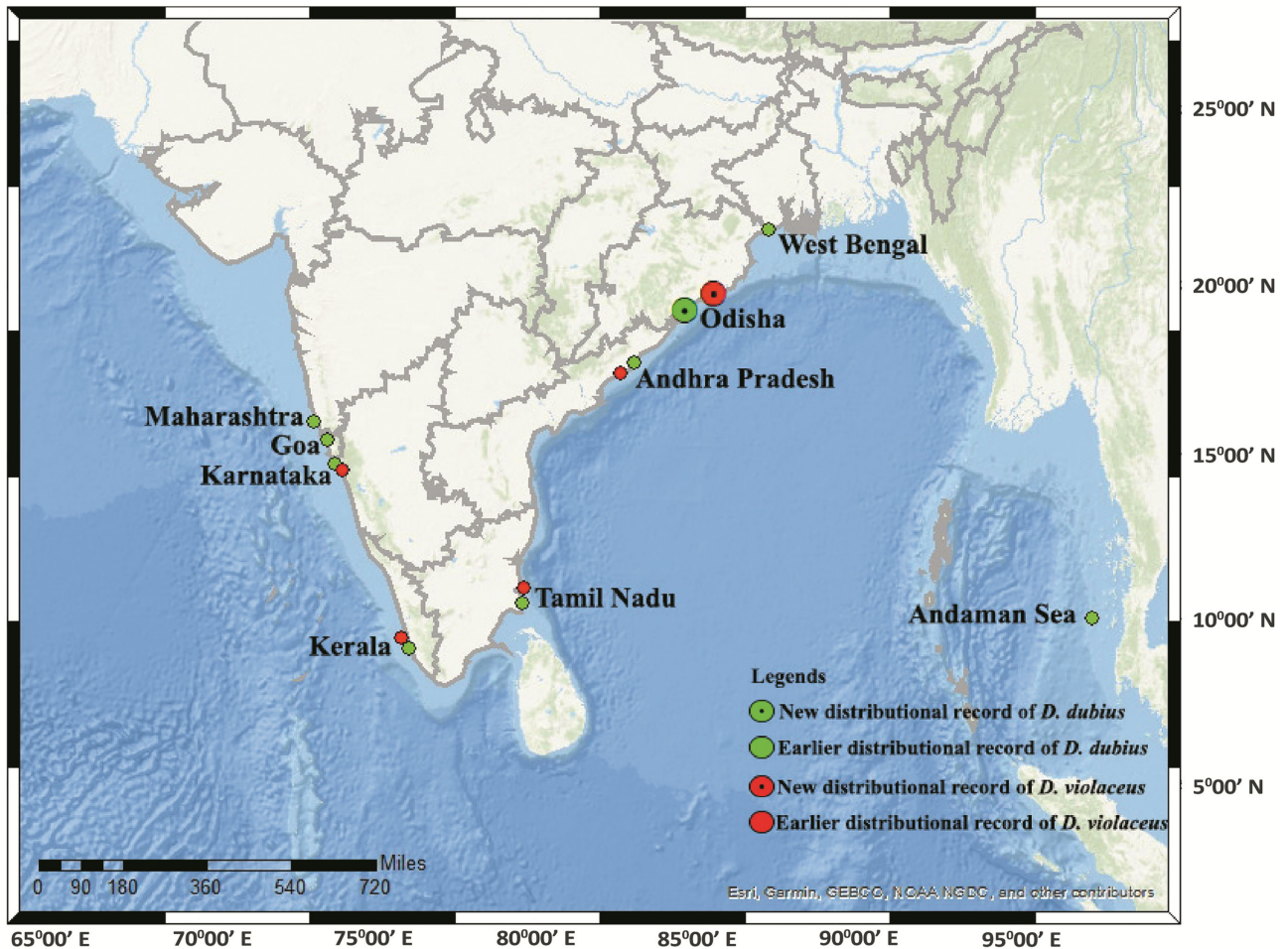


Fig. 2 — Distributional map of *Diogenes dubius* (Herbst, 1804) and *Diogenes violaceus* Henderson, 1893 within India

Discussion

Odisha has documented a total of 646 species of crustaceans, which belong to 180 families and 377 genera¹⁶. Among these, hermit crabs represent a modest diversity, with only twenty-eight species reported so far⁴. Consequently, there is a notable lack of comprehensive scientific studies focused specifically on hermit crabs in the region. Only a few researchers have studied hermit crab diversity along the Odisha coast^{3,17-20}. So far, only ten species of the genus *Diogenes* have been reported from the Odisha coast⁵. This study presents the first report of the occurrence of *Diogenes dubius* (Herbst, 1804) and *Diogenes violaceus* Henderson, 1893 from the Odisha coast with description, illustration, and detailed morphometric analysis (Table 2).

Diogenes violaceus shows close similarity with *D. custos* but can be differentiated based on lower outer face of the carpus of the left cheliped, as the lower outer face of the carpus of the left cheliped of

D. violaceus is subsulcate, whereas it is not subsulcate in *D. custos*. Similarly, *D. dubius* shows close affinity to *D. alias*¹⁴ but can be differentiated on the basis of differences in left cheliped ultrastructure. Furthermore, these two reported species, *i.e.*, *D. violaceus* and *D. dubius* can be differentiated from each other based on the nature of bifurcation of the antennal aucicle¹⁴.

Previously conducted studies of hermit crab taxonomy mainly focus on vital morphological characteristics, but little importance has been given to using morphometric analysis as a species identification tool. However, a study by Rahayu *et al.*²² suggests that morphometric analysis can be a vital tool for certain species-level identifications. Rahayu *et al.*²² select the shield length-breadth ratio as one of the vital parameters for species identification. In this study, the shield length-breadth ratio for *D. dubius* is 1.07, whereas it is 1.45 for *D. violaceus*. Here, a detailed morphometric analysis

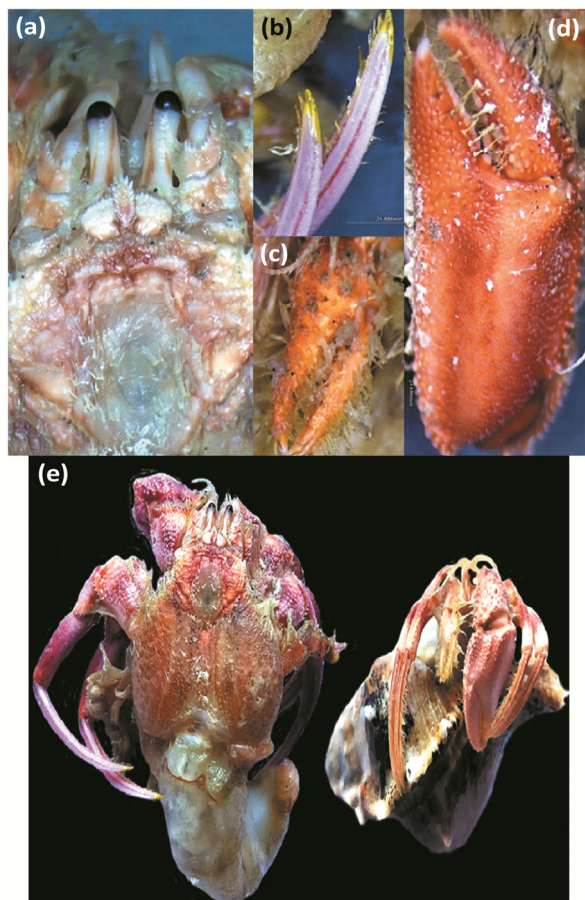


Fig. 3 — a) Shield of *D. violaceus* with associated structure like ocular peduncle, ocular acicle, antennular peduncle, antennal acicle, intercalary ristiform process; b) Dactylus of amulatory leg with small yellowish spinules; c) Right cheliped; d) Left cheliped; and e) Whole body view of *D. violaceus*

has been conducted following relevant literature^{7,8} to identify additional parameters that can be used as a preliminary species identification tool.

However, this study presents the first report of the occurrence of *Diogenes dubius* (Herbst, 1804) and *Diogenes violaceus* Henderson, 1893, from Odisha. All the specimens of *D. violaceus* and *D. dubius* from current study match the descriptions in the relevant scientific literature⁹⁻¹⁵. Consequently, the total number of hermit crab species of the genus *Diogenes* reported in Odisha now increases to twelve.

Conclusion

Hermit crabs play a crucial role in marine benthic and intertidal ecosystems, yet they remain one of the least studied animal taxa. Increasing anthropological pressures on coastal environments and habitat destruction are rapidly driving many species to extinction. Therefore, comprehensive research on

hermit crab species diversity, their biology, ecological roles, and population dynamics is essential for developing effective conservation and management strategies.

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Conflict of Interest

The authors don't have any conflicts of interest.

Ethical Statement

The species in this study are not listed under any schedule groups in the Wildlife Protection Act, so no permission was required.

Author Contributions

TKS: Identification and writing of the manuscript; RKB: Specimen collection; and AM: Specimens collection, conceptualization, and editing of the manuscript.

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