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A new species of the freshwater crab genus *Oziotelphusa* Müller, 1887 from Tamil Nadu, India

(Crustacea, Decapoda, Brachyura, Gecarcinucidae)

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A new species of gecarcinucid freshwater crab, *Oziotelphusa naga* sp. nov., is described herein from Nagercoil of Kanyakumari district in Tamil Nadu, India. The new species is distinct among the Indian congeners due to its stout and distinctly sinuous terminal segment of the male first gonopod. Among the Sri Lankan species of *Oziotelphusa* Müller, 1887, *O. naga* sp. nov. resembles *O. minneriyaensis* Bott, 1970, in the structure of the male gonopods but can easily be distinguished by the less convex dorsal surface of the carapace, the relatively more narrow frontal median triangle, and the relatively longer male second gonopod. *Oziotelphusa* is now represented by 18 species: eight species from India and 10 from Sri Lanka. The distributional records of all the Indian species of *Oziotelphusa* are provided.

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Introduction

The gecarcinucid genus *Oziotelphusa* Müller, 1887, is distributed in the lowlands of Sri Lanka and most part of the Deccan Peninsula of India where rice is the major crop (Bahir & Yeo 2005, Pati & Sharma 2012a, 2014, Pati et al. 2014, Raj et al. 2017). *Oziotelphusa* is one of the most species rich freshwater crab genera in the Indian subcontinent and currently contains 17 species: seven species from India: *O. aurantia* (Herbst, 1799), *O. biloba* Bahir & Yeo, 2005, *O. bouvieri* (Rathbun, 1904), *O. ganjamensis* Pati & Sharma, 2012, *O. kerala* Bahir & Yeo, 2005, *O. ravi* Raj, Kumar & Ng, 2017, and *O. wagrakarowensis* (Rathbun, 1904) (Bahir & Yeo 2005, Pati & Sharma 2012a, Raj et al. 2017); and 10 species from Sri Lanka: *O. ceylonensis* (Fernando, 1960), *O. dakuna* Bahir & Yeo, 2005, *O. gallicola* Bahir & Yeo, 2005, *O. hippocastanum* (Müller, 1887), *O. intuta* Bahir & Yeo, 2005, *O. kodagoda* Bahir & Yeo, 2005, *O. minneriyaensis* Bott, 1970, *O. populosa* Bahir & Yeo, 2005, *O. ritigala* Bahir & Yeo, 2005, and *O. stricta* Ng & Tay, 2001 (Ng & Tay 2001, Bahir & Yeo 2005, Bahir et al. 2005).

The Indian species of *Oziotelphusa* are known only from certain districts of Indian states/union territory: Anantapur district of Andhra Pradesh; Bangalore Rural, Bangalore Urban, Chamarajanagar, Chikballapura, Hassan, Kolar, Mysore, and Uttara Kannada districts of Karnataka; Kozhikode, Malappuram, Palakkad, Thrissur, Kottayam, and Kollam districts of Kerala; Kolhapur, Nanded, Sangli, and Solapur districts of Maharashtra; Bhadrak, Ganjam, and Puri districts of Odisha; Puducherry district of Puducherry; Kancheepuram, Nagapattinam, Salem, Villupuram, and Kanyakumari districts of Tamil Nadu (Table 1). There are probably more species to be described from India as much of the Deccan peninsula is still largely unexplored, e.g. Odisha,

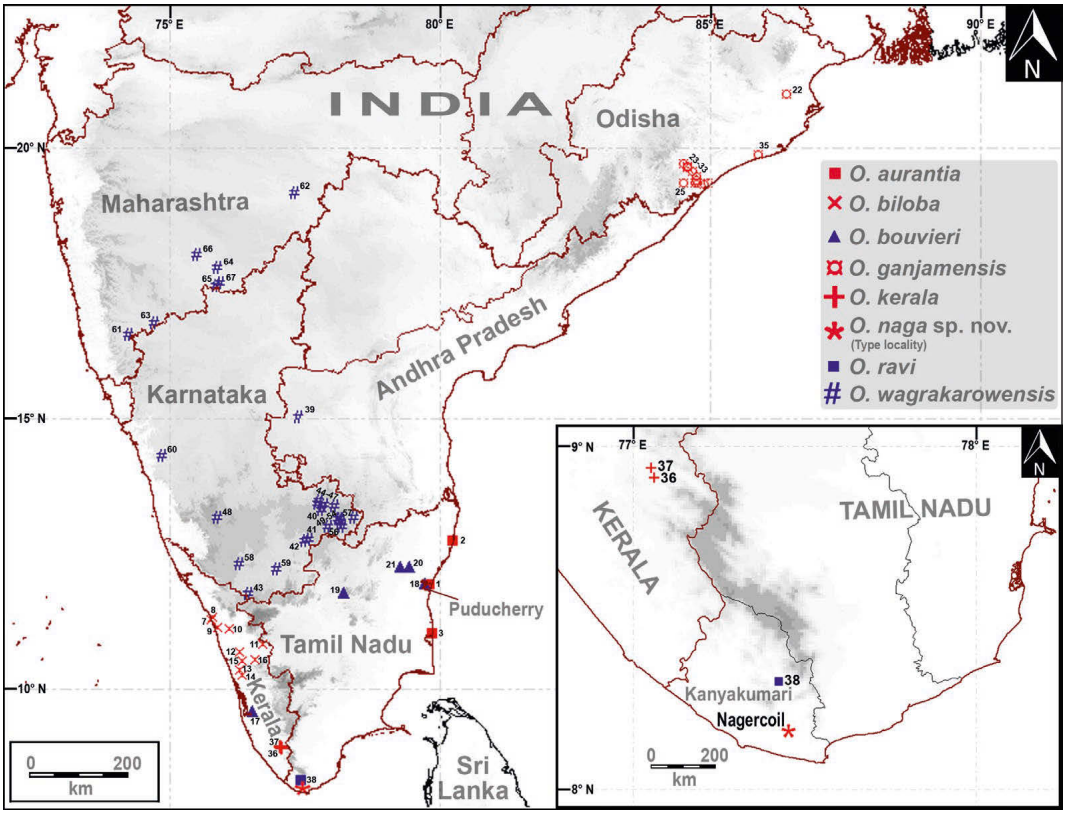


Fig. 1. Map showing distribution of Indian species of *Oziotelphusa*. Numbers correspond to the localities in Table 1.

Telangana, Andhra Pradesh, part of Maharashtra bordering with Karnataka, Belagavi and Kalaburagi divisions of Karnataka, south and central Tamil Nadu, and lowlands of Kerala (Fig. 1).

Only three species of *Oziotelphusa* have so far been recorded from the state of Tamil Nadu: *O. aurantia*, *O. bouvieri*, and *O. ravi* (Latreille 1825, H. Milne Edwards 1837, A. Milne-Edwards 1869, Wood-Mason 1871, Henderson 1893, Ortmann 1893, 1897, De Man 1898, Rathbun 1904, Alcock 1910, Fernando 1960, Bott 1970a,b, Bahir & Yeo 2005, Raj et al. 2017) (Table 1, Fig. 1). The latter species was only recently described by Raj et al. (2017) from Keeriparai near Nagercoil of Kanyakumari district in south Tamil Nadu. Recently, additional crab specimens were collected from the rice fields near Nagercoil (Fig. 1). These crabs proved to be hitherto undescribed and are assigned to a new species of *Oziotelphusa*, *O. naga* sp. nov.

Material and methods

The collected crabs were preserved in 70 % ethyl alcohol and deposited in the National Zoological Collection of the Zoological Survey of India, Western Regional Centre, Pune (ZSI-WRC). Specimens of *O. ganjamensis* were also examined from the collections ZSI-WRC and the Crustacean Section of the Zoological Survey of India, Kolkata (ZSIK) in order to confirm its distributional range.

The measurement method follows Ng (1988). The anatomical terminology is after Ng (1988), Ng & Tay (2001), and Davie et al. (2015). The type specimens were photographed using Canon EOS 700D camera. The pencil drawings of the body parts were obtained through a camera lucida and then digitally traced using the GNU Image Manipulation Program (GIMP) software by following Montesanto (2015). Finally, the illustrations were processed using the Adobe Photoshop.

The following abbreviations are used: cw, carapace width; cl, carapace length; ch, carapace height; fw, frontal width; p2–p5, pereiopods 2–5; s1–s8, thoracic sternites 1–8; G1, male first gonopod; G2, male second gonopod.

Taxonomy

Family Gecarcinucidae Rathbun, 1904

Genus *Oziotelphusa* Müller, 1887

***Oziotelphusa naga* sp. nov.**
Figs 2–4

Type material. Holotype: adult male (cw 37.79 mm, cl 28.33 mm, ch 17.35 mm, fw 11.50 mm), Edalakudy near Nagercoil, Kanyakumari district, Tamil Nadu, India (8.169 °N, 77.452 °E), 9 m above sea level, 4 March 2018, collected by F. Vargila (ZSI-WRC C.1709). – Paratypes: adult female (cw 38.39 mm, cl 28.85 mm, ch 19.00 mm, fw 11.68 mm), same data as holotype (ZSI-WRC C.1710); adult male (cw 34.86 mm, cl 26.74 mm, ch 15.98 mm, fw 12.00 mm) and adult female (cw 36.33 mm, cl 27.67 mm, ch 18.16 mm, fw 11.61 mm), same data as holotype (ZSI-WRC C.1711); adult male (cw 33.77 mm, cl 25.64 mm, ch 15.19 mm, fw 11.14 mm) and adult female (cw 36.01 mm, cl 27.94 mm, ch 17.57 mm, fw 11.73 mm), same data as holotype (ZSI-WRC C.1712); adult male (cw 32.30 mm, cl 24.81 mm, ch 14.43 mm, fw 10.67 mm) and adult female (cw 35.44 mm, cl 27.06 mm, ch 17.06 mm, fw 11.40 mm), same data as holotype (ZSI-WRC C.1713).

Diagnosis. Carapace dorsal surface moderately convex; frontal margin slightly concave medially; postorbital cristae sharp, almost straight, not sloping, entire; epibranchial tooth moderate, sharp, very slightly elevated from postorbital cristae; branchial regions gently inflated; frontal median triangle not as broad as frontal margin, dorsal margin completely fused with lateral margins; epistomal median lobe with distinct tooth (Figs 2A,B, 3A,B, 4A). Suture between male thoracic sternites s2/s3 distinct, deep, not reaching lateral margins; suture between male thoracic sternites s3/s4 distinct as broad, deep groove or visible as 2 moderately deep submedian depressions, not reaching lateral margins (Figs 2C, 3D). Male pleon relatively T-shaped, lateral margins strongly concave; pleonal somite 6 trapezoidal, broader than long, as long as telson, with gently to distinctly concave lateral margins; telson relatively broad, proximal width ca. 1.1 times median length (Figs 2C, 3E). Female pleon ovate, almost covering thoracic sternites when closed (Fig. 4B). G1 moderately stout, bent outwards at juncture between terminal and subterminal segments; terminal segment stout, horn-like, distinctly sinuous, long, ca. 0.4 times length of basal segment, entirely bent, directed laterally outwards, proximal half distinctly stout and dilated, distal half gradually narrow, tip truncate; subterminal segment moderately stout (Fig. 3F–H). G2 relatively long, ca. 1.2–1.3 times length of G1; distal segment relatively long, ca. 0.4–0.5 times length of basal segment (Fig. 3I). Vulvae on thoracic sternite 6 oblong-ovate, large, occupying ca. 0.5 times length of thoracic sternite 6, situated adjacent to margin with thoracic sternite 5 (Fig. 4C).

Description of male holotype

Carapace transversely ovate, slightly broader than long (cw/cl = 1.3), moderately deep (ch/cl = 0.6); dorsal surface moderately convex, smooth except for epigastric cristae, postorbital cristae, and posterolateral surfaces; anterolateral surface gently inflated in frontal view; anterolateral margins short, strongly convex, smooth, cristate; posterolateral margins long, gently concave, joins straight posterior carapace margin, with long, distinct, oblique striae; front not deflexed, trapezoidal, surface uneven; frontal margin slightly broad (fw/cw = 0.3), slightly concave medially; epigastric cristae distinct, sharp, sloped laterally, distinctly anterior to postorbital cristae, not confluent with postorbital cristae; postorbital cristae distinct, sharp, almost straight, not sloping, entire; external orbital tooth prominent, triangular, tip slightly below line with frontal margin, clearly demarcated from epibranchial tooth by V-shaped notch, outer margin almost straight, ca. 3 times length of inner margin, inner margin gently curved, joining supraorbital margin; epibranchial tooth moderate, sharp, very slightly elevated from postorbital cristae, distinctly away from level of supraorbital margin; postorbital region strongly concave; branchial regions inflated; cervical grooves deep, broad, short, discontinuous, not reaching postorbital cristae; mesogastric groove shallow, narrow, very short, bifurcated posteriorly; H-shaped groove visible; subhepatic region rugose; suborbital region rugose, glabrous; suborbital margin concave, entire, lined with very low, rounded granules; pterygostomial region smooth, glabrous; frontal median triangle complete, not as broad as frontal margin, dorsal margin completely fused with lateral margins; epistomal median lobe with distinct tooth (Figs 2A,B, 3A,B).

Eyes filling up most of orbital space; eye stalk moderately long, stout; cornea moderately large, pigmented (Fig. 2B). Antennae long, reaching cornea of eyes; antennules long, folded in narrow transverse fossae (Fig. 2B).

Mandibular palp 2 segmented; terminal segment bilobed, anterior lobe large, subequal. First, second maxillipeds each with long flagellum on exopod. Third maxillipeds cover most of buccal cavity when closed; ischium subrectangular, longer than broad, with distinct, deep, oblique submedian groove; merus subovate, broader than long; exopod slender, longer than ischium, reaching half-length of merus, with distinct long flagellum, reaching almost entire width of merus (Fig. 3C).

Table 1. Records of the Indian species of *Oziotelphusa*. Numbers assigned to the localities are shown in Figure 1.

Records	Citation
***Oziotelphusa aurantia* (Herbst, 1799)**	
PUDUCHERRY union territory	
PUDUCHERRY district	
1. Puducherry [11.914 °N, 79.814 °E]	Latreille (1825), H. Milne-Edwards (1837), A. Milne-Edwards (1869), Wood-Mason (1871), Ortmann (1893), Ortmann (1897), De Man (1898)
TAMIL NADU state	
KANCHEEPURAM district	
2. Mamallapuram (= Mahabalipuram), rice-fields opposite to Madras Crocodile Bank Trust [12.746 °N, 80.235 °E]	Bahir & Yeo (2005)
NAGAPATTINAM district	
3. Tharangambadi (= Tranquebar) [11.027 °N, 79.854 °E]	Rathbun (1904), Bott (1970a, 1970b), Bahir & Yeo (2005)
State unknown	
4. Coromandel Coast (no exact locality)	H. Milne Edwards (1837)
5. East India (no exact locality)	De Man (1898), Herbst (1799), Bahir & Yeo (2005)
6. India (no exact locality)	De Man (1898)
***Oziotelphusa biloba* Bahir & Yeo, 2005**	
KERALA state	
KOZHIKODE district	
7. Eranhipalam [11.280 °N, 75.784 °E]	Pati et al. (2014)
8. Muttoli, Kakkodi [11.234 °N, 75.808 °E]	Pati & Sureshan, unpublished data
MALAPPURAM district	
9. Kadakkattupara, Thenjipalam [11.134 °N, 75.894 °E]	Pati & Sureshan, unpublished data
10. Manjeri [11.120 °N, 76.120 °E]	Rajesh et al. (2017)
PALAKKAD district	
11. Malampuzha [10.828 °N, 76.737 °E]	Rajesh et al. (2017)
THRISSUR district	
12. Asurankundu [10.686 °N, 76.296 °E]	Pati et al. (2014)
13. Kodagara village on Thrissur-Chalakudy road [10.365 °N, 76.318 °E]	Bahir & Yeo (2005), Raj et al. (2017), Rajesh et al. (2017)
14. Koratty village on Chalakudy-Angamaly road [10.267 °N, 76.350 °E]	Bahir & Yeo (2005)
15. Peechi [10.527 °N, 76.361 °E]	Rajesh et al. (2017)
16. Vazhani [10.553 °N, 76.586 °E]	Pati et al. (2014)
***Oziotelphusa bouvieri* (Rathbun, 1904)**	
KERALA state	
KOTTAYAM district	
17. Kottayam* [9.592 °N, 76.522 °E]	Pillai (1951)
PUDUCHERRY union territory	
PUDUCHERRY district	
18. Gingee (= Sangarabarani) River, near Puducherry [11.951 °N, 79.705 °E]	Rathbun (1904)
TAMIL NADU state	
SALEM district	
19. Yercaud, Shervaroy Hills [11.775 °N, 78.209 °E]	Alcock (1910), Fernando (1960)
VILLUPURAM district	
20. Gingee [12.250 °N, 79.417 °E]	Rathbun (1904)
21. Velanthangal [12.267 °N, 79.262 °E]	Rathbun (1904), Fernando (1960), Bott (1970a), Bahir & Yeo (2005)

Table 1. (continued).

Records	Citation
***Oziotelphusa ganjamensis* Pati & Sharma, 2012**	
ODISHA state	
BHADRAK district	
22. Barikpur [20.990 °N, 86.418 °E]	Pati, unpublished data (ZSI-WRC, not catalogued)
GANJAM district	
23. Balakrushnapur, Berhampur-Digapahandi road [19.358 °N, 84.729 °E]	Pati & Sharma (2012a)
24. Chhatrapur [19.350 °N, 84.964 °E]	Pati, unpublished data (ZSI-WRC C.1096)
25. Ghodahada Canal, near Duargaon [19.345 °N, 84.529 °E]	Pati, unpublished data (ZSI-WRC C.1099)
26. Gopinathpur, Kukudakhandi [19.405 °N, 84.749 °E]	Pati, unpublished data (ZSI-WRC C.1100)
27. Hinjilicut [19.464 °N, 84.747 °E]	Pati, unpublished data (ZSI-WRC C.1092)
28. Jagadalapur [19.343 °N, 84.782 °E]	Pati, unpublished data (ZSI-WRC C.1098)
29. Jagannathapur [19.327 °N, 84.888 °E]	Pati, unpublished data (ZSI-WRC C.1097)
30. Mundamarai [19.642 °N, 84.597 °E]	Pati, unpublished data (ZSI-WRC C.1094)
31. Nalabanta [19.571 °N, 84.676 °E]	Pati, unpublished data (ZSI-WRC C.1093)
32. Nuagada, Suramani [19.715 °N, 84.516 °E]	Pati, unpublished data (ZSI-WRC C.1101)
33. Potasonga Nalla, near Hanumantadwara, Dharkota [19.651 °N, 84.589 °E]	Pati, unpublished data (ZSI-WRC C.1095)
34. Ganjam† (no exact locality)	Henderson (1893), Ortmann (1897), Rathbun (1904)
PURI district	
35. Sara Lake [19.867 °N, 85.900 °E]	Alcock (1910)‡
***Oziotelphusa kerala* Bahir & Yeo, 2005**	
KERALA state	
KOLLAM district	
36. Kulathupuzha [8.909 °N, 77.059 °E]	Rajesh et al. (2017)
37. Kolaththuppuzha-Tenmalai Road [8.937 °N, 77.051 °E]	Bahir & Yeo (2005), Raj et al. (2017), Rajesh et al. (2017)
***Oziotelphusa ravi* Raj, Kumar & Ng, 2017**	
TAMIL NADU state	
KANYAKUMARI district	
38. Keeriparai, near Nagercoil [8.314 °N, 77.422 °E]	Raj et al. (2017)
***Oziotelphusa wagrakarowensis* (Rathbun, 1904)**	
ANDHRA PRADESH state	
ANANTAPUR district	
39. Vajrakarur§ [15.026 °N, 77.381 °E]	Rathbun (1904), Bott (1970a), Bahir & Yeo (2005)
KARNATAKA state	
BANGALORE RURAL district	
40. Vijayapura Tank [13.295 °N, 77.801 °E]	Pati & Sharma (2014)
BANGALORE URBAN district	
41. Bannerghatta National Park [12.770 °N, 77.568 °E]	Srivastava (2007)¶, Srivastava (2013)¶
42. Kaggalahalli, near Bannerghatta National Park [12.728 °N, 77.486 °E]	Srivastava (2007)¶, Srivastava (2013)¶
CHAMARAJANAGAR district	
43. Bandipur Tiger Reserve, Pdoddane Katte and Karigondu Katte [11.769 °N, 76.448 °E]	Pati & Sharma (2014)
CHIKBALLAPURA district	
44. Appayya Kunta, Chikballapura [13.426 °N, 77.730 °E]	Srivastava (2013)#, Pati & Sharma (2014)
45. Chikballapur (Manchanpani Tank) [13.464 °N, 77.747 °E]	Srivastava (2013)#, Pati & Sharma (2014)
46. Chintamani (Kanepalli Tank) [13.381 °N, 78.037 °E]	Pati & Sharma (2014)
47. Siddalghata (Gavana Tank) [13.392 °N, 77.865 °E]	Srivastava (2013)#, Pati & Sharma (2014)

Table 1. (continued).

Records	Citation
***Oziotelphusa wagrakarowensis* (Rathbun, 1904)** (continued)	
KARNATAKA state (continued)	
HASSAN district	
48. Belur, Hassan [13.163 °N, 75.868 °E]	Srivastava (2013)¶
KOLAR district	
49. Bangarpet (Abdul Ali Garden) [12.993 °N, 78.179 °E]	Srivastava (2013)#, Pati & Sharma (2014)
50. Dodda Hassala (Dodda Hassala Lake) [13.009 °N, 78.166 °E]	Srivastava (2013)#, Pati & Sharma (2014)
51. Katerpalem (Malekar Tank) [13.136 °N, 78.133 °E]	Srivastava (2013)#, Pati & Sharma (2014)
52. Kolar (Gopal Tank) [13.130 °N, 78.129 °E]	Srivastava (2013)¶
53. Kolar (Gudi Bandi Tank)	Srivastava (2013)¶
54. Kolar (Sultan Tank) [13.131 °N, 78.111 °E]	Srivastava (2013)¶
55. Kudi	Srivastava (2013)¶
56. Malur (Malur Tank) [13.007 °N, 77.927 °E]	Pati & Sharma (2014)
57. Mulbagal (Mashid Basalguntha Tank) [13.162 °N, 78.390 °E]	Pati & Sharma (2014)
MYSORE district	
58. Hunsur, Tributary of Cauveri River, 50 km west of Mysore on Madikeri-Mysore Road [12.309 °N, 76.286 °E]	Bahir & Yeo (2005)☼
59. Kollegal Road, Mysore [12.201 °N, 76.982 °E]	Srivastava (2013)¶
UTTARA KANNADA district	
60. Hosur, Siddapur [14.295 °N, 74.853 °E]	Srivastava (2013)#, Pati & Sharma (2014)
MAHARASHTRA state	
KOLHAPUR district	
61. Nadi Kinara, Vannur [16.546 °N, 74.243 °E]	Pati & Sharma (2014)
NANDED district	
62. Kabarali village [19.153 °N, 77.306 °E]	Pati & Sharma (2014)
SANGLI district	
63. Mhaisal, 15 km from Miraj [16.752 °N, 74.704 °E]	Pati & Sharma (2014)
SOLAPUR district	
64. Banegaon, near Nannaj (= Great Indian Bustard Sanctuary) [17.777 °N, 75.882 °E]	Pati & Sharma (2012b), Pati & Sharma (2014)
65. Nagamma Tank, on Vizapur Road [17.460 °N, 75.851 °E]	Pati & Sharma (2014)
66. Pimpaldara Nalla, near Padasali-Madha [18.030 °N, 75.508 °E]	Pati & Sharma (2014)
67. Sind River, near Sindkhed [17.501 °N, 75.930 °E]	Pati & Sharma (2014)

* The occurrence of the species in Kerala is doubtful since Kottayam is far away from the type locality (Velanthangal of Villupuram district, Tamil Nadu).

† Except for *O. ganjamensis*, no other species of *Oziotelphusa* is found in the Ganjam district (Pati, unpublished data).

‡ Alcock (1910) reported *Paratelphusa* (*Oziotelphusa*) *hydrodromus* Herbst from Sara (= Sur) Lake of Orissa. His specimens (16♂♂ and 11♀♀, ZSIK 5716/10) were examined and found to be conspecific with *O. ganjamensis*.

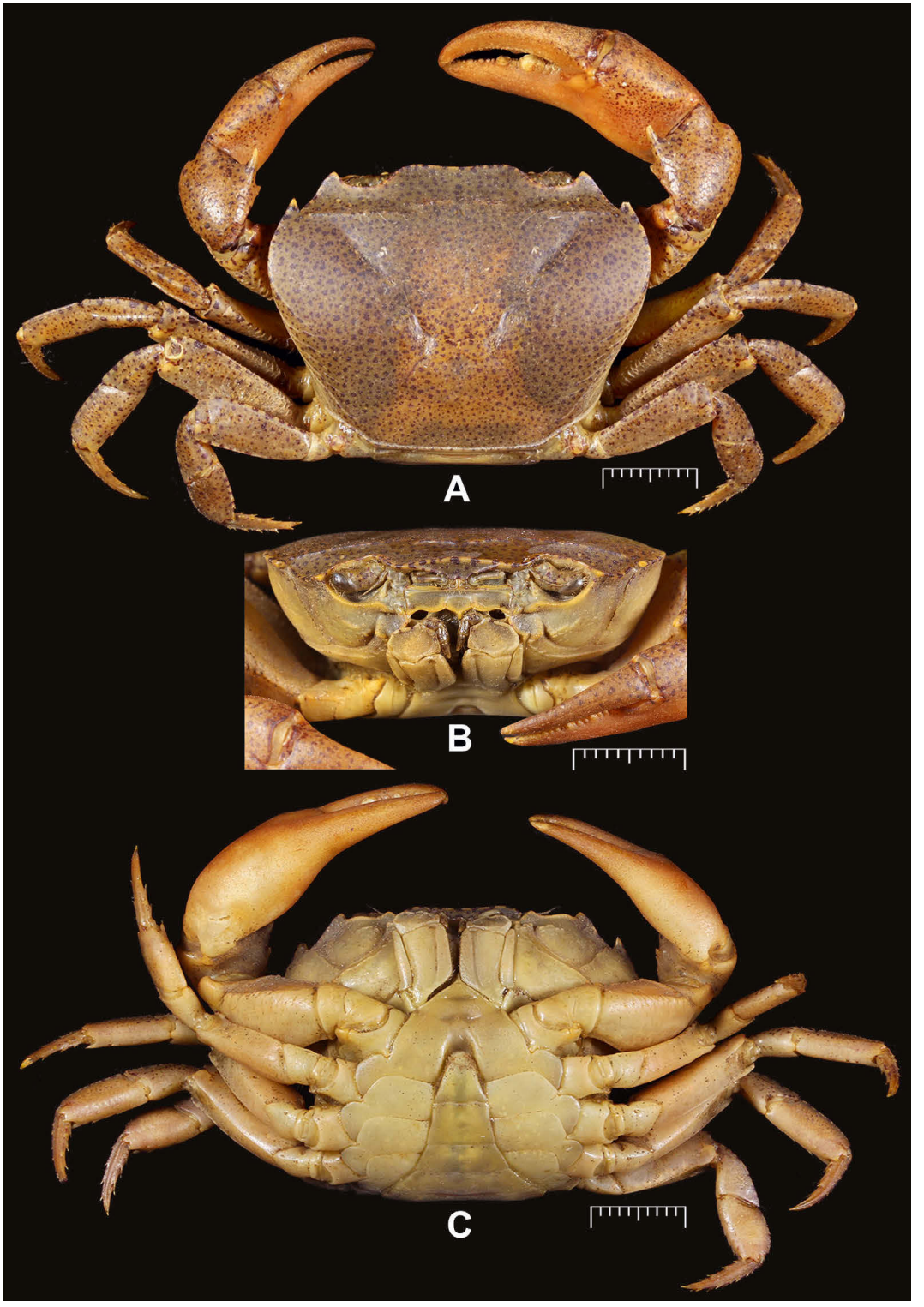
§ "Wagra-Karow" was misspelt by Rathbun (1904). Vajrakarur is the only city next to Bellari with similar phonetics, but it is in Anantapur district of Andhra Pradesh. In fact, Vajrakarur is more than 300 km away from Mysore.

¶ Species reported by Srivastava (2007, 2013) is doubtful because all the specimens from this region were turned out to be *O. wagrakarowensis* (see Pati & Sharma 2014).

Specimens examined by Srivastava (2013) were assigned to *O. wagrakarowensis* by Pati & Sharma (2014).

☼ Bahir & Yeo (2005) had mistaken a male specimen from Hunsur of Mysore district as topotype. The type locality is approximately 350 km away from Hunsur. Rathbun (1904) had mentioned that the type locality was just north of Mysore. This could be the reason for confusion.

Fig. 2. *Oziotelphusa naga* sp. nov., holotype male (37.79 × 28.33 mm) (ZSI-WRC C.1709). **A.** Dorsal view. **B.** Frontal view. **C.** Ventral view. Scale bars: 10 mm. ▷


A
B
C

Chelipeds smooth, asymmetrical, right chela larger (Fig. 2A,C). Major cheliped with 2 or 3 large, blunt teeth on each finger, distinct gape when fingertips in contact; dactylus curved, equal in length to palm, smooth; palm longer than high, inner and outer surfaces smooth; carpus slightly rugose on outer surface, inner distal major tooth prominent, long, slender, sharp, subbasal granule distinct, slightly sharp; merus slightly rugose on outer surface (Fig. 2A).

Ambulatory legs stout, shorter than chelipeds, p3 longest, p5 shortest; merus (p2–p5) slightly rugose, lacking subdistal spine; propodus (p3) 2 times as long as broad; dactylus (p2–p5) equal in length to propodus, with short, sharp chitinous spines on lateral margins (Fig. 2A,C).

Thoracic sternites smooth, glabrous; suture between thoracic sternites s2/s3, s3/s4 distinct as deep, broad groove, not reaching lateral margins; suture between thoracic sternites s4/s5, s5/s6, s6/s7 shallow, narrow, medially interrupted; suture between thoracic sternites s7/s8 very shallow, narrow, complete (Figs 2C, 3D). Pleonal locking mechanism on submedian part of thoracic sternite 5 with low tubercle.

Sternopleonal cavity deep, long, reaching imaginary line joining submedian part of cheliped coxae (Fig. 2C). Pleon almost T-shaped, lateral margins distinctly concave; pleonal somites 1, 2 rectangular; pleonal somite 3 trapezoidal, with strongly convex lateral margins; pleonal somites 4, 5 trapezoidal, with straight lateral margins; pleonal somite 6 narrowly trapezoidal, broader than long, distinctly longer than preceding somites, as long as telson, with gently concave lateral margins; telson broad, proximal width ca. 1.1 times median length, with almost straight lateral margins, apex round (Figs 2C, 3E).

G1 moderately stout, bent outwards at juncture between terminal and subterminal segments; terminal and subterminal segments clearly demarcated by distinct membranous suture; terminal segment stout, horn-like, distinctly sinuous, long, ca. 0.4 times length of subterminal segment, entirely bent, directed laterally outwards, proximal half distinctly stout and dilated, distal half gradually narrow, tip truncate; subterminal segment moderately stout, distinctly broad basally, distal half distinctly narrow than proximal half, outer and inner margins concave (Fig. 3F–H). G2 long, ca. 1.3 times length of G1; distal segment long, ca. 0.5 times length of basal segment (Fig. 3I).

Live colour. The dorsal surface of the carapace is brown with numerous deep purple spots. The ventral surface of the carapace is yellow in males and light brown in females. Pereiopods are brown with numerous deep purple spots dorsally and light brown ventrally. The live colour and spotting patterns of the new species is similar to *O. minneriyaensis* from Sri Lanka (see Ng & Tay 2001).

Paratypes. The male paratypes are similar to the holotype in carapace morphology and gonopod structures except for the following differences: the suture between thoracic sternites s3/s4 of the smallest male paratype (ZSI-WRC C.1713) is visible as two moderately deep submedian depressions (vs. distinct as deep, broad, continuous groove, not reaching lateral margins); the G2 in all the male paratypes (ZSI-WRC C.1711–1713) is comparatively short, ca. 1.2 × length of the G1 (vs. comparatively long, ca. 1.3 × length of G1); the G2 distal segment of the smallest male paratype (ZSI-WRC C.1713) is relatively short, ca. 0.4 × length of the basal segment (vs. relatively long, ca. 0.5 × length of the basal segment).

The female paratypes resemble the holotype in most of the non-sexual characters except for the following differences: the carapace of the large female paratypes (ZSI-WRC C.1710, 1711) is deeper, ch/cl = 0.7 (vs. less deep, ch/cl = 0.6); the chelipeds of all the female paratypes (ZSI-WRC C.1710–1713) are symmetrical (vs. asymmetrical). Their pleon is ovate, almost covering the thoracic sternites when closed; the pleonal somite 1 is short; the pleonal somites 2–5 are progressively longer; the pleonal somite 6 is longest, much broader than long, longer than telson, with slightly convex lateral margins; the telson is broadly triangular, much broader than long, with straight lateral margins (Fig. 4B). The vulvae on the thoracic sternite 6 are oblong-ovate, large, occupying nearly half the length of the thoracic sternite 6, situated adjacent to the margin with the thoracic sternite 5, surrounded by a raised rim, and completely covered by a membranous operculum (Fig. 4C).

Etymology. The species name 'Naga' is derived from the Sanskrit for cobra, referring to the distinctly sinuous G1 terminal segment of the crab among the Indian congeners. Coincidentally, the new species was collected near Nagercoil, a town name originated from the Nagaraja (meaning King of Serpents) temple. Used as a noun in apposition.

Type locality. Nagercoil, Kanyakumari district, Tamil Nadu, India (8.169 °N, 77.452 °E; 9 m above sea level).

Remarks. Among the species of *Oziotelphusa*, *O. naga* sp. nov. mostly resembles *O. minneriyaensis* due to the similarity in the structure of the male gonopods. Both the species possess a stout, horn-like, distinctly sinuous, long G1 terminal segment (ca. 0.4 × length of the subterminal segment), a moderately stout G1 subterminal segment, and a long G2 distal segment (ca. 0.4–0.5 × length of the basal segment) (Fig. 3F–I; see

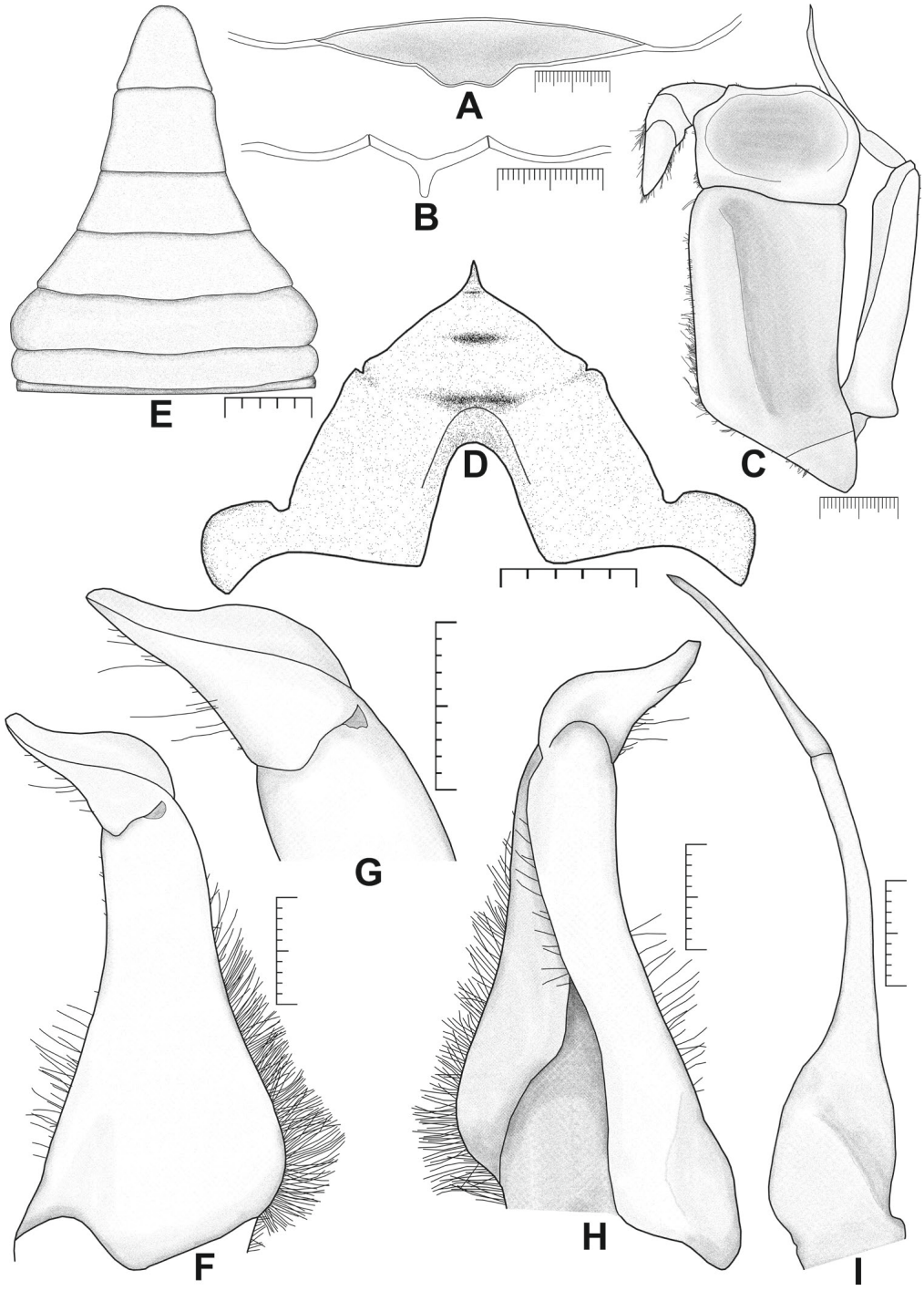
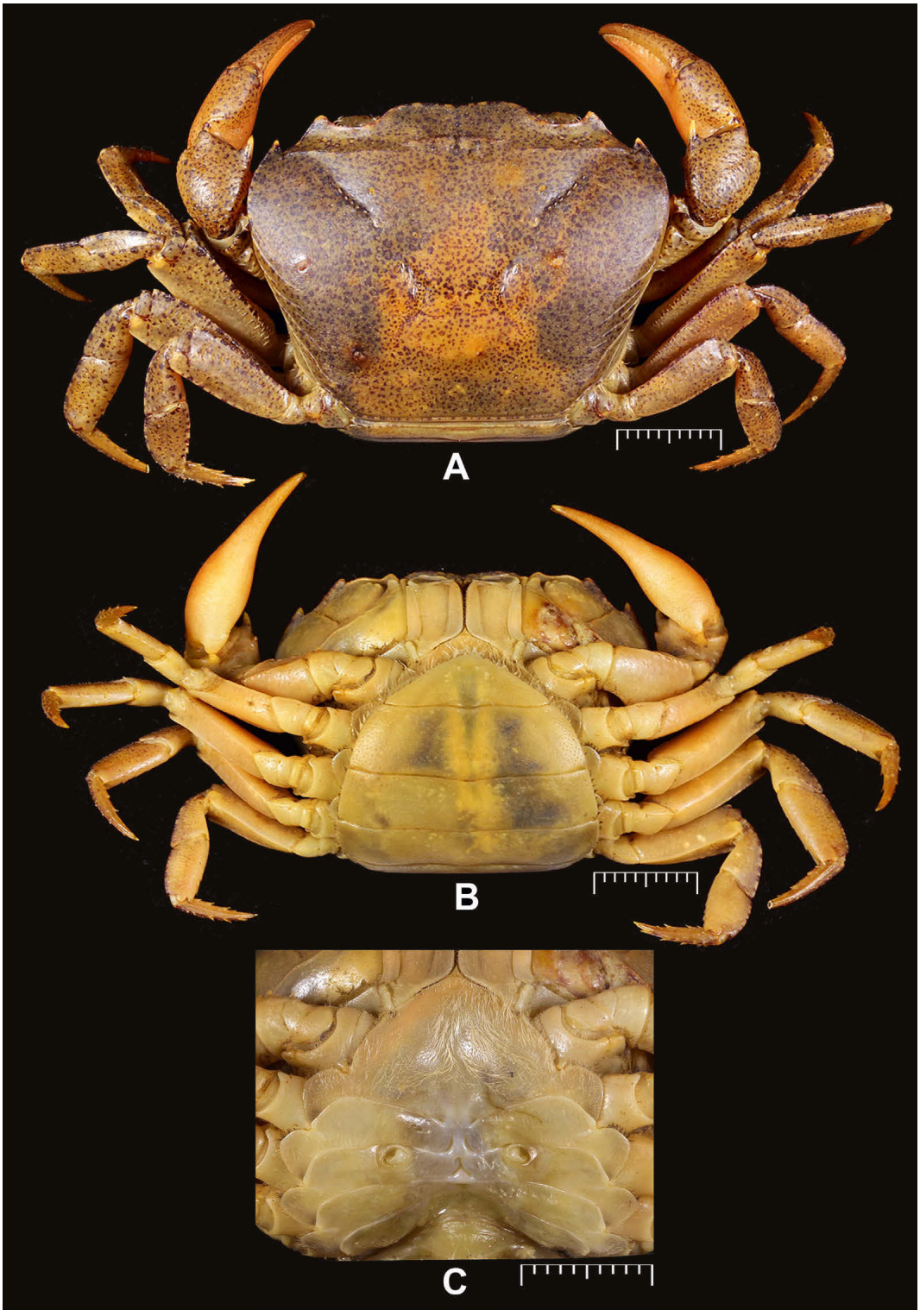


Fig. 3. *Oziotelphusa naga* sp. nov., holotype male (37.79 × 28.33 mm) (ZSI-WRC C.1709). **A.** Frontal median triangle. **B.** Epistomal median lobe. **C.** Left third maxilliped. **D.** Anterior thoracic sternites (s1–s4). **E.** Pleon. **F.** Dorsal view of left G1. **G.** Dorsal view of terminal segment of left G1. **H.** Ventral view of left G1. **I.** Left G2. Scale bars: A–C, 2 mm; D, E, 5 mm; F–I, 1 mm.


A
B
C

Fernando 1960: fig. 13I,J; Bott 1970b: fig. 3A–C, pl. 6, fig. 13A,B; Bahir & Yeo 2005: figs 23C–G, 24C,D,F–J, 25C,E). The G2 is nevertheless distinctly longer than the G1 in *O. naga* sp. nov. (Fig. 3F,I) whereas the G2 is equally long as the G1 in *O. minneriyaensis* (see Fernando 1960: fig. 13I,J; Bahir & Yeo 2005: fig. 24C,H) (Table 2). Although many features of the carapace are common to both species, the less convex dorsal surface of the carapace and the relatively more narrow frontal median triangle (Figs 2B, 3A) of *O. naga* sp. nov. readily distinguish it from *O. minneriyaensis* which possesses a more convex dorsal surface of the carapace and a relatively more broad frontal median triangle (see Bahir & Yeo 2005: fig. 26B) (Table 2).

Oziotelphusa naga sp. nov. is unique among the Indian congeners due to its stout, distinctly sinuous G1 terminal segment (Fig. 3F–H) (vs. relatively slender, almost straight to curved to varying degrees, never S-shaped in congeners; see Bahir & Yeo 2005: figs 7B, 8C–E, 10A–C, 12B–D, 13C–F, 16A–E, 30C–H, 31C–H, 39B–D; Pati & Sharma 2012a: fig. 3A–C; Raj et al. 2017: figs 4A–E, 9B).

Some Sri Lankan species (*O. ceylonensis*, *O. gallicola*, *O. intuta*, *O. kodagoda*, *O. minneriyaensis*, and *O. ritigala*) also possess a sinuous G1 terminal segment. Together with *O. intuta*, *O. minneriyaensis*, and *O. ritigala*, *O. naga* sp. nov. can be distinguished from *O. ceylonensis*, *O. gallicola*, and *O. kodagoda* by the relatively T-shaped male pleon with strongly concave lateral margins (Fig. 3E; see Bott 1970b: pl. 3, fig. 6B; Bahir & Yeo 2005: figs 23B, 24B, 25B, 36C, 37B, 44C) (vs. relatively triangular male pleon with relatively less concave lateral margins; see Bahir & Yeo 2005: figs 18C, 20B, 21B, 34C, 35B, 40B, 41C) and the distinctly sinuous G1 terminal segment (Fig. 3F–H; see Bott 1970b: fig. 3A–C, pl. 6, fig. 13A,B; Bahir & Yeo 2005: figs 23C–G, 24C,D,F,G,I,J, 25C,E, 37D,E,G,H,J, 44D–G, 46A,B,D,E,G,H) (vs. gently sinuous G1 terminal segment; see Bahir & Yeo 2005: figs 18D–F, 19A–H, 20C,D, 21C,D, 35C,D,F,G,I,J, 40D,E,G). In addition to the T-shaped male pleon and the distinctly sinuous G1 terminal segment, *O. naga* sp. nov. is similar to *O. intuta*, *O. minneriyaensis*, and *O. ritigala* in the following suite of characters: epistomal median lobe with distinct tooth (Figs 2B, 3B; see Bahir & Yeo 2005: figs 26B, 36B, 45B); G1 terminal segment entirely bent and directed laterally outwards, with stout proximal half (Fig. 3F–H; see Bott 1970b: fig. 3A–C, pl. 6, fig. 13A,B; Bahir & Yeo 2005: figs 23C–G, 24C,D,F,G,I,J, 25C,E, 37D,E,G,H,J, 44D–G, 46A,B,D,E,G,H).

◁ **Fig. 4.** *Oziotelphusa naga* sp. nov., paratype female (38.39 × 28.85 mm) (ZSI-WRC C.1710). **A.** Dorsal view. **B.** Ventral view. **C.** Thoracic sternites showing vulvae. Scale bars: 10 mm.

All four species (*O. intuta*, *O. minneriyaensis*, *O. naga* sp. nov., and *O. ritigala*), however, can be separated from each other by the following characters: convexity of the carapace dorsal surface [moderately convex in *O. naga* sp. nov. and *O. ritigala* vs. strongly convex in *O. intuta* and *O. minneriyaensis*]; relative broadness of the frontal median triangle [not as broad as the frontal margin in *O. naga* sp. nov., *O. intuta*, and *O. ritigala* vs. almost as broad as the frontal margin in *O. minneriyaensis*]; structure of the suture between thoracic sternites s2/s3 [distinct as deep groove in *O. naga* sp. nov. and *O. minneriyaensis* vs. visible as shallow groove in *O. intuta* and *O. ritigala*]; length of the sixth male pleonal somite [as long as telson in *O. naga* sp. nov., *O. minneriyaensis*, and *O. ritigala* vs. slightly longer than telson in *O. intuta*]; broadness of the male telson [relatively broad, proximal width ca. 1.1–1.2 × median length in *O. naga* sp. nov., *O. minneriyaensis*, and *O. ritigala* vs. relatively narrow, proximal width ca. 1.0 × median length in *O. intuta*]; appearance of the G1 subterminal segment [moderately to distinctly stout in *O. naga* sp. nov., *O. intuta*, and O. *minneriyaensis* vs. slender in *O. ritigala*]; relative length of the G2 [relatively long, ca. 1.2–1.4 × G1 length in *O. naga* sp. nov., *O. intuta*, and *O. ritigala* vs. relatively short, ca. 1.0 × G1 length in *O. minneriyaensis*] (Table 2).

All the genera and species of freshwater crabs in Sri Lanka are endemic except for the lowland genera *Oziotelphusa* and *Spiralothelphusa* Bott, 1968 (Bahir et al. 2005). Previously, two Indian species of *Oziotelphusa* (*O. aurantia* and *O. bouvieri*) were reported from Sri Lanka by Müller (1887), Doflein (1900), Balss (1914), Roux (1915), and Fernando (1960). All the previous records from Sri Lanka were reviewed by Ng & Tay (2001) and Bahir & Yeo (2005). Their study revealed that the past records are either doubtful or a clear case of misidentification. No Indian species of *Oziotelphusa* is therefore known from Sri Lanka. In fact, all the Sri Lankan species of *Oziotelphusa* are endemic (see Ng & Tay 2001, Bahir & Yeo 2005). Bossuyt et al. (2004) also inferred that Sri Lanka maintained its native fauna largely distinct from the Indian mainland, which was intermittently connected over the past 500 000 years.

The Indian species, *O. naga* sp. nov. is rather close to the Sri Lankan species, *O. minneriyaensis* on the basis of morphology, and both may be sister species. As regards to the G1 structure, the new species has no affinity with the Indian congeners, especially *O. ravi*, which was recently described from the same geographical area i.e. Nagercoil. In these situations, several assumptions can be made on their speciation. Geographic isolation is least expected in the species of *Oziotelphusa* since the Indian mainland was intermittently connected to Sri Lanka

(see Bossuyt et al. 2004). Differences in habitat preference are unlikely in *Oziotelphusa* species as most of them prefer slow-flowing or stagnant water habitats such as rice fields, ponds, marshes, etc. (see Bahir & Yeo 2005, Raj et al. 2017). Since variation in carapace morphology is less among the congeners (Bahir & Yeo 2005), speciation could be occurred due to the differences in compatibility between the male and female copulatory organs. This is especially apparent from the distinct structure of the male gonopods of each species. A molecular study, therefore, should be done on the genus to test Bossuyt et al. (2004), which could be interesting from the zoogeographical point of view.

Ecological notes. *Oziotelphusa naga* sp. nov. dwells inside the burrows along rice field embankments. Crabs are very common during monsoon season (June to August) and between February and May when the paddy fields get flooded with rain or irrigated water.

Geographical distribution. *Oziotelphusa naga* sp. nov. is known only from the type locality, Nagercoil of Kanyakumari district in Tamil Nadu, India.

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Table 2. Character matrix for the separation of *Oziotelphusa* species with T-shaped male pleon and distinctly sinuous G1 terminal segment.

Characters	*O. naga* sp. nov.	*O. minneriyaensis*	*O. ritigala*	*O. intuta*
Carapace dorsal surface	moderately convex (Fig. 2B)	strongly convex (see Bahir & Yeo 2005: fig. 26B)	moderately convex (see Bahir & Yeo 2005: fig. 45B)	strongly convex (see Bahir & Yeo 2005: fig. 36B)
Frontal median triangle	not as broad as frontal margin (Figs 2B, 3A)	almost as broad as frontal margin (see Bahir & Yeo 2005: fig. 26B)	not as broad as frontal margin (see Bahir & Yeo 2005: figs 44B, 45B)	not as broad as frontal margin (see Bahir & Yeo 2005: figs 36B, 37C)
Suture between thoracic sternites s2/s3	distinct, deep (Figs 2C, 3D)	distinct, deep (see Bahir & Yeo 2005: figs 23A, 24A, 25A, 26C)	visible as shallow groove	visible as shallow groove (see Bahir & Yeo 2005: figs 36C, 37A)
Sixth male pleonal somite	as long as telson (Figs 2C, 3E)	as long as telson (see Bahir & Yeo 2005: figs 23B, 24B, 25B, 26C)	as long as telson (see Bahir & Yeo 2005: fig. 44C)	slightly longer than telson (see Bahir & Yeo 2005: figs 36C, 37B)
Male telson	relatively broad, proximal width ca. 1.1 × median length (Figs 2C, 3E)	relatively broad, proximal width ca. 1.1 × median length (see Bahir & Yeo 2005: figs 23B, 24B, 25B, 26C)	relatively broad, proximal width ca. 1.2 × median length (see Bahir & Yeo 2005: fig. 44C)	relatively narrow, proximal width ca. 1.0 × median length (see Bahir & Yeo 2005: figs 36C, 37B)
G1 subterminal segment	moderately stout (Fig. 3F)	moderately stout (see Bahir & Yeo 2005: figs 23C,G, 24C,I, 25C)	slender (see Bahir & Yeo 2005: figs 44D, 46A,G)	distinctly stout (see Bahir & Yeo 2005: fig. 37D,J)
G2	relatively long, ca. 1.2–1.3 × length of G1 (Fig. 3I)	relatively short, ca. 1.0 × length of G1 (see Bahir & Yeo 2005: fig. 24C,H)	relatively long, ca. 1.3 × length of G1 (see Bahir & Yeo 2005: figs 44D,H, 46A,F)	relatively long, ca. 1.4 × length of G1 (see Bahir & Yeo 2005: fig. 37D,I)

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