

FRESHWATER CRABS (CRUSTACEA: DECAPODA: BRACHYURA: GECARCINUCIDAE) IN THE COLLECTION OF WESTERN GHAT REGIONAL CENTRE, ZOOLOGICAL SURVEY OF INDIA, KOZHIKODE

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INTRODUCTION

Freshwater crabs of India have been poorly studied (Cumberlidge *et al.*, 2009) among the crustaceans even though 94 species have already been reported from the country (S.K. Pati, unpublished data). Systematic contributions on the group in India were mainly that of Alcock (1910), Bott (1970a) and Bahir & Yeo (2005 and 2007). Many reports (Alcock, 1910; Chhapgar, 1956; Bott, 1970a; Srivastava, 2005; Bahir & Yeo, 2007; Ghatak & Ghosh, 2008; Pati & Sharma,

2011, 2013, 2014a and Klaus *et al.*, 2014) on the freshwater crabs of Western Ghats are also available. Recently, some new taxa have been described from the Western Ghats (Pati & Sharma, 2013, 2014a; Klaus *et al.*, 2014) besides a recent report on the specimens in the National Zoological Collections of Western Regional Centre, Zoological Survey of India, Pune (Pati & Sharma, 2014b). Nevertheless, knowledge on diversity and distribution of freshwater crabs in the Western Ghats is limited due to poor sampling efforts and inaccessibility to remote localities in general

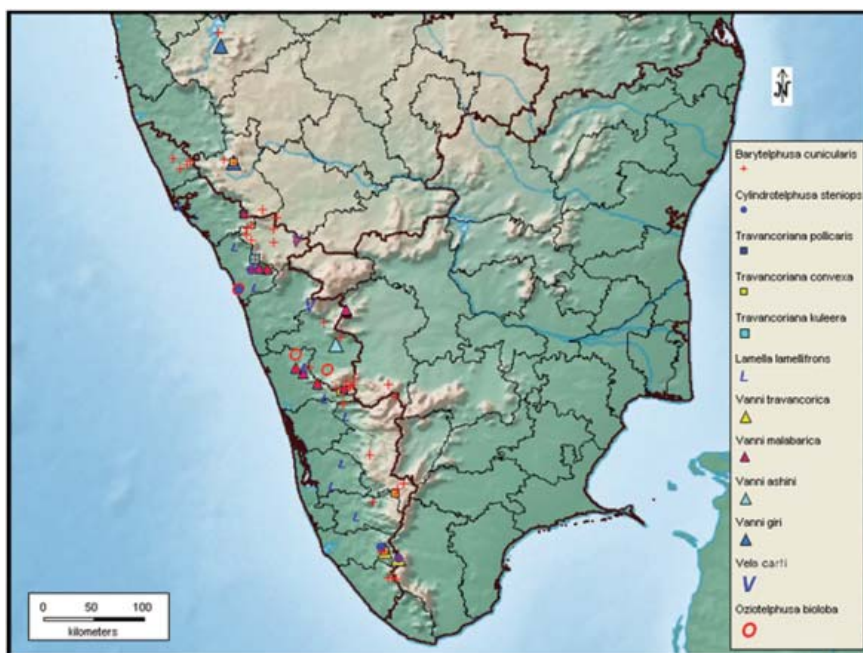


Fig. 1. Map showing distribution of freshwater crabs studied in the collection of WGRC, ZSI, Kozhikode.

and unstudied museum specimens in particular. Hence, priority was given to study systematically the unidentified freshwater crabs of the National Zoological Collections (NZC) of Western Ghat Regional Centre (WGRC), Zoological Survey of India (ZSI), Kozhikode.

MATERIAL AND METHODS

The holdings of NZC, WGRC, Kozhikode contained about 194 freshwater crab specimens collected mainly from Western Ghats (in the southern states of Karnataka, Kerala and Tamil Nadu) over a period of 33 years from 1981 to 2013. Freshwater crab specimens were identified using both morphological and male gonopod structures following Alcock (1910), Bott (1970a) and Bahir & Yeo (2005 & 2007). Methods of measurement and terminology were adopted from Ng & Tay (2001) and Bahir & Yeo (2007).

The following abbreviations are used: Coll.: Collector; dist.: district; IUCN: International Union for Conservation of Nature; NZC: National Zoological Collections; R.F.: Reserve Forest; T.R.: Tiger Reserve; W.L.S.: Wildlife Sanctuary; WGRC: Western Ghat Regional Centre; ZSI: Zoological Survey of India; G1: male first pleopod; G2: male second pleopod.

RESULTS

From collections of WGRC, ZSI, Kozhikode, 12 species of freshwater crabs under 7 genera of the family Gecarcinucidae were identified. All the species except *Vanni giri* Bahir & Yeo, 2007 from Kerala, 3 species from Karnataka and 1 species from Tamil Nadu were collected (Table-1). Distribution of all the identified species is presented (Fig.-1).

Table-1. District-wise distribution of freshwater crabs studied from the collection of WGRC, ZSI, Kozhikode

State	District	Species												Specimens studied
		1	2	3	4	5	6	7	8	9	10	11	12	
Karnataka	Chikkamagaluru	+	-	-	-	-	-	-	-	-	+	-	-	3
	Kodagu	+	-	-	+	-	-	-	-	-	+	-	-	13
Kerala	Ernakulam	+	-	-	-	-	+	-	-	-	-	-	-	4
	Idukki	+	-	-	+	-	-	-	-	-	-	-	-	12
	Kannur	+	-	+	-	-	+	-	-	-	-	-	-	18
	Kasaragod	+	-	-	-	-	-	-	-	-	-	-	-	10
	Kollam	+	+	-	+	-	-	+	-	-	-	-	-	11
	Kottayam	-	-	-	-	-	+	-	-	-	-	-	-	2
	Kozhikode	+	+	-	-	+	+	-	+	-	-	+	+	20
	Palakkad	+	-	+	-	-	-	-	+	+	-	+	-	46
	Pathanamthitta	+	-	-	-	-	+	-	-	-	-	-	-	7
	Thiruvananthapuram	+	-	-	-	-	-	-	-	-	-	-	-	4
Tamil Nadu	Thrissur	+	-	-	+	-	+	-	+	-	-	-	+	24
	Wayanad	+	-	-	-	-	-	-	-	-	-	+	-	19
	Coimbatore	+	-	-	-	-	-	-	-	-	-	-	-	1
Specimens studied		118	4	4	11	2	16	2	18	6	3	3	7	194

Species-1: *Barytelphusa cunicularis* (Westwood, 1836); 2: *Cylindrotelphusa steniops* (Alcock, 1909); 3: *Travancoriana pollicaris* (Alcock, 1909); 4: *Travancoriana convexa* (Roux, 1931); 5: *Travancoriana kuleera* Bahir & Yeo, 2007; 6: *Lamella lamellifrons* (Alcock, 1909); 7: *Vanni travancorica* (Henderson, 1913); 8: *Vanni malabarica* (Henderson, 1912); 9: *Vanni ashini* Bahir & Yeo, 2007; 10: *Vanni giri* Bahir & Yeo, 2007; 11: *Vela carli* (Roux, 1931); 12: *Oziotelphusa biloba* Bahir & Yeo, 2005

SYSTEMATIC LIST

- Phylum ARTHROPODA Latreille, 1829
 Subphylum CRUSTACEA Brünnich, 1772
 Class MALACOSTRACA Latreille, 1802
 Subclass EUMALACOSTRACA Grobben, 1892
 Superorder EUCARIDA Calman, 1904
 Order DECAPODA Latreille, 1803
 Suborder PLEOCYEMATA Burkenroad, 1963
 Infraorder BRACHYURA Linnaeus, 1758
 Section EUBRACHYURA de Saint Laurent, 1980
 Subsection HETEROTREMATA Guinot, 1977
 Superfamily GECARCINUCOIDEA Rathbun, 1904
 Family GECARCINUCIDAE Rathbun, 1904
1. *Barytelphusa cunicularis* (Westwood, 1836)
 2. *Cylindrotelphusa steniops* (Alcock, 1909)
 3. *Travancoriana pollicaris* (Alcock, 1909)
 4. *Travancoriana convexa* (Roux, 1931)
 5. *Travancoriana kuleera* Bahir & Yeo, 2007
 6. *Lamella lamellifrons* (Alcock, 1909)
 7. *Vanni travancorica* (Henderson, 1913)
 8. *Vanni malabarica* (Henderson, 1912)
 9. *Vanni ashini* Bahir & Yeo, 2007
 10. *Vanni giri* Bahir & Yeo, 2007
 11. *Vela carli* (Roux, 1931)
 12. *Oziotelphusa biloba* Bahir & Yeo, 2005

SYSTEMATIC ACCOUNT

1. *Barytelphusa cunicularis* (Westwood, 1836)
 (Plate-I, Figs. 1–3; Plate-III, Figs. 1–3)
 1836. *Thelphusa cunicularis* Westwood in Sykes & Westwood, *Trans. Ent. Soc. London*, **1**: 183.
 1905. *Potamon (Potamonautes) jacquemonti* Rathbun, *Nouv. Arch. Mus. Hist. nat. Paris*, (4)**7**: 185.
 1910. *Paratelphusa (Barytelphusa) jacquemontii* Alcock, *Cat. Ind. decap. Crust. Coll. Ind. Mus.*, **I**(2): 79.
 1970a. *Barytelphusa (Barytelphusa) cunicularis* Bott, *Abh. senckenb. naturforsch. Ges.*, **526** : 31.

2007. *Barytelphusa cunicularis* Bahir and Yeo, *Raffles B. Zool., Supp. No.* **16** : 312.

Type locality : Western Ghats from latitude 17° to 19° 23' N and longitude from 73° to 75° E (previously in Bombay Presidency), Maharashtra, India.

Material examined: 1 ♀, Annamalai, Yerabtiyar, Coimbatore dist., Tamil Nadu, 20. 12. 1983, Coll. G.U. Kurup & Party, ZSI/WGRC/IR/INV/2749; 1 ♂, Nanjarajapuzha, Coorg, Kodagu dist., Karnataka, 05.01.1985, Coll. K.N. Nair & Party, ZSI/WGRC/IR/INV/2732; 2 ♀, Nagarhole River, Kodagu dist., Karnataka, 16. 01. 1985, Coll. K.N. Nair & Party, ZSI/WGRC/IR/INV/2758; 1 ♀, Kakktha holi, Kodagu dist., Karnataka, 28. 01. 1985, Coll. K.N. Nair & Party, ZSI/WGRC/IR/INV/2748; 1 ♂ & 1 ♀, Vaniyampara, Vellani, Thrissur dist., Kerala, 14.03.1992, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2695; 2 ♀, Meenmutty, Kattilappara, Kulathupuzha, Kollam dist., Kerala, 22.03.1992, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2705; 1 ♂, Bonacaud, Thiruvananthapuram dist., Kerala, 26.03.1992, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2677; 1 ♀, Bonacaud, Thiruvananthapuram dist., Kerala, 26.03.1992, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2679; 1 ♀, Parappa-Santhimala, Kasaragod dist., Kerala, 24.09. 1993, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2739; 2 ♀, Maruthom, Kasaragod dist., Kerala, 26.10.1993, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2752; 1 ♂, Coorg & Wayanad, Kodagu dist., Karnataka, 04. 03. 1994, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2758; 1 ♂, Kalligola, Kodagu dist., Karnataka, 04. 03. 1994, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2744; 2 ♂ & 1 ♀, Devarakolley, Kodagu dist., Karnataka, 05.03.1994, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2738; 3 ♂ & 2 ♀, Kavadikanam, Samakochi & Bandarkozhi-Payradukka, Kasaragod dist., Kerala, 20. 03. 1994, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2681; 1 ♂, Periya Choppera, Wayanad dist., Kerala, 14.08.1994, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2727; 1 ♂, Periya Peats,

- Wayanad dist., Kerala, 15.08.1994, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2697; 5 ♂ & 2 ♀, Mokeyamkundu, Wayanad dist., Kerala, 12.11.1994, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2700; 4 ♂ & 1 ♀, Kurichiyat R.F., Wayanad dist., Kerala, 23.12.1994, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2716; 2 ♀, Kurichiyat R.F., Wayanad dist., Kerala, 24.12.1994, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2720; 2 ♂, Kuruva, Wayanad dist., Kerala, 25.12.1994, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2736; 1 ♂ & 1 ♀, Ambayathode, Kannur dist., Kerala, 02.02.1995, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2698; 1 ♂ & 1 ♀, Narikadavu, Aralam W.L.S., Kannur dist., Kerala, 06.04.1995, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2751; 5 ♂ & 6 ♀, Uruppukunnu, Aralam W.L.S., Kannur dist., Kerala, 15.04.1995, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2701; 2 ♂ & 1 ♀, Vellanimala, Thrissur dist., Kerala, 09.10.1995, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2713; 3 ♂ & 2 ♀, Vengoli, Parambikulam W.L.S., Palakkad dist., Kerala, 27.10.1995, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2730; 2 ♂ & 2 ♀, Sarkapathi, Parambikulam W.L.S., Palakkad dist., Kerala, 29.10.1995, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2728; 1 ♂ & 1 ♀, Vattachira, near Thusaragiri, Kozhikode dist., Kerala, 15.02.1996, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2715; 3 ♂, Chimmoni, Thrissur dist., Kerala, 26.02.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2710; 1 ♂, Orukomban, Parambikulam, Palakkad dist., Kerala, 15.03.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2699; 1 ♀, Karimala, Parambikulam W.L.S., Palakkad dist., Kerala, 18.03.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2735; 1 ♂ & 3 ♀, Tunnel Entry Road, Parambikulam W.L.S., Palakkad dist., Kerala, 21.03.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2678; 1 ♀, Meenmutty, Kozhikode dist., Kerala, 05.06.1996, Coll. Ashok Kumar & N.P. Pillai, ZSI/WGRC/IR/INV/2690; 1 ♂ & 1 ♀, Mlappara, Periyar T.R., Idukki dist., Kerala, 04.11.1996, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2674; 1 ♂, Karadikkavala, Periyar T.R., Idukki dist., Kerala, 06.11.1996, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2722; 1 ♀, Mlappara, Periyar T.R., Idukki dist., Kerala, 08.11.1996, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2712; 1 ♂ & 4 ♀, Mullakudi, Periyar T.R., Idukki dist., Kerala, 12.11.1996, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2742; 1 ♂, Vellagi Kamalli, Idukki W.L.S., Idukki dist., Kerala, 14.11.1996, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2688; 1 ♂, Chambakkad, Chinnar W.L.S., Idukki dist., Kerala, 18.11.1996, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2719; 2 ♂ & 2 ♀, Kariyanchola, Parambikulam W.L.S., Palakkad dist., Kerala, 22.01.1997, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2726; 1 ♂ & 4 ♀, Thellickal, Parambikulam W.L.S., Palakkad dist., Kerala, 24.01.1997, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2731; 1 ♂, Angamoozhy, Pathanamthitta dist., Kerala, 20.02.1997, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2692; 1 ♂, Tunnel Entry, Parambikulam W.L.S., Palakkad dist., Kerala, 23.03.1997, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2687; 1 ♂, Kottayali, Parambikulam, Palakkad dist., Kerala, 28.03.1997, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2680; 1 ♂, Choodal, Shendurney W.L.S., Kollam dist., Kerala, 07.08.1997, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2682; 1 ♀, Kattilappara, Shendurney W.L.S., Kollam dist., Kerala, 12.08.1997, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2709; 1 ♂ & 1 ♀, Peruthady, Ranipuram, Kasaragod dist., Kerala, 18.05.1998, Coll. M. Madhavan, ZSI/WGRC/IR/INV/2676; 1 ♂, Myladipuzha (Malampuzha), Palakkad dist., Kerala, 17.03.1999, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2684; 1 ♂, Kanjirapuzha, Palakkad dist., Kerala, 22.03.1999, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2686; 1 ♂ & 1 ♀, Idamalayi/Kapayem, Ernakulam dist., Kerala, 19.11.1999, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2673; 1 ♂, Vithura-Chathancode, Thiruvananthapuram dist., Kerala, 18.03.2001, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2729; 1 ♂ & 1 ♀, Thechi, Kinaloor Estate, Kozhikode dist., Kerala, 30.05.2002, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2717; 1 ♂, Bhadra

Dam Site, Lakka Valley Range, Bhadra W.L.S., Chikkamagaluru dist., Karnataka, 07.11.2006, Coll. K.G. Emiliyamma, ZSI/WGRC/IR/INV/2724; 1 ♀, Pandipath, Thiruvananthapuram dist., Kerala, 14. 10. 2012, Coll. K.G. Emiliyamma, ZSI/WGRC/IR/INV/2937 and 1 ♀, Kakkayem, Ambalapara, Malabar W.L.S., Kozhikode dist., Kerala, 29.05.2013, Coll. K.G. Emiliyamma, ZSI/WGRC/IR/INV/2934.

Diagnosis: Carapace broader than long, slightly convex anteriorly and gradually sloped posteriorly; epigastric cristae well developed, slightly anterior to and confluent with postorbital cristae; *postorbital cristae well developed, forms a gentle concave ridge in dorsal view, separated from epibranchial tooth by cervical groove; external orbital angle triangular, with outer margin 2.5 times length of inner margin; epibranchial tooth distinct, blunt, in level with postorbital cristae; epistomal median lobe without median tooth.* Exopod of third maxilliped with long flagellum. Suture between thoracic sternites 2, 3 distinct; between 3, 4 visible as shallow grooves on sides only. Male abdomen narrowly triangular; sixth male abdominal somite broader than long, nearly equal in length to telson, with concave lateral margins; telson tongue shaped. *G1 long, narrow, curving slightly outwards; terminal article long (0.6 to 0.65 times length of subterminal segment), tip pointed. G2 short; distal article short (0.2 times length of basal segment).*

Distribution: Distributed throughout India from Himachal Pradesh in north to Kerala in south except north-east India.

IUCN status: Least Concern (Cumberlidge, 2008a).

2. *Cylindrotelphusa steniops* (Alcock, 1909)

(Plate-I, Figs. 4–6; Plate-III, Figs. 4–6)

1909a. *Gecarcinucus (Cylindrotelphusa) steniops* Alcock, *Rec. Indian Mus.*, **3**(4): 380.

1910. *Gecarcinucus (Cylindrotelphusa) steniops* Alcock, *Cat. Ind. decap. Crust. Coll. Ind. Mus.*, **I**(2) : 125.

1970a. *Cylindrotelphusa steniops* Bott, *Abh. senckenb. naturforsch. Ges.*, **526**: 28.

2007. *Cylindrotelphusa steniops* Bahir and Yeo, *Raffles B. Zool., Supp. No.* **16**: 315.

Type locality: Shathancotta (presently Sasthamkotta) near Quilon (presently Kollam), Kollam district, Kerala, India.

Material examined: 1 ♂, Eranhipalam, Kozhikode dist., Kerala, 11. 01. 1982, Coll. K.N. Nair, ZSI/WGRC/IR/INV/2704; 1 ♂, Choodal, Shendurney W.L.S., Kollam dist., Kerala, 07. 08. 1997, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2683; 1 ♀, Thechi, Kinaloor Estate, Kozhikode dist., Kerala, 30. 05. 2002, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2718 and 1 ♀, Thenmala I.B. area, Kollam dist., Kerala, 18. 10. 2012, Coll. K.G. Emiliyamma, ZSI/WGRC/IR/INV/2932.

Diagnosis: Carapace deep, *dorsal surface highly convex;* postorbital cristae well developed; *anterolateral margin of carapace with distinct serrations;* external orbital angle small, acutely triangular, with outer margin nearly same length as inner margin; epibranchial tooth blunt and less distinct; epistomal median lobe with acute median tooth. Exopod of third maxilliped with long flagellum and not reaching proximal one-third of merus. Suture between thoracic sternites 2, 3 visible as shallow depression; between 3, 4 visible as shallow grooves on sides only. Male abdomen narrowly triangular; sixth male abdominal somite broad, squarish; telson narrowly triangular, longer than sixth abdominal somite, with concave outer margin. *G1 long, narrow; terminal article long (0.55 times length of subterminal segment), sickle-shaped, tip pointed. G2 short; distal article short (0.2 times length of basal segment).*

Distribution: Kerala (Kollam, Kozhikode, Idukki, Thiruvananthapuram and Thrissur) and Tamil Nadu (Nilgiris).

IUCN status: Least Concern (Cumberlidge, 2008b).

3. *Travancoriana pollicaris* (Alcock, 1909)

(Plate-I, Figs. 7–9)

1909a. *Paratelphusa (Barytelphusa) pollicaris* Alcock, *Rec. Indian Mus.*, **3**(4): 377.

1910. *Paratelphusa (Barytelphusa) pollicaris* Alcock, *Cat. Ind. decap. Crust. Coll. Ind. Mus.*, **1**(2): 89.
1931. *Paratelphusa (Barytelphusa) pollicaris* Roux, *Rev. Suisse Zool.*, **38**(4): 48.
- 1970a. *Travancoriana pollicaris* Bott, *Abh. senckenb. naturforsch. Ges.*, **526**: 41.
- 1970b. *Travancoriana pollicaris* Bott, *Rev. Suisse Zool.*, **77**(2): 336.
2007. *Travancoriana pollicaris* Bahir and Yeo, *Raffles B. Zool., Supp. No. 16*: 318.
- 1970a. *Travancoriana pollicaris* Bott, *Abh. senckenb. naturforsch. Ges.*, **526**: 41 (part) (not *Paratelphusa (Barytelphusa) pollicaris* Alcock, 1909).
2007. *Travancoriana convexa* Bahir and Yeo, *Raffles B. Zool., Supp. No. 16*: 321.

Type locality: Tandikudi, Palnis, Dindigul district, Tamil Nadu, India.

Material examined: 1♂ & 2♀, Otekally/S. Coorg, Kodagu dist., Karnataka, 08.03.1994, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2746; 3♀, Sholayar R.F., Thrissur dist., Kerala, 21.02.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2689; 1♀, Sholayar, Thrissur dist., Kerala, 22.02.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2706; 1♀, Mlappara, Periyar T.R., Idukki dist., Kerala, 04.11.1996, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2675 and 1♂ & 2♀, Kattilappara, Shendurney W.L.S., Kollam dist., Kerala, 12.08.1997, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2708.

Type locality: South India, presented by Travancore Museum, India.

Material examined: 2♀, Uruppukunnu, Aralam W.L.S., Kannur dist., Kerala, 15.04.1995, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2702 and 2♂, Karimala, Parambikulam W.L.S., Palakkad dist., Kerala, 18.03.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2734.

Diagnosis: Carapace broader than long, slightly convex in frontal view; epigastric cristae well developed, slightly anterior to and confluent with postorbital cristae; postorbital cristae well developed, reaching rugose epigastric cristae; external orbital angle broadly triangular, with outer margin 5 times length of inner margin; epigastric groove long and bifurcated posteriorly; cervical grooves deep, broad; epibranchial tooth indistinct, in level with postorbital cristae. Exopod of third maxilliped with long flagellum. Suture between thoracic sternites 2, 3 visible as broad groove not reaching lateral margins; between 3, 4 visible on sides only. *Male abdomen acutely triangular*; sixth male abdominal somite broader than long, nearly equal in length to telson. G1 terminal article short (0.3 times length of subterminal segment), *tip distinctly curving outwards*. G2 distal article long (0.5 times length of basal segment).

Distribution: Known only from the type specimens collected from south India.

IUCN status: Data Deficient (Cumberlidge, 2008c).

4. *Travancoriana convexa* (Roux, 1931)

(Plate-I, Figs. 10–12; Plate-III, Figs. 7–9)

1931. *Paratelphusa (Barytelphusa) pollicaris convexa* Roux, *Rev. Suisse Zool.*, **38**(4): 49.

Diagnosis: Carapace broader than long, slightly convex in frontal view; epigastric cristae well developed, slightly anterior to and confluent with postorbital cristae; postorbital cristae and epigastric cristae well developed, confluent; epigastric cristae rugose; external orbital angle broadly triangular, with outer margin 5 times length of inner margin; epigastric groove long and bifurcated posteriorly; cervical grooves deep, distinctly broad; epibranchial tooth small, blunt, cleft clearly visible. Exopod of third maxilliped with long flagellum. Suture between thoracic sternites 2, 3 distinct as narrow groove reaching lateral margins; between 3, 4 visible as shallow groove reaching lateral margins. *Male abdomen narrowly triangular*; sixth male abdominal somite broader than long, slightly exceeds telson length. G1 stout, almost straight, *inner margin characteristically curved or angled slightly below juncture between terminal article and subterminal segment*; terminal article long (0.5 times length of subterminal segment), *cone-shaped*. G2 distal article long (0.55 times length of basal segment).

Distribution: Kerala (Idukki) and Tamil Nadu (Dindigul).

IUCN status: Least Concern (Esser & Cumberlidge, 2008a).

5. *Travancoriana kuleera* Bahir & Yeo, 2007
(Plate-I, Figs. 13–15; Plate-III, Figs. 10–12)

2007. *Travancoriana kuleera* Bahir and Yeo, *Raffles B. Zool., Supp. No. 16*: 323.

Type locality: Between Gudalur and Manjeri, Malappuram district, Kerala, India [type locality in the original description was mentioned as ‘between Gudalur and Manjery, Tamil Nadu, India’ (Bahir & Yeo, 2007). However, from the data of geographical coordinates, it was confirmed that the holotype and male paratypes was actually described from Malappuram district of Kerala and the female paratypes from Nilgiris district of Tamil Nadu].

Material examined: 1 ♀, Kakkayem, Ambalapara, Malabar W.L.S., Kozhikode dist., Kerala, 22.05.2013, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2936 and 1 ♀, Kakkayem, Ambalapara, Malabar W.L.S., Kozhikode dist., Kerala, 29.05.2013, Coll. K.G. Emiliyamma, ZSI/WGRC/IR/INV/2935.

Diagnosis: Carapace broader than long, slightly convex in frontal view; epigastric cristae well developed, slightly anterior to and confluent with postorbital cristae; postorbital cristae and epigastric cristae well developed, confluent; epigastric cristae rugose; external orbital angle broadly triangular, with outer margin 3 times length of inner margin; epigastric groove long and bifurcated posteriorly; cervical grooves shallow, narrow, much interrupted; epibranchial tooth small, blunt, cleft clearly visible. Exopod of third maxilliped with long flagellum. Suture between thoracic sternites 2, 3 distinct as broad groove not reaching lateral margins; between 3, 4 visible reaching lateral margins. *Male abdomen broadly T-shaped*; sixth male abdominal somite longer than broad, longer than telson. G1 long, almost straight; terminal article long (0.35 times length of subterminal segment), narrow, *cone-*

shaped with characteristically bent tip, inner margin characteristically curved or angled slightly below juncture between terminal and subterminal segments; subterminal segment stout. G2 distal article long (0.4 times length of basal segment).

Distribution: Kerala (Malappuram) and Tamil Nadu (Nilgiris).

IUCN status: Data Deficient (Esser & Cumberlidge, 2008b).

6. *Lamella lamellifrons* (Alcock, 1909)

(Plate-I, Figs. 16–18; Plate-III, Figs. 13–15)

1909a. *Paratelphusa (Barytelphusa) lamellifrons* Alcock, *Rec. Indian Mus.*, **3**(4): 376.

1909b. *Paratelphusa (Barytelphusa) lamellifrons* Alcock, *Rec. Indian Mus.*, **3**(3): 251.

1910. *Paratelphusa (Barytelphusa) lamellifrons* Alcock, *Cat. Ind. decap. Crust. Coll. Ind. Mus.*, **I**(2): 82.

1970a. *Barytelphusa (Barytelphusa) cunicularis* Bott, *Abh. senckenb. naturforsch. Ges.*, **526**: 31, 32 (part) (not *Thelphusa cunicularis* Westwood, 1836).

2007. *Lamella lamellifrons* Bahir and Yeo, *Raffles B. Zool., Supp. No. 16*: 330.

Type locality: Madathara (=Madathoray) (Travancore Museum), Kollam district, Kerala, India.

Material examined: 2 ♂ & 4 ♀, Kamanem Peroor, Konni, Pathanamthitta dist., Kerala, 24.01.1992, Coll. M.B. Raghunathan & Party, ZSI/WGRC/IR/INV/2760; 1 ♀, Kuthiran, Thrissur dist., Kerala, 14.03.1992, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2755; 1 ♂, Peringalkuth, Irumbupalam, Thrissur dist., Kerala, 20.02.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2737; 1 ♀, Athirapally, Thrissur dist., Kerala, 23.02.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2703; 1 ♀, Janakikkotu, Kuttiyadi R.F., Kozhikode dist., Kerala, 26.03.1996, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2759; 1 ♂, Karukachal, Kottayam dist., Kerala, 25.10.2000, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2725; 1 ♀, Bharananganam, Kottayam dist., Kerala, 28.10.2000, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2694; 1 ♀, Poolade, Rangapuzha?, Kozhikode dist., Kerala, 24.04.2002, Coll. K.G.

Emiliyamma, ZSI/WGRC/IR/INV/2753; 1♂, Madayipara, Kannur dist., Kerala, 23.09.2003, Coll. Md. Jafer Palot, ZSI/WGRC/IR/INV/2750; 1♂, Urulanthanni, Thattakkad, Ernakulam dist., Kerala, 03.12.2006, Coll. K. Rajmohana, ZSI/WGRC/IR/INV/2743 and 1♂, Urulanthanni, Ernakulam dist., Kerala, 13.12.2006, Coll. K. Rajmohana, ZSI/WGRC/IR/INV/2756.

Diagnosis: Carapace broader than long, slightly convex anteriorly and flat posteriorly; epigastric cristae well developed, slightly anterior to and confluent with postorbital cristae; epistomal median lobe without median tooth; *postorbital cristae and epigastric cristae well developed, confluent, forming sharp and straight crest; external orbital angle broadly triangular, with outer margin 5 times length of inner margin;* cervical grooves shallow, broad; *epibranchial tooth sharp, acutely triangular, separated from external orbital angle by distinct cleft, even visible from ventral view, well below level of postorbital cristae.* Exopod of third maxilliped with long flagellum. Suture between thoracic sternites 2, 3 distinct as narrow groove reaching lateral margins; between 3, 4 slightly visible as shallow groove from sides only. Male abdomen T-shaped; sixth male abdominal somite longer than broad, longer than telson. G1 long, narrow, straight, inner margin characteristically curved or angled slightly below juncture between terminal article and subterminal segment; terminal article long (0.4 times length of subterminal segment), tip circular; subterminal segment stout. G2 distal article short (0.2 times length of basal segment).

Distribution: Kerala (Kollam, Kottayam, Pathanamthitta, Thiruvananthapuram and Thrissur).

IUCN status: Least Concern (Cumberlidge, 2008d).

7. *Vanni travancorica* (Henderson, 1913)

(Plate-II, Figs. 1–3; Plate-III, Figs. 16–18)

1913. *Paratelphusa* (*Liotelphusa*) *malabarica* var. *travancorica* Henderson, *Rec. Indian Mus.*, **9**(2): 47.

1931. *Paratelphusa* (*Barytelphusa*) *travancorica* Roux, *Rev. Suisse Zool.*, **38**(4) : 53.

1970a. *Travancoriana malabarica* Bott, *Abh. senckenb. naturforsch. Ges.*, **526**: 42 (part) (not *Paratelphusa* (*Liotelphusa*) *malabarica* Henderson, 1912).

1970b. *Travancoriana travancorica* Bott, *Rev. Suisse Zool.*, **77**(2): 336.

2007. *Vanni travancorica* Bahir and Yeo, *Raffles B. Zool., Supp. No.* **16**: 338.

2011. *Vanni travancorica* Pati & Sharma, *Bionotes*, **13**(4): 152.

Type locality : Ponmudi, Thiruvananthapuram district, Kerala (Earlier in Travancore), India.

Material examined: 1♂, Choodal, Shendurney W.L.S., Kollam dist., Kerala, 07.08.1997, Coll. P.M. Sureshan, ZSI/WGRC/IR/INV/2685 and 1♀, Kattilappara, Kollam dist., Kerala, 16.10.2012, Coll. K.G. Emiliyamma, ZSI/WGRC/IR/INV/2938.

Diagnosis: Carapace slightly broader than long, slightly convex in frontal view; postorbital cristae distinct, reaching rugose epigastric cristae; external orbital angle outer margin 3 times length of inner margin; cervical grooves shallow, broad, much interrupted; epibranchial tooth slightly visible, cleft visible. Third maxilliped exopod with long flagellum. Suture between thoracic sternites 2, 3 very shallow, not reaching lateral margins; between 3, 4 indistinct. Male abdomen T-shaped; sixth male abdominal somite squarish, longer than broad, longer than telson. G1 almost straight, inner margin characteristically curved or angled just below juncture between terminal article and subterminal segment; *terminal article comparatively very narrow, short (0.25 times length of subterminal segment), cone-shaped; subterminal segment basal part distinctly broader than distal part.* G2 distal article relatively short (0.45 times length of basal segment).

Distribution: Karnataka (Uttar Kannada) and Kerala (Thiruvananthapuram).

IUCN status: Data Deficient (Esser & Cumberlidge, 2008c).

8. *Vanni malabarica* (Henderson, 1912)

(Plate-II, Figs. 4–6; Plate-IV, Figs. 1, 2)

1912. *Paratelpusa* (*Liotelpusa*) *malabarica* Henderson, *Rec. Indian Mus.*, 7(2): 111.
1913. *Paratelpusa* (*Liotelpusa*) *malabarica* Henderson, *Rec. Indian Mus.*, 9(2): 48.
- 1970a. *Travancoriana malabarica* Bott, *Abh. senckenb. naturforsch. Ges.*, 526: 42.
2007. *Vanni malabarica* Bahir and Yeo, *Raffles B. Zool., Supp. No.* 16: 340.

Type locality: River at Kavalai in the Cochin State Forest, Kochi district, Kerala, India.

Material examined: 8♂ & 1♀, Dohney, Nilgiri Biosphere, Palghat, Palakkad dist., Kerala, 16.01.1990, Coll. M.B. Raghunathan & Party, ZSI/WGRC/IR/INV/2747; 4♀, Karadipara, Peechi, Thrissur dist., Kerala, 15.03.1992, Coll. K.C. Gopi & Party, ZSI/WGRC/IR/INV/2754; 1♂, Vellanimala, Thrissur dist., Kerala, 09.10.1995, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2714; 1♀, Vattachira, near Thusaragiri, Kozhikode dist., Kerala, 15.02.1996, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2715; 1♀, Chimmioni, Thrissur dist., Kerala, 26.02.1996, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2711 and 2♂, Kakkavayal, Eangapuzha, Kozhikode dist., Kerala, 20.10.2009, Coll. K.G. Emiliyamma, ZSI/WGRC/IR/INV/2740.

Diagnosis: Carapace broader than long, slightly convex in frontal view; *postorbital cristae* distinct, just reaching distinct and rugose epigastric cristae; external orbital angle outer margin 2.5 times length of inner margin; cervical grooves shallow, broad, interrupted; epibranchial tooth blunt, cleft visible. Third maxilliped exopod with long flagellum. Suture between thoracic sternites 2, 3 and 3, 4 indistinct. Male abdomen T-shaped; sixth male abdominal somite squarish, longer than broad, longer than telson. G1 almost straight, inner margin characteristically curved or angled just below juncture between terminal article and subterminal segment; *terminal article* stout, short (0.2 times length of subterminal segment), cone-shaped; subterminal segment basal part broader

than distal part. G2 distal article relatively short (0.25 times length of basal segment).

Distribution: Kerala (Kochi).

IUCN status: Data Deficient (Cumberlidge, 2008e).

9. *Vanni ashini* Bahir & Yeo, 2007

(Plate-II, Figs. 7–9; Plate-IV, Figs. 3–5)

2007. *Vanni ashini* Bahir and Yeo, *Raffles B. Zool., Supp. No.* 16: 343.

Type locality: Ponnudi, Thiruvananthapuram district, Kerala, India.

Material examined: 6♀, Dhoni-Choppel, Nilgiri Biosphere, Palghat, Palakkad dist., Kerala, 17.11.1990, Coll. M.B. Raghunathan & Party, ZSI/WGRC/IR/INV/2707.

Diagnosis: Carapace slightly broader than long, slightly convex in frontal view; postorbital cristae distinct, sharp, reaching rugose epigastric cristae; external orbital angle outer margin 3 times length of inner margin; cervical grooves shallow, slightly broad, interrupted; epibranchial tooth blunt, cleft visible. Third maxilliped exopod with long flagellum. *Ambulatory legs* long; *second and third pairs of legs* longest, more than 2 times carapace length. Suture between thoracic sternites 2, 3 narrow, not reaching lateral margins and between 3, 4 indistinct. Male abdomen T-shaped; sixth male abdominal somite squarish, longer than broad, longer than telson. G1 almost straight, inner margin slightly curved or angled just below juncture between terminal article and subterminal segment; *terminal article* stout, short (0.2 times length of subterminal segment), cone-shaped; subterminal segment basal part broader than distal part. G2 distal article relatively short (0.4 times length of basal segment).

Distribution: Kerala (Thiruvananthapuram).

IUCN status: Data Deficient (Esser & Cumberlidge, 2008d).

10. *Vanni giri* Bahir & Yeo, 2007

(Plate-II, Figs. 10–12; Plate-IV, Figs. 6–8)

2007. *Vanni giri* Bahir and Yeo, *Raffles B. Zool., Supp. No.* 16: 346.

Type locality: Between Munnar-Maraiyoor, on Munnar-Pollachchi, Idukki district, Kerala, India.

Material examined: 1♂, Otekally/S. Coorg, Kodagu dist., Karnataka, 08.03.1994, Coll. P.M. Sureshan & Party, ZSI/WGRC/IR/INV/2745 and 2♂, Virapakshi Khan, Bhadra W.L.S., Chikkamagaluru dist., Karnataka, 22.11.2007, Coll. Md. Jafer Palot, ZSI/WGRC/IR/INV/2757.

Diagnosis: Carapace broader than long, slightly convex in frontal view; *postorbital cristae distinct, granular, reaching rugose epigastric cristae*; external orbital angle outer margin 3 times length of inner margin; cervical grooves shallow, broad, interrupted; epibranchial tooth distinct, blunt, cleft visible. Third maxilliped exopod with long flagellum. Suture between thoracic sternites 2, 3 narrow, reaching lateral margins and between 3, 4 very shallow. Male abdomen broadly T-shaped; sixth male abdominal somite squarish, longer than broad, longer than telson. G1 almost straight, inner margin characteristically curved or angled just below juncture between terminal article and subterminal segment; *terminal article stout, short (0.25 times length of subterminal segment), cone-shaped, tip curved outwards*. G2 distal article slightly long (0.4 times length of basal segment).

Distribution: Kerala (Idukki).

IUCN status: Data Deficient (Esser & Cumberlidge, 2008e).

Remarks: In original description of the species, it was wrongly mentioned that distal article of G2 is 0.25 times the length of basal segment (Bahir & Yeo, 2007: p.346). From the figure of left G2 of the holotype male (Bahir & Yeo, 2007: figure 43E), it was confirmed that G2 distal article is 0.4 times the length of basal segment. The present specimens are also having a long distal article (Plate-IV, Fig. 8).

11. *Vela carli* (Roux, 1931)

(Plate-II, Figs. 13–15; Plate-IV, Figs. 9–11)

1931. *Paratelpusa (Barytelpusa) carli* Roux, *Rev. Suisse Zool.*, **38**(4): 50.

1970a. *Travancoriana carli* Bott, *Abh. senckenb. naturforsch. Ges.*, **526**: 43.

1970b. *Travancoriana carli* Bott, *Rev. Suisse Zool.*, **77**(2): 336.

2007. *Vela carli* Bahir and Yeo, *Raffles B. Zool., Supp. No.* **16**: 349.

Type locality: Mudumalai, Nilgiris district, Tamil Nadu, India.

Material examined: 1♂, Silent Valley, Pathrakadavu, Palghat, Palakkad dist., Kerala, 08.02.1988, Coll. G.U. Kurup & Party, ZSI/WGRC/IR/INV/2741; 1♀, Kurichiyat R.F., Wayanad dist., Kerala, 24.12.1994, Coll. C. Radhakrishnan, ZSI/WGRC/IR/INV/2721 and 1♂, Kakkayem, Ambalapara, Malabar W.L.S., Kozhikode dist., Kerala, 29.05.2013, Coll. K.G. Emiliyamma, ZSI/WGRC/IR/INV/2933.

Diagnosis: Carapace broader than long, highly convex in frontal view; postorbital cristae distinct, confluent with epigastric cristae; external orbital angle outer margin 3 times length of inner margin; *cervical grooves shallow, broad*; epigastric groove long; epibranchial tooth small, blunt, cleft visible; *frontal margin almost straight; epistome with lateral and outer parts of posterior margin almost straight*. Third maxilliped exopod with long flagellum. Suture between thoracic sternites 2, 3 prominent, deep, not reaching lateral margins and between 3, 4 prominent, deep, reaching lateral margins. Male abdomen T-shaped; sixth male abdominal somite very long, longer than broad, longer than telson, *lateral margins gently converging distally*; telson slightly narrow. G1 almost straight, inner margin characteristically curved or angled just below juncture between terminal article and subterminal segment; terminal article long (0.4 times length of subterminal segment), cone-shaped, *basal two-thirds part distinctly stouter than cylindrical distal one-third part*, tip straight. G2 distal article long (0.45 times length of basal segment).

Distribution: Tamil Nadu (Nilgiris).

IUCN status: Data Deficient (Cumberlidge, 2008f).

12. *Oziotelphusa biloba* Bahir & Yeo, 2005

(Plate-II, Figs. 16–18; Plate-IV, Figs. 12–14)

2005. *Oziotelphusa biloba* Bahir and Yeo, *Raffles B. Zool., Supp. No. 12*: 101.*Type locality*: Kodagara Village on Trissur-Chalakudy Road, Thrissur district, Kerala.*Material examined*: 1♂ & 2♀, Eranhipalam, Kozhikode dist., Kerala, 03.10.1981, Coll. K.N. Nair, ZSI/WGRC/IR/INV/2691; 1♀, Eranhipalam, Kozhikode dist., Kerala, 05.05.1982, Coll. Jian Koshy, ZSI/WGRC/IR/INV/2733; 1♀, Vazhani, Thrissur dist., Kerala, 07.10.1995, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2693 and 1♂ & 1♀, Asurankundu, Thrissur dist., Kerala, 08.10.1995, Coll. K.C. Gopi, ZSI/WGRC/IR/INV/2723.*Diagnosis*: Carapace broader than long, highly convex in frontal view; epigastric cristae distinct, anterior to postorbital cristae; postorbital cristae distinct, sharp, gently curved; postorbital region concave; branchial regions inflated; external orbital angle outer margin 2 times length of inner margin; cervical grooves very shallow, narrow, interrupted, not reaching level of postorbital cristae; epigastric groove bifurcated; epibranchial tooth moderate in size, not very much sharp, situated slightly above postorbital cristae level and below supraorbital margin level; frontal margin straight in dorsal view; *epistomal median lobe notched or bilobed*, without a distinct, sharp tooth. Third maxilliped exopod with long flagellum. Suture between thoracic sternites 2, 3 deep, short, not reaching lateral margins and between 3, 4 deep, broad, not reaching lateral margins. Male abdomen narrowly triangular, lateral margins concave; sixth male abdominal somite trapezoidal, slightly broader than long, slightly shorter than telson, lateral margins concave; telson broad, elongate, lateral margins nearly straight. G1 stout; terminal article short (0.4 times length of subterminal segment), basal two-thirds part stout and turned outwards; subterminal segment much stouter than terminal article, basal two-thirds part comparatively stout than distal one-third part. G2 distal article short (0.35 times length of basal segment).*Distribution*: Kerala (Thrissur).*IUCN status*: Vulnerable (Esser & Cumberlidge, 2008f).**DISCUSSION***Barytelphusa cunicularis* (Westwood, 1836) was commonly found in the areas under study except Kottayam district of Kerala. *Lamella lamellifrons* (Alcock, 1909) is a widely distributed species in Kerala and can be found up to 190 m altitude. *Vela carli* (Roux, 1931) was recorded for the first time from Kerala whereas *Travancoriana convexa* (Roux, 1931) and *Vanni giri* Bahir & Yeo, 2007 stood as new records to Karnataka. *Travancoriana kuleera* Bahir & Yeo, 2007 was originally described from Malappuram district of Kerala but wrongly mentioned as from Tamil Nadu (Bahir & Yeo, 2007). Hence, the present records from Kozhikode district of Kerala is only a range extension of *T. kuleera*.**SUMMARY**Freshwater crabs (194 specimens) in the collections of Western Ghat Regional Centre, Zoological Survey of India, Kozhikode, have been identified. In total, 12 species under 7 genera of the family Gecarcinucidae are reported. Data on distribution of all the identified species are provided. *Barytelphusa cunicularis* (Westwood, 1836) was the most commonly collected species in the studied area (Karnataka, Kerala and Tamil Nadu). *Vela carli* (Roux, 1931) is recorded for the first time from Kerala whereas *Travancoriana convexa* (Roux, 1931) and *Vanni giri* Bahir & Yeo, 2007 were found to be new records to Karnataka.**ACKNOWLEDGEMENTS**

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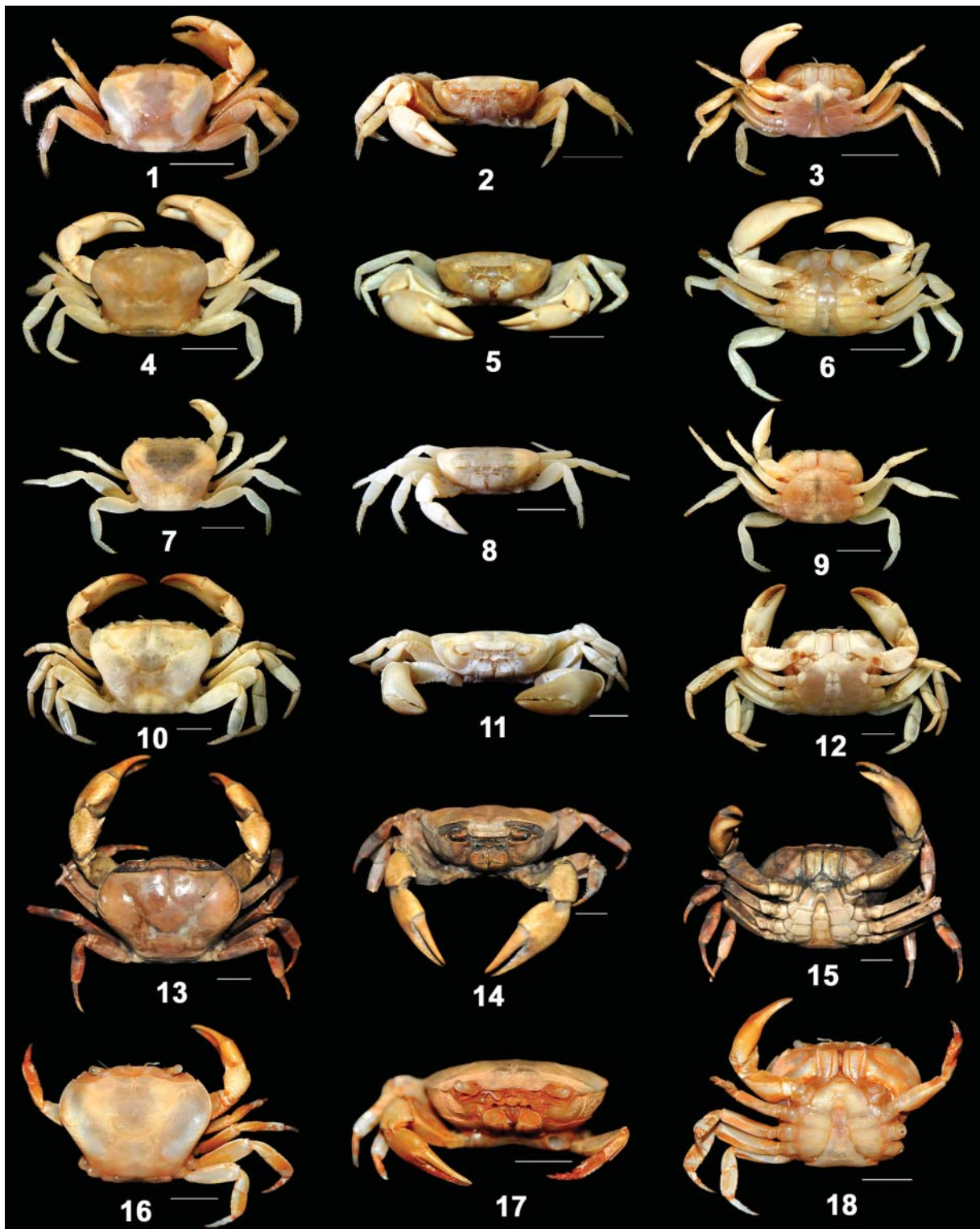
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PLATE-I



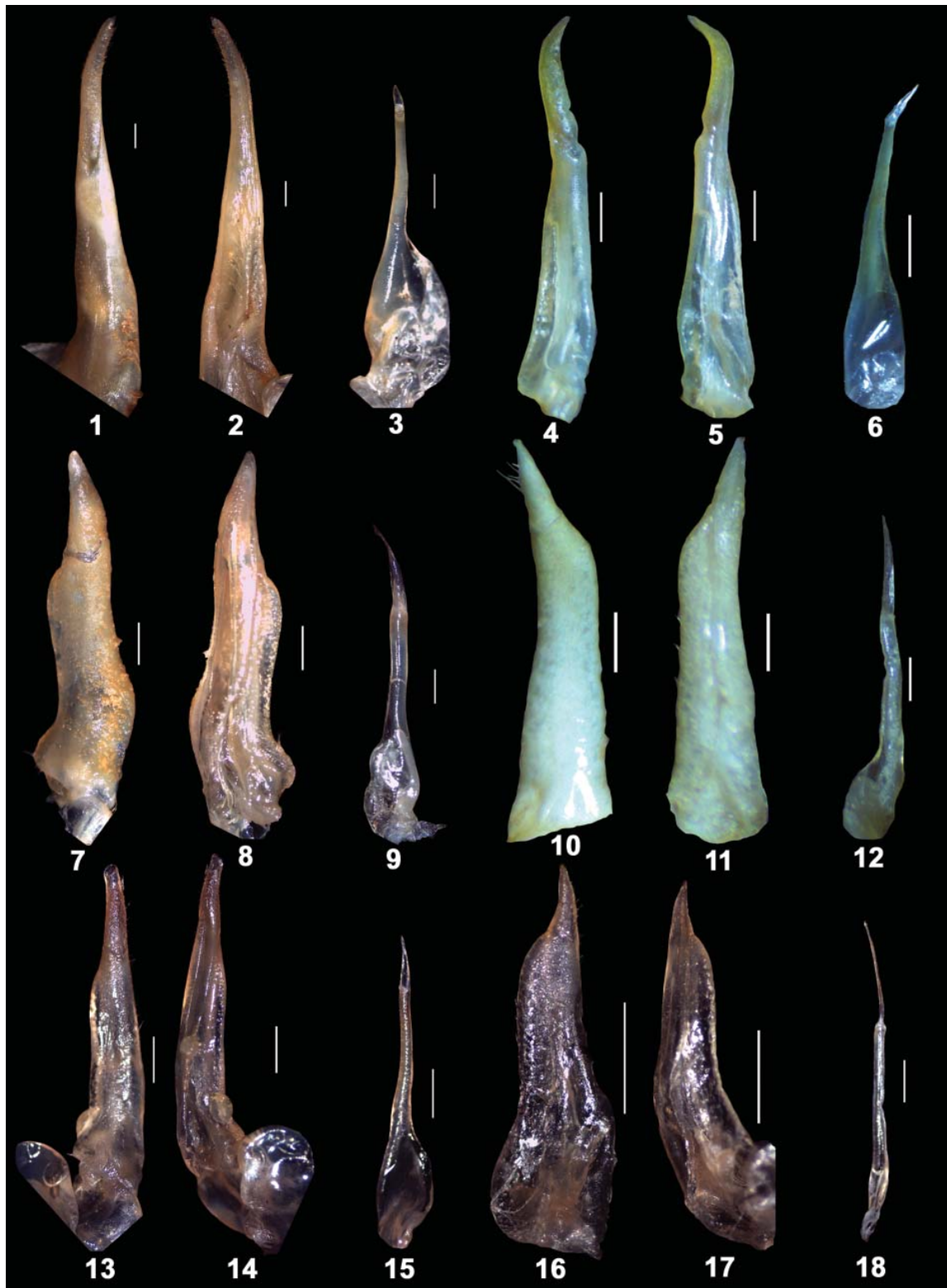
1–3. *Barytelphusa cunicularis*; 4–6. *Cylindrotelphusa steniops*; 7–9. *Travancoriana pollicaris*; 10–12. *Travancoriana convexa*; 13–15. *Travancoriana kuleera*; 16–18. *Lamella lamellifrons*. 1, 4, 7, 10, 13, 16, dorsal views; 2, 5, 8, 11, 14, 17, frontal views; 3, 6, 9, 12, 15, 18, ventral views. Scale bar = 10 mm.

PLATE-II



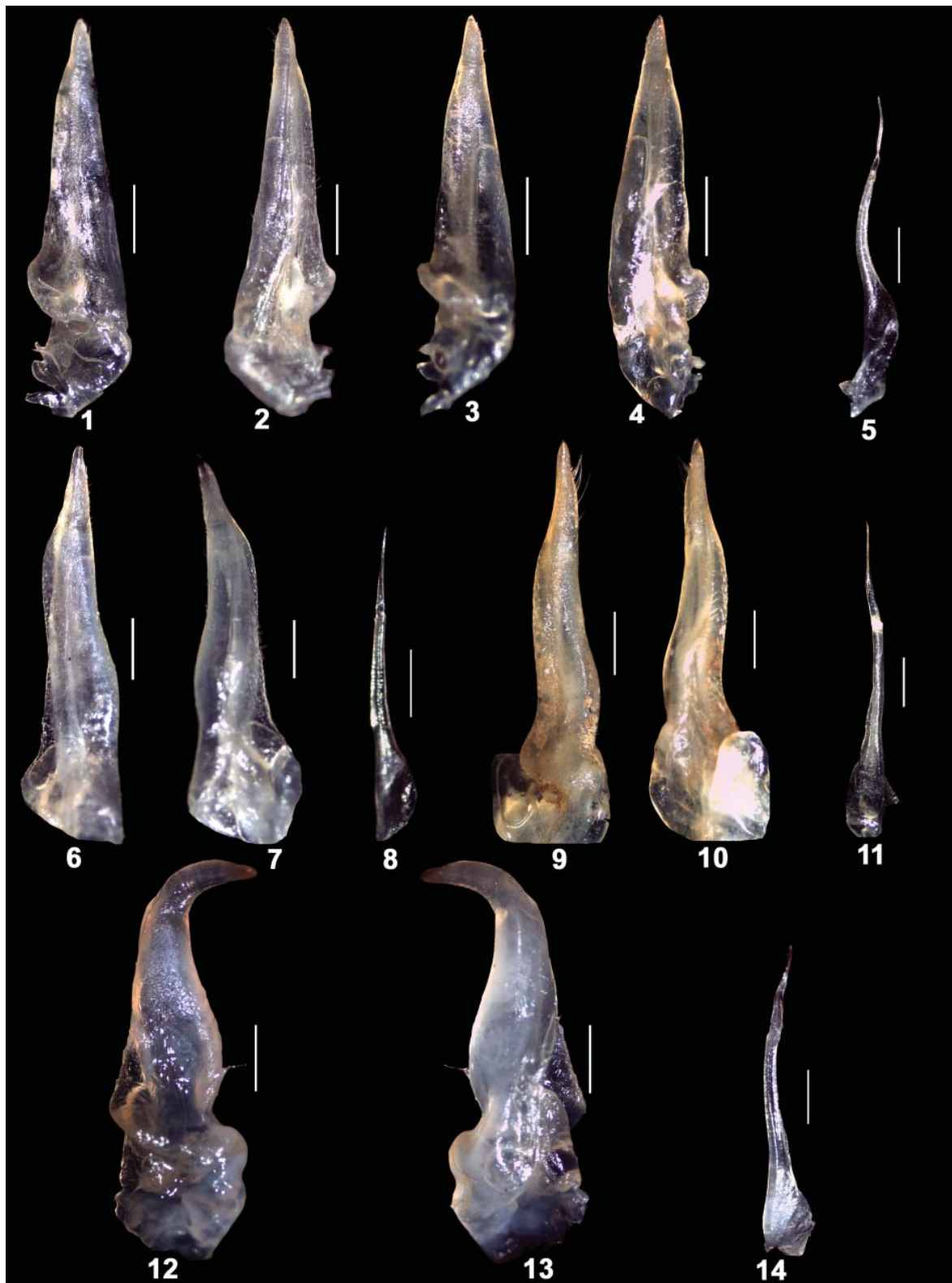
1-3. *Vanni travancorica*; 4-6. *Vanni malabarica*; 7-9. *Vanni ashini*; 10-12. *Vanni giri*; 13-15. *Vela carli*; 16-18. *Oziotelphusa biloba*. 1, 4, 7, 10, 13, 16, dorsal views; 2, 5, 8, 11, 14, 17, frontal views; 3, 6, 9, 12, 15, 18, ventral views. Scale bar = 10 mm.

PLATE-III



1–18. Gonopod structures. 1–3. *Barytelphusa cunicularis*; 4–6. *Cylindrotelphusa steniops*; 7–9. *Travancoriana convexa*; 10–12. *Travancoriana kuleera*; 13–15. *Lamella lamellifrons*; 16–18. *Vanni travancorica*. 1, 4, 7, 13, 16, right G1 dorsal views; 2, 5, 8, 14, 17, right G1 ventral views; 3, 6, 9, 15, 18, right G2; 10, left G1 dorsal view; 11, left G1 ventral view; 12, left G2. Scale bar = 1 mm.

PLATE-IV



1–14. Gonopod structures. 1, 2. *Vanni malabarica*; 3–5. *Vanni ashini*; 6–8. *Vanni giri*; 9–11. *Vela carli*; 12–14. *Oziotelphusa biloba*. 1, 3, 6, 9, 12, right G1 dorsal views; 2, 4, 7, 10, 13, right G1 ventral views; 5, 8, 14, right G2; 11, left G2. Scale bar = 1 mm.