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First record of sand crab, *Jonas kalpakkamensis* Barathkumar, Das & Satpathy, 2016 (Decapoda, Brachyura, Corystidae) from the Western Indian Ocean with a key to the genus *Jonas*

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Research Article

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Abstract

A total of five specimens of sand crab, *Jonas kalpakkamensis* Barathkumar, Das & Satpathy, 2016 were recorded for the first time from the Western Indian Ocean. The sand crab specimens were collected from the bycatch of the commercial demersal trawler targeting crustaceans at a depth of 15–50 m operated along the western region of the Gujarat coastal waters. The collected specimen consists of 3 males and 2 females and it was identified by comparing with holotype and paratype specimens. Previously, *J. kalpakkamensis* was reported from the Eastern Indian Ocean in the Bay of Bengal region but there is no report or distribution of this sand crab in the Western Indian Ocean. The detailed taxonomic diagnostic character of the sand crab, *J. kalpakkamensis* and the key for all species under the genus *Jonas* reported globally is provided in the current study.

Introduction

The crabs occupy a significant position among the animal groups of the marine environment (Sureandiran *et al*., 2023a). Among the class Malacostraca the brachyuran crabs display high diversity which constitutes 107 families, 1567 genera with 7683 valid species (De Grave *et al*., 2023). In India, a total of 910 species of marine brachyuran crabs under 361 genera belonging to 62 families were reported (Trivedi *et al*., 2018). The brachyuran crabs of the family Corystidae is commonly called as the burrowing crab because they mostly show the character of burrowing under the soft sediments and are mostly found in the sandy or muddy environment (Naderloo, 2017). The burrowing crabs are commonly distributed in the global waters at a depth of less than 115 m (Marco-Herrero, 2022). Globally, the corystid group consists of 11 genera among those the genus *Jonas* commonly called as the sand crab comprises of 7 valid species (DecaNet, 2024). In India three species namely *J. choprai*, *J. indicus,* and *J. kalpakkamensis* were reported from coastal waters of Tamil Nadu and West Bengal (Chopra, 1935; Deb, 1999; Manokaran *et al*., 2008; Pillai and Thirumilu, 2008; Barathkumar *et al*., 2016).

Jonas kalpakkamensis was documented only from Tamil Nadu coast along the Bay of Bengal region further there is no record of this species from any other coast. In the present study, the sand crab, *J. kalpakkamensis* Barathkumar, Das & Satpathy, 2016 is reported for the first time from the Gujarat coast along the Western Indian Ocean. Further, detailed taxonomical notes of the species and identification key for *Jonas* spp. are provided.

Materials and methods

A total of five specimens ($n = 5$) were collected from the crustacean bycatch landings during March 2023 from Veraval fishing harbour (20° 50' N and 70° 28' E), Gujarat, India, Western Indian Ocean (Figure 1). The specimens of *J. kalpakkamensis* were caught by trawl net operated along the Gujarat coast, Arabian Sea at a depth range between 15 and 50 m. The collected sand crab specimens were identified following Barathkumar *et al*. (2016) and morphometric measurements (Table 1) were made using the Vernier caliper (VC) with an accuracy of 0.1 mm. Photographs of the crabs were captured using the Nikon D-5300 camera and further, the crabs were preserved using 10% formalin and deposited in the Museum of College of Fisheries Science, Veraval. In the present study, body parts of the sand crab were made using the pencil sketch manner by referring the standard literature and software (Barathkumar *et al*., 2016; Sureandiran *et al*., 2023b).

Results

Systematic position

Order: DECAPODA Latreille, 1802
Family: CORYSTIDAE Samouelle, 1819

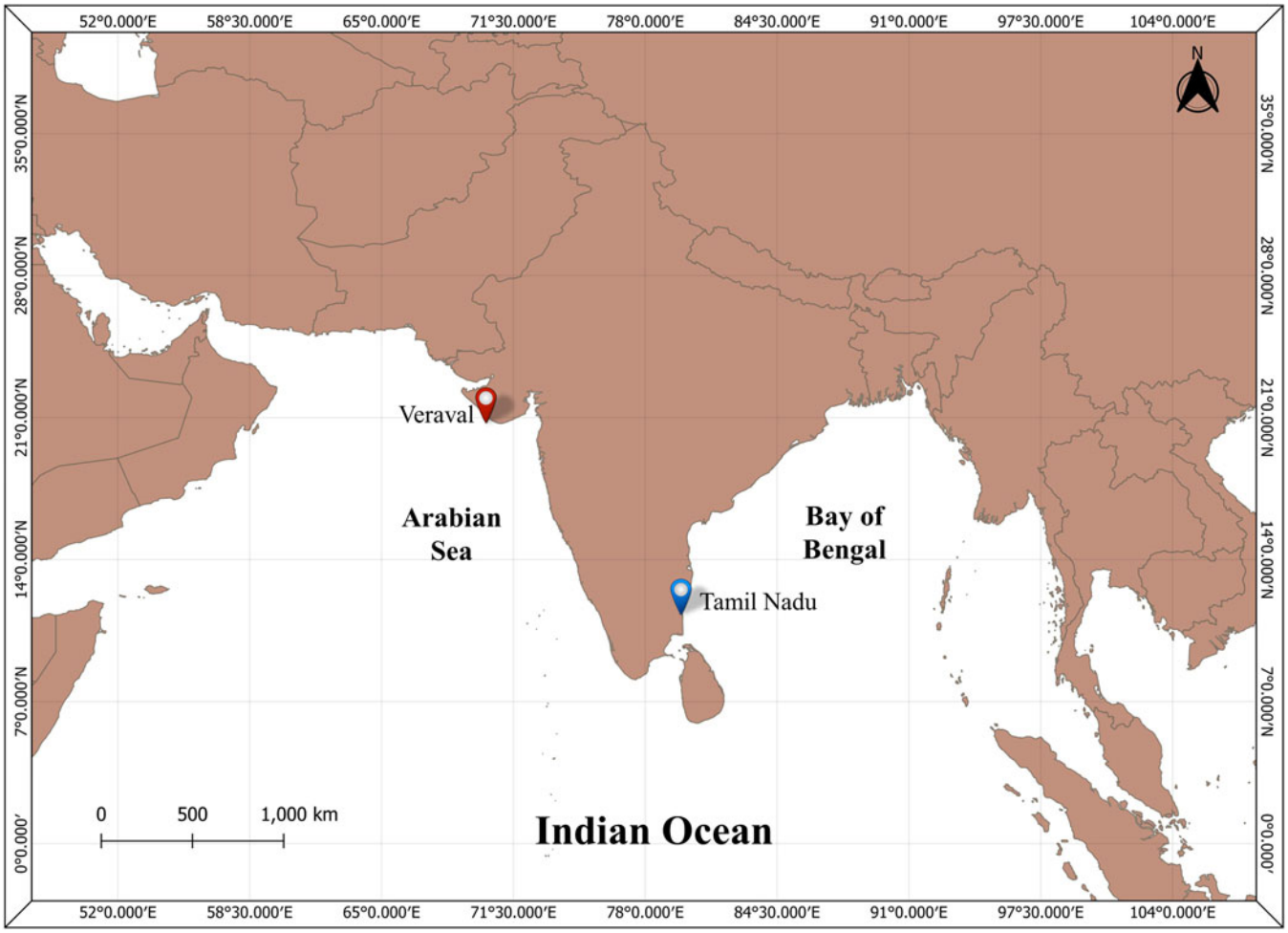

Figure 1. Map of the study area Veraval fishing harbour, Gujarat, Western Indian Ocean (note: red marking indicates the present study area and blue marking indicates the previous report).

Genus: *Jonas* Hombron & Jacquinot, 1846
Species: *Jonas kalpakkamensis* Barathkumar, *et al.*, 2016
(Figure 2–4)

Materials examined

Sand crab, *J. kalpakkamensis* ($n = 5$), (carapace width = 12.4 to 17.2 mm, carapace length = 19.2 to 30.2 mm); coll. B. Sureandiran; 9th March, 2023 from the Veraval fishing harbour (20° 50' N and 70° 28' E), Gujarat, India.

Diagnosis

Carapace oval, dorsal surface possessing tiny hair, granules scattered, 10 spines present on lateral margin size reducing towards last spine, 1st larger, 2nd–4th spine equal in size 5th & 6th slightly equal, 7th–9th spine blunt not spinous, 10th spine longer than 9th, between the 10th spine of both lateral side eight to twelve granules present; rostrum bifurcated; supra-orbital spine elongated and longer than size of rostrum; eyes fully occupying orbit portion, orbital portion not developed well, some setae present around orbit portion; orbital spine elongated than first anterolateral tooth of carapace; chelipeds layered with granules, carpus possessing two unequal spines on outer margin, merus size lesser than the ischium; ambulatory legs with dense hairs, fourth leg consists of 3 spines, last leg dactylus spatuliform; abdomen region short, 1st–3rd abdomen somites not wide, 4th & 5th somite extremely wide, 6th somite half wide in size of 5th somite. G1 slender, L-shaped, stout at base, tip elongated.

Colouration

The live specimen carapace region is bright orange reddish with frontal portion more bright than the posterior part; claw shows

Table 1. Morphometric measurements of *Jonas kalpakkamensis* collected from the Veraval fishing harbour, Gujarat, Western Indian Ocean and comparison with holotype and paratype (Barathkumar *et al.*, 2016)

	Male			Female			
Morphometric characters	S-1	S-2	S-3	S-1	S-2	Holotype (ZSI/MBRC/D1.244)	Paratype (EnSD/2013/35-36)
Carapace length (mm)	19.2	24.1	28.3	26.3	30.2	29	24–32
Carapace width (mm)	12.4	14.8	17.1	15.1	17.2	16	13–16
Total weight (g)	1.90	3.40	5.20	4.30	5.50	-	-

('S' present study specimens).

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Figure. 2. Dorsal and ventral view of *Jonas kalpakkamensis* Barathkumar, Das & Satpathy, 2016 collected from the Veraval fishing harbour, Gujarat, Western Indian Ocean. (scale bars: 1 cm).

faded colour in appearance; ambulatory legs tip and hair reddish; 1st five spines on the lateral region of the carapace orange coloured remaining all spines colour faded. The colouration of the 10% formalin preserved specimen was slightly faded on the carapace region compared to the fresh specimen.

Remarks

Jonas kalpakkamensis shows similarity with its congener *J. formosae* because the *J. formosae* is the only species found in the Southeast Asia and Northern region of Taiwan (Ng *et al.*, 2000). The *J. formosae* is distinguishable from *J. kalpakkamensis* through scattered tiny granules like structure present over the surface of the carapace region particularly on the raised portion and presence of 3 spines over the merus segment of the walking leg (Barathkumar *et al.*, 2016). However *J. choprai* reported from the Indian coast (Manokaran *et al.*, 2008) is differentiated from the *J. kalpakkamensis* by the presence of wider carapace and elongated supraorbital spines. According to Ng *et al.* (2000) the holotype (ZRC 1969.11.20.3) examined specimen consists of longest 2nd leg and in *J. kalpakkamensis* all the ambulatory legs are quite similar in size. The another species reported from Indian coast was *J. indicus* which is differentiated from the *J. kalpakkamensis* in possessing the well-developed spines (Naderloo, 2017) referred from the holotype specimen of *J. indicus* (C 1766/1) in case of *J. kalpakkamensis* 1st to 4th spine only developed remaining spine are blunt and undefined.

Habitat

Generally, found on the sandy mud shallow habitat with depth range of 20–30 m (Barathkumar *et al.*, 2016). In the present study, specimens were caught at the muddy region at a depth range of 15–50 m.

Known distributions

J. kalpakkamensis is reported only from Bay of Bengal (Tamil Nadu) (Barathkumar *et al.*, 2016).

Discussions

The corystid group crabs are only reported from the soft sediment areas at the depth range of 2–115 m according to Marco-Herrero (2022). In the present study, the specimens of *J. kalpakkamensis* were harvested at the depth range of 15 to 50 m which confirms the depth of availability and habitat of the species in marine ecosystem. The genus *Jonas* closely resembles with the genus *Gomeza* as these genera can be differentiated by having slender and elongated carapace from the anterior to the posterior region in the *Jonas*, on the other hand the *Gomeza* genus possess the oval like shaped carapace (Ng *et al.*, 2000). In India three species under *Jonas* genus were reported *viz. Jonas choprai*, *J. indicus,* and *J. kalpakkamensis* from the east coast of India and no report is found along the west coast of India (Trivedi *et al.*, 2018). The *J. indicus* was

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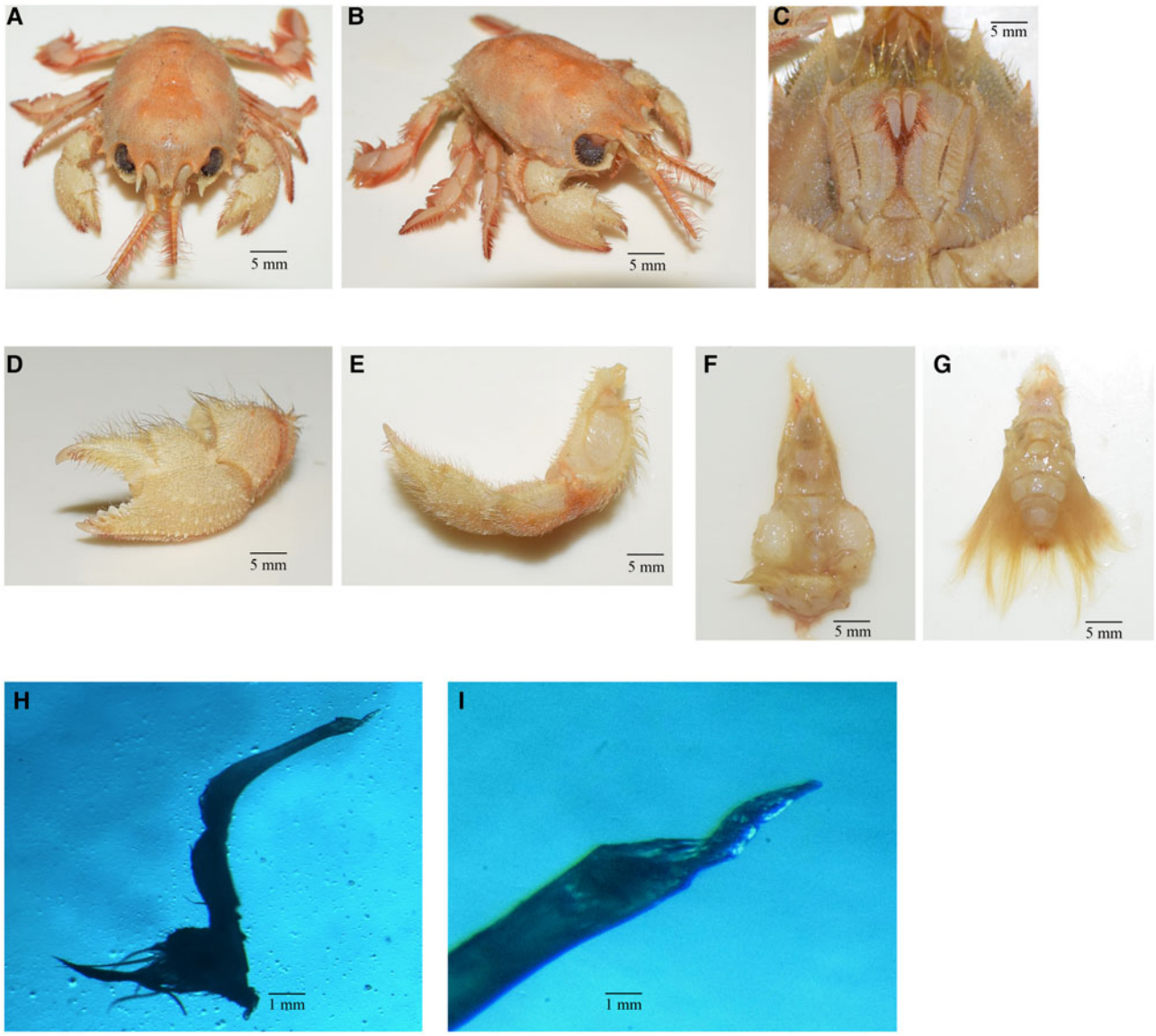

Figure. 3. *Jonas kalpakkamensis*: (a) frontal view of carapace, (b) lateral view of carapace, (c) dorsal view of mandible & maxilliped, (d) frontal view of left claw, (e) dorsal view of left claw, (f) male abdomen, (g) female abdomen, (h) dorsal view of G2 and (i) close view of G2 tip.

earlier reported from the Gulf of Oman region (Barathkumar *et al.*, 2016) and this *J. indicus* is the closely resembling species with *J. kalpakkamensis* due to the morphological similarity like the presence of the tiny granulations with tubercles in the upper surface region of the carapace referred from the holotype specimen – C 1766/1 collected from the Bay of Bengal at depth range between 36 and 96.5 m. As per IUCN Red List of Threatened Species (IUCN, 2022) the sand crab *J. kalpakkamensis* was categorized as Not Evaluated (NE) and presently the species is not consumed for food, but it is utilized for preparation of animal feed due to its insect like appearance and very less meat yielding property. The identification of sand crabs under the genus *Jonas* is quite difficult due to lack of proper taxonomical notes and species descriptions. The comparison of the present study specimens with the holotype specimen (Male, ZSI/MBRC/D1.244) collected from the Chennai coast and paratype specimen (Male, EnSD/2013/35-36) collected from the Chennai coast helped in identification of the specimen as *J. kalpakkamensis*. In the present study, the specimens were collected during the March month which is considered as the pre-monsoon season along the Gujarat coast. The sand crab existence in the Arabian Sea region could be attributed to changes in the climate, such as fluctuations in sea surface temperature (SST) and the dynamic water circulation pattern between the Arabian Sea and the Bay of Bengal (Sureandiran *et al.*, 2023c). Besides exploratory vessel surveys are required in and around the north-eastern Arabian Sea region to estimate the actual diversity of the decapod crustacean resources (Sureandiran *et al.*, 2024).

Key to the genus *Jonas* and the list of species reported globally

1. Carapace longitudinally ovate; clusters of pearliform granules present 1
- Carapace oval. 2
- Carapace elongated. 3
  1a. Lateral margin consists of 7 spines, ambulatory legs with dense hairs . . . . . *J. macropthalmus*

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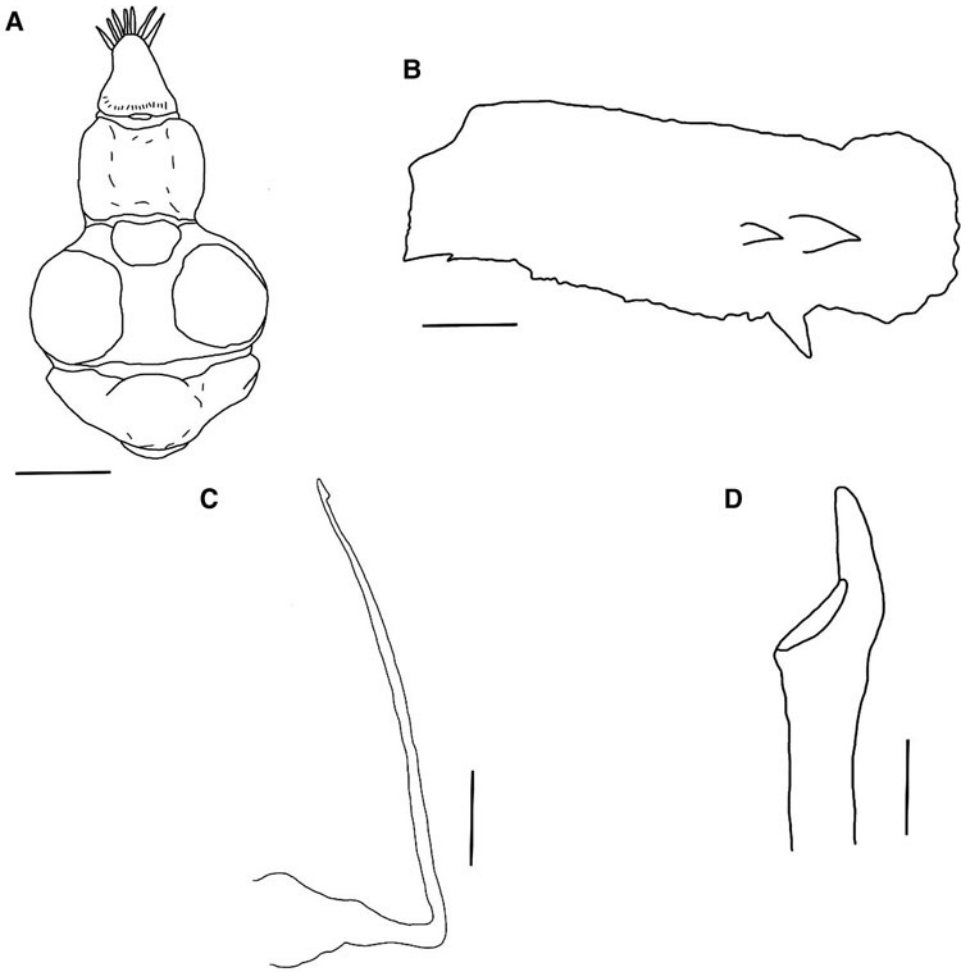

Figure. 4. *Jonas kalpakkamensis*, (a) Abdomen, (b) 4th ambulatory leg comprising of three spines, (c) G1 and (d) G2 tip (scale bars: a & b - 5 mm, c & d - 1 mm).

1b. G1 hooked and the distal part sub-conical in shape. . . . . *J. distincta*
1c. G1 L-shaped in ventral view; tip G2 short with broad base, basal part curved. . . . . *J. kalpakkamensis*
1d. G1 hooked and the distal is elongated, tip prolong appears filamentous . . . . . *J. formosae*
2a. First anterolateral spine strong and longer than remaining; presence of distinct ventral spine in basis-ischium of last ambulatory leg. . . . . *J. choprai*
2b. Prominent curved lateral spines; larger posterolateral teeth. . . . . *J. indicus*
3a. Penultimate segment longer, half as long as first . . . . . *J. leuteanus*

Data availability. The authors confirm that the data supporting the findings of this study are available within the article.

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Author contributions. B. Sureandiran: collected the crab specimen, preparation of the manuscript, software analysis, microscopic examination and image preparation. T. H. Dave: supervision of the study. N. K. Suyani: review and editing of manuscript. K. Karuppasamy: taxonomic advice and conceptualization.

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Competing interests. None.

Ethical standards. The authors declare that the work did not involve experiments with vertebrates. The work was carried out within local guidelines without causing damage to the environment.

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