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Notes on Gerridae (Hemiptera: Heteroptera: Gerromorpha) from the Eastern Ghats of Telangana and Northern Andhra Pradesh, India

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Abstract. *Jaiswal D, Banerjee S. 2024. Notes on Gerridae (Hemiptera: Heteroptera: Gerromorpha) from the Eastern Ghats of Telangana and Northern Andhra Pradesh, India. Nusantara Bioscience 16: 43-53.* Gerridae is the family of semi-aquatic bugs found in both the lentic and lotic freshwater bodies. The present study focused on the Gerridae from the Eastern Ghats of Telangana and Northern Andhra Pradesh, India. This study documented a total number of 16 species belonging to 13 genera and 7 subfamilies under the family Gerridae. *Tenagogonus nicobarensis* Andersen, 1964, was earlier described from Andaman and Nicober islands and also known to be endemic to that particular geographical area. We are recording this species for the first time from the mainland of the Indian subcontinent. *Ventidius aquarius* Distant, 1910 was also recorded for the first time during this present study from the Eastern Ghats, an endemic species to peninsular India. Another species, *Naboandelus signatus* Distant, 1910 is also recorded from the Eastern Ghats of Andhra Pradesh as well as an addition to the state fauna of Andhra Pradesh. It is a widespread species and reported from both central and northeastern India. In southern India, it was reported from the two states and present record will be the additional third state to its distribution. In addition to taxonomic details, the article covers the geographic distribution of the 16 species. This study has also led to the addition of nine species of Gerridae to the state fauna of Andhra Pradesh.

Keywords: Distributions, Eastern Ghats, India, new records, semi-aquatic bugs

INTRODUCTION

The Eastern Ghats, also known as Kizhakku thodarchi malaigal, Prva Gha, or toorpu kanumalu in the south, are a discontinuous series of mountains along India's eastern coast. It spans five states, including Odisha, Andhra Pradesh, Telangana, Karnataka, and Tamil Nadu, and is located between 76° 50' E and 86° 30' E Longitudes and 11° 30' N and 22° 0' N Latitudes. It is substantially older than the Western Ghats and has a complex geologic history related to the formation and dissolution of the ancient supercontinent of Rodinia and the formation of the Gondwana supercontinent (ENVIS 2023). It is divided into three regions: the northern area from Odisha to Guntur, the central section from Guntur to the Tamil Nadu border, and the southern section wholly in Tamil Nadu (Legris and Meher 1982). The Eastern Ghats are a mix up of various ecoregions that run from south to north along India's east coast. Eastern Highlands wet deciduous forests, East Deccan dry evergreen forests, Deccan thorn scrub forests, shrub lands, and South Deccan Plateau dry deciduous forests are the most important ecoregions (ENVIS 2023).

The term "aquatic bugs" refers to freshwater hemipterans, which are mostly adapted to aquatic environments. Based on their preferred habitats and niches, the water bugs, members of the suborder Heteroptera (known as true bugs), are classified into three infraorders: Nepomorpha, Gerromorpha, and Leptopodomorpha. As predators, scavengers, or collectors, they are essential to freshwater environments and have a significant impact on the food web. Compared to Nepomorpha, the Gerromorphan has a smaller fossil record. The Nepomorphan has a vast fossil record. Nepomorpha and Leptopodomorpha are members of the sister group of the Panheteroptera, known as Gerromorpha (Schuh and Slater 1995).

The world's aquatic insect biota is largely composed of aquatic and semi-aquatic Heteroptera, or water bugs. Heteroptera suborder (Insecta, Hemiptera) members are found all over the world and inhabit a diverse range of environments (Schuh and Slater 1995; Gullan and Cranston 2017). The Heteroptera infraorders Gerromorpha, Leptopodomorpha, and Nepomorpha are associated with water bodies (Nieser and Melo 1997; Panizzi and Grazia 2015). Small to medium-sized, semiaquatic insects belong to the infraorder Gerromorpha and are typically found near the edges or on the surface of freshwater bodies (Andersen 1982; Dias-Silva et al. 2009, 2013).

Currently, eight families and about 160 genera comprise the more than 2,100 species of Gerromorpha that are known to exist globally (Polhemus and Polhemus 2008). The Infraorder Gerromorpha is a group of semi-aquatic insects that can be recognized by long, conspicuous antennae that are placed in front of the eyes and longer than the head. Except the coldest and driest regions, they are found throughout all climatic zones (Thirumalai 2002). Eight families make up this infraorder: Hermatobatidae, Veliidae, Paraphrynoveliidae, Mesoveliidae, Hebridae, and Gerridae (Andersen 1964). Of the eight families mentioned above, there are currently no records of Paraphrynoveliidae, Macroveliidae, or Hermatobatidae from India

(Subramanian and Basu 2017).

The family Gerridae commonly known as water striders belonging to the superfamily Gerroidea, predatory water bugs, which suck body fluids of live and partly dead insects (Jehamalar and Chandra 2013a,b). They occur in diverse habitats both in lentic (lakes, ponds, pools, reservoirs, agricultural fields and temporary waters) and lotic ecosystems (streams, seepage, springs, rivers and irrigation canals). According to Polhemus and Polhemus (2008), there are more than 751 species belonging to 67 genera belonging to the family Gerridae known from the world. Whereas from the oriental region, more than 287 Gerridae species are documented so far, which is around 38% of the total reported species in this family. Thirumalai (2002) documented 77 species belonging to 27 genera under 7 subfamilies belonging to the family Gerridae from India. Later, Subramanian and Basu (2017) did study on aquatic and semi-aquatic Hemiptera from India and documented 93 species of family Gerridae belonging to 26 genera. After several studies done on this family, around 109 species were recorded from India (Basu et al. 2018a,b,c; Jehamalar et al. 2018a,b, 2023; Chandra et al. 2020, 2022; Jehamalar and Chandra 2020; Jehamalar and Dash 2021; Lyngdoh et al. 2021). Bal (2007) made a taxonomic account of the aquatic and semi-aquatic bugs from Andhra Pradesh and recorded 31 species belonging to 16 genera and 8 families, where he mentioned 8 species under 5 genera and 3 subfamilies belonging to the family Gerridae, whereas, only 8 species and 6 genera were documented under this family from Telangana after the bifurcation from Andhra Pradesh (Chandra et al. 2021). This study made an attempt to assess the Gerridae species, their status of diversity and their distribution from freshwater bodies of parts of the Eastern Ghats of Telangana and northern Andhra Pradesh.

MATERIALS AND METHODS

Study area

Throughout the past years, aquatic and semi-aquatic Hemiptera were studied from different parts from India, mainly from central, eastern parts and some southern, north and north eastern parts. At the same time these bugs were documented from parts of Western Ghats also. Eastern Ghats are left from extensive studies. Semi-aquatic bugs were collected from 46 sampling locations from the Eastern Ghats of Telangana and northern Andhra Pradesh (Table 1). There has been an extensive study carried out in those said localities between July 2021 and January 2023 (Figure 1).

Collection and preservation

Long-handled round nylon water nets with long handles were used for collecting the specimens. The specimens were preserved in 70% ethyl alcohol and stored in glass vials of 50 ml. For better results, aquatic and semi-aquatic bugs are collected using both qualitative and quantitative methods. A qualitative strategy was used to obtain a greater number of species from various collection locations. All collecting sites were swept three times for quantitative analysis, and the materials were preserved in glass vials for future research. After arriving at the laboratory, all specimens were identified to the species level, and each species was numbered from each collection locality for quantification. The species abundance, richness, and diversity indices were calculated using the statistical software PAST 4.03.

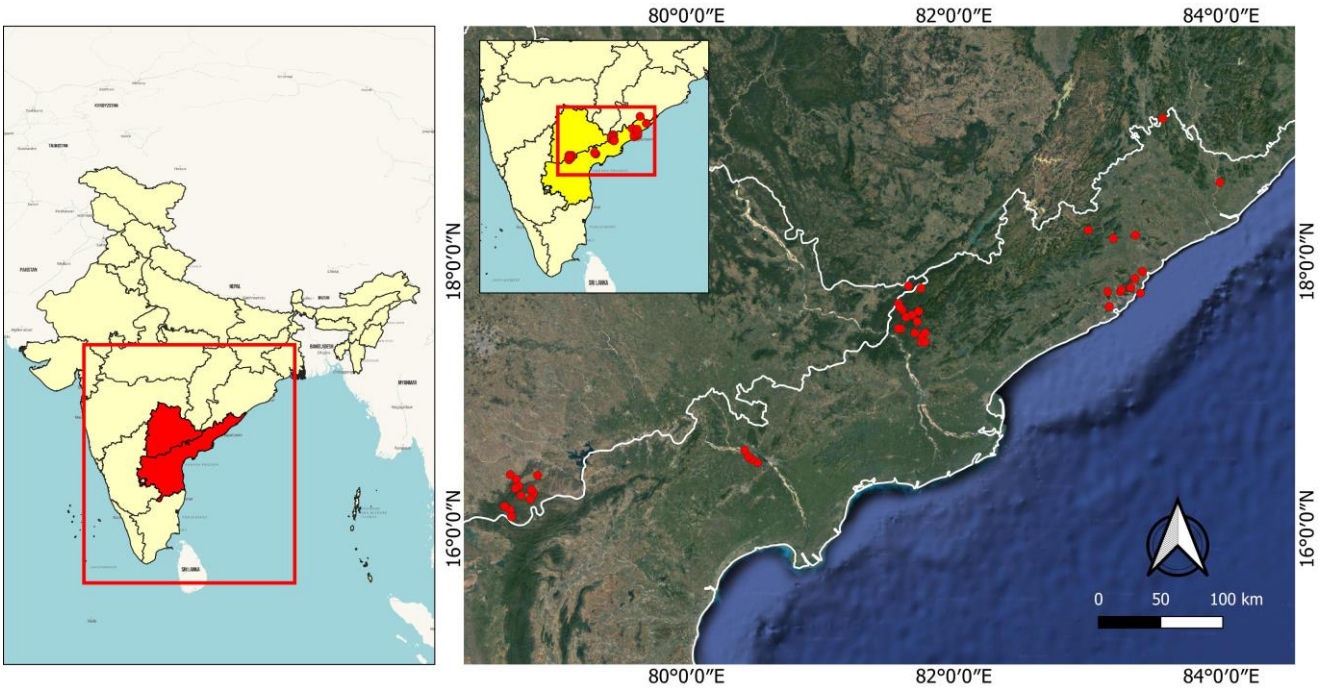

Figure 1. Survey locations in Andhra Pradesh and Telangana of India and points indicating the survey localities throughout the Eastern Ghats of both states

Table 1. Collection locations throughout the Eastern Ghats of Telangana and northern Andhra Pradesh, India

Locations	District	State	Coordinates	Elevation (m)
Mallela Theertham waterfalls	Nagarkurnool	Telangana	16°16’02.0” N, 78°51’21.9” E	673
Bairampally	Nagarkurnool	Telangana	16°8'33.72" N, 78°40'52.68" E	756
Bolghatpally	Nagarkurnool	Telangana	16°24'7.92" N, 78°53'9.96" E	592
Nadimpally	Nagarkurnool	Telangana	16°24'25.2" N, 78°40'55.92' E	463
Octopus view point	Nagarkurnool	Telangana	16°13’22.5” N, 78°49’53.9” E	801
Mannanur	Nagarkurnool	Telangana	16°19’12” N, 78°44’44” E	791
Pichakuntla Cheruvu	Nagarkurnool	Telangana	16°5’31.8” N, 78°41’29.5” E	514
Saleshwarama	Nagarkurnool	Telangana	16°10’11.09” N, 78°38’21.69” E	725
Maisamma loddi	Nagarkurnool	Telangana	16°18’18” N, 78°43’14” E	730
Ramapenta	Nagarkurnool	Telangana	16°17’45” N, 78°50’21” E	586
Umamaheshwarama	Nagarkurnool	Telangana	16°22’21” N, 78°43’38” E	544
Mulliguda	Alluri Sitharama Raju	Andhra Pradesh	19°4'18.84" N, 83°33'48.96" E	337
Barangi village	Alluri Sitharama Raju	Andhra Pradesh	17°24'1.44" N, 81°45'19.8" E	149
Bhupathipalem reservoir	Alluri Sitharama Raju	Andhra Pradesh	17°26'40.56" N, 81°45'54.36" E	214
Koyalagudam	Alluri Sitharama Raju	Andhra Pradesh	17°29'54.6" N, 81°36'15.48" E	410
Anampalli	Alluri Sitharama Raju	Andhra Pradesh	17°28'1.56" N, 81°42'30.24" E	307
Kintukuru base camp	Alluri Sitharama Raju	Andhra Pradesh	17°29'58.56" N, 81°35'5.28" E	116
Stream near Kintukuru base camp	Alluri Sitharama Raju	Andhra Pradesh	17°28'1.2" N, 81°42'29.88" E	305
Near Coffee plantation	Alluri Sitharama Raju	Andhra Pradesh	17°36'5.04" N, 81°41'16.44" E	502
GM Vallasa	Alluri Sitharama Raju	Andhra Pradesh	17°35'5.64" N, 81°38'33" E	468
Maredumilli	Alluri Sitharama Raju	Andhra Pradesh	17°33'6.48" N, 81°43'38.28" E	520
Pamulamaredi	Alluri Sitharama Raju	Andhra Pradesh	17°48'5.4" N, 81°45'14.4" E	1045
Thatipudi reservoir	Alluri Sitharama Raju	Andhra Pradesh	18°10'28.92" N, 83°11'36.24" E	114
Jala Tharangini waterfalls	Alluri Sitharama Raju	Andhra Pradesh	17°49'8.04" N, 81°39'39.96" E	277
Amrutadhara waterfalls	Alluri Sitharama Raju	Andhra Pradesh	17°38'21.48" N, 81°36'47.16" E	629
Near Tiger club	Alluri Sitharama Raju	Andhra Pradesh	17°41'16.08" N, 81°35'8.16" E	484
Ijjaluru	Alluri Sitharama Raju	Andhra Pradesh	17°39'32.76" N, 81°35'47.4" E	614
Sivalingapuram	Visakhapatnam	Andhra Pradesh	18°14'7.0794" N, 83°0'25.2" E	990
Relli Lake	Visakhapatnam	Andhra Pradesh	17°48'22.68" N, 83°19'24.9594" E	135
Mudasarlova reservoir	Visakhapatnam	Andhra Pradesh	17°45'50.75" N, 83°23'46.3194" E	12
Gambheeram gadda reservoir	Visakhapatnam	Andhra Pradesh	17°52'25.67" N, 83°21'18.01" E	55
KB reservoir	Visakhapatnam	Andhra Pradesh	17°39'52.91" N, 83°9'47.88" E	285
Koneru	Visakhapatnam	Andhra Pradesh	17°46'36.48" N, 83°14'47.76" E	74
Adidavaram cheruvu	Visakhapatnam	Andhra Pradesh	17°47'23.27" N, 83°15'14.7594" E	199
Meghadri gadda reservoir	Visakhapatnam	Andhra Pradesh	17°46'28.91" N, 83°9'3.9594" E	53
Gosthani river	Visakhapatnam	Andhra Pradesh	17°55'36.83" N, 83°24'41.04" E	36
Kakru Nelivada roadside	Alluri Sitharama Raju	Andhra Pradesh	18°11'51.72" N, 83°21'29.5194" E	99
Near AP Secretariate	Guntur	Andhra Pradesh	16°29'51.71" N, 80°31'56.28" E	45
Near AP High Court	Guntur	Andhra Pradesh	16°31'13.43" N, 80°29'22.2" E	47
Thullur	Guntur	Andhra Pradesh	16°32'26.52" N, 80°27'50.76" E	47
Guntivada	Alluri Sitharama Raju	Andhra Pradesh	18°35'34.73" N, 83°59'27.30" E	104
Kondavada	Alluri Sitharama Raju	Andhra Pradesh	17°37'43.81" N, 81°44'15.64" E	494
Ananthavaram	Guntur	Andhra Pradesh	16°35'19.31" N, 80°26'10.31" E	45
Vatavarlapally pond	Nagarkurnool	Telangana	16°15'01.17" N, 78°45'45.61"E	825
Rampa waterfalls	Alluri Sitharama Raju	Andhra Pradesh	17°28'02.87" N, 81°47'09.59" E	276
Pala Kalwa	Alluri Sitharama Raju	Andhra Pradesh	17°23'58.88" N, 81°47'9.72" E	141

Identification

Each individual was examined under a stereo-zoom binocular microscope, Olympus SZX10 and photographed under Leica M205A. Identification was done following standard literature by Gupta (1981), Chen and Zettel (1999), Thirumalai (1986, 1999, 2002), Bal and Basu (1994), Jehamalar and Chandra (2013a,b, 2016), Subramanian and Basu (2017), Basu et al. (2018a,b,c). All the identified specimens were registered and deposited in the National Zoological Collections of Zoological Survey of India, Freshwater Biology Regional Centre, Hyderabad.

RESULTS AND DISCUSSION

We examined semi-aquatic bugs of the family Gerridae from the Eastern Ghats in the Telangana districts of Nagarkurnool and Nalgonda, as well as the Andhra Pradesh districts of Alluri Sitharama Raju, Guntur, and Visakhapatnam. During the collection periods, all of the collection locations cover freshwater bodies, small ponds, reservoirs, and rocky streams. There were 16 species identified from 46 sites surveyed, representing 13 genera and 7 subfamilies. These locations were located in both protected and non-protected areas of both states. Collection location wise species distribution was discussed in Table 2.

Table 2. Location wise species distribution

Locations/species	*C. Productus*	*A. Kumari*	*O. Rhexenor*	*A. Adelaidis*	*G. Nepalensis*	*N. Parvulus*	*L. Fossarum fossarum*	*L. Nitidus*	*L. Fluviorum*	*T. Nicobarensis*	*M. Communis*	*M. Communoides*	*V. Aquarius*	*P. Agriodes*	*R. Kraepelini*	*N. Signatus*
Mallelatheertham waterfalls	+	+						+	+		+			+		
Bairampally							+	+								
Bolghatpally							+									
Nadimpally							+	+								
Octopus view point							+	+								
Mannanur							+									
Pichakuntla Cheruvu								+			+					
Saleshwarama									+		+			+		
Maisamma loddi									+							
Ramapenta											+					
Umamaheshwarama												+				
Mulliguda									+		+			+		
Barangi village	+															
Bhupathipalem reservoir	+							+								
Koyalagudam														+		
Anampalli	+													+		
Kintukuru base camp	+	+							+	+	+		+	+		
Stream near Kintukuru base camp	+												+			
Near Coffee plantation	+												+			
GM Vallasa	+									+	+					
Maredumilli	+															
Pamulamaredi														+		
Thatipudi reservoir	+				+						+			+		+
Jala Tharangini waterfalls														+		
Amrutadhara waterfalls														+		
Near Tiger club	+													+		
Ijjaluru														+		
Sivalingapuram														+		
Relli Lake				+												
Mudasarlova reservoir									+							
Gambheeram gadda reservoir							+	+								
KB reservoir				+												
Koneru				+												
Adidavaram cheruvu			+	+	+		+		+							
Meghadri gadda reservoir							+	+								
Gosthani river							+									
Kakru Nelivada roadside										+						
Near AP Secretariate							+	+								
Near AP High Court							+									
Thullur							+	+								
Guntivada	+					+		+					+			
Kondavada	+										+		+			
Ananthavaram															+	
Vatavarlapally pond															+	
Rampa waterfalls							+	+						+		
Pala Kalwa								+						+		

Nine species were documented as new records from the Andhra Pradesh state fauna, out of the 16 species that were found in this study. Among the six subfamilies, Gerrinae dominated with seven species, followed by Halobatinae with three and Eotrechinae with two species. *Ptilomera agriodes* Schmidt, 1926 was the most abundant species (Figure 2), according to all survey locations, followed by *Metrocoris communis* Distant, 1910 and *Limnogonus fossarum fossarum* Fabricius 1775). Two species were collected from a single location, *Naboandelus signatus* Distant, 1910 from the subfamily Trapobatinae and *Metrocoris communoides* Chen & Nieser, 1993 of subfamily Halobatinae. These two species are very rare to be collected and *M. Communoides* is often overlooked with misidentification with *M. Communis* as there is very little difference in the paramere structure between them.

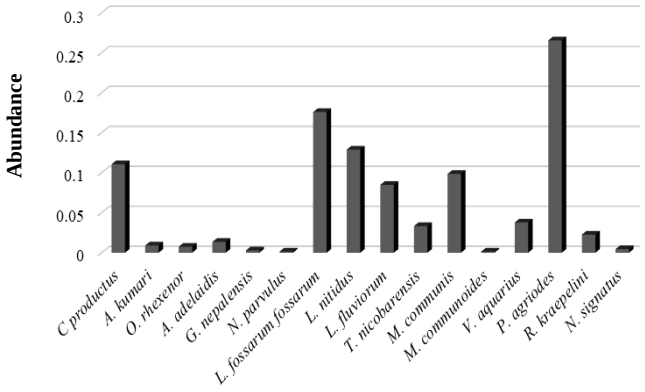

Figure 2. Illustration of species abundance from the study sites.

Another species *N. Signatus* also collected from single location in Andhra Pradesh with only two individuals along with the *M. Communis*. It was observed that *N. Signatus* was restricted to a single site within Andhra Pradesh's Papikonda National Park (Table 2). One specimen each of the two species, *M. Communoides* and *N. Parvulus*, has been collected from a single collection location.

Systematic account

Order Hemiptera Linnaeus, 1758

Family Gerridae Leach, 1815

Subfamily Cylindrostethinae Matsuda, 1960

Cylindrostethus productus (Spinola, 1840) (Figure 3.A)

Gerris productus Spinola, 1840, 2: 184, Syntype ♂. – Museum of Natural History, London.

Material examined: 4♂, 5♀, 24.xii.2021, Mallelatheertham waterfalls; 5♂, 5♀, 16.vii.2021, Bhupathipalem reservoir; 3♂, 6♀, 18.vii.2021, Tiger club; 1♂, 3♀, 17.vii.2021, Barangi village; 1♂, 5.xii.2021, Kondavada; 1♂, 2♀, 20.i.2022, Guntivada; 4♂, 5♀, 7.xii.2021, Anampalli; 1♂, 7.xii.2021, 4♂, 3♀, 30.vii.2022, Kintukuru base camp; 2♂, 3♀, 7.xii.2021, Stream near Kintukuru base camp; 1♀, 31.vii.2022, Coffee plantation; 2♂, 3♀, 31.vii.2022, Gm Vallasa; 2♂, 31.vii.2022, Maredumilli; 2♂, 5♀, 27.vii.2022, Thatipudi reservoir, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh (New record), Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Punjab, Tamil Nadu (Jehamalar and Chandra 2016); Telangana (Chandra et al. 2021); Uttarakhand, Uttar Pradesh and West Bengal (Jehamalar and Chandra 2016). **Elsewhere:** Nepal and Sri Lanka (Jehamalar and Chandra 2016).

Subfamily Eotrechinae Matsuda, 1960

Amemboa* (*Amemboa*) *kumari (Distant, 1910) (Figure 3.B)

Onychotrechus kumari Distant, 1910, 5: 145, Holotype ♂. – Travancore, Kerala.

Material examined: 2♂, 3♀, 24.xii.2021, Mallelatheertham waterfalls; 1♂, 7.xii.2021. Kintukuru base camp, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh (New record), Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Odisha, Tamil Nadu (Chandra et al. 2020); Telangana and West Bengal (Chandra et al. 2020).

Remark: It is an endemic species of the Indian subcontinent with wide distribution in Peninsular India.

Onychotrechus rhexenor Kirkaldy, 1903 (Figure 3.C)

Onychotrechus rhexenor Kirkaldy, 1903, 44: 108, Holotype ♂. – Museum of Natural History, London.

Material examined: 2♂, 3♀, 24.vii.2022, Adidavaram Cheruvu, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh (New record), Chhattisgarh, Karnataka, Kerala, Maharashtra, Rajasthan, Tamil Nadu (Chandra et al. 2020) and Telangana. **Elsewhere:** Socotra Island (Chandra et al. 2020).

Subfamily Gerrinae Bianchi, 1896

Aquarius adelaidis **(**Dohrn, 1860) (Figure 3.D)

Gerris adelaidis Dohrn, 1860, 21: 408, Holotype ♂. – Natural History Museum, Leipzig

Material examined: 2♂, 20.viii.2022, Relli lake; 1♂, 2♀, 24.vii.2022, Koneru; 1♂, 19.vii.2022, KB reservoir; 3♂, 2♀, 24.viii.2022, Adidavaram Cheruvu, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Odisha, Punjab, Rajasthan, Sikkim, Tamil Nadu, Telangana, Uttarakhand, Uttar Pradesh and West Bengal (Chandra et al. 2021). **Elsewhere:** Bangladesh, China, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Singapore, Sri Lanka, Thailand and Vietnam (Chandra et al. 2020).

Gerris* (*Gerris*) *nepalensis Distant, 1910 (Figure 3.K)

Gerris nepalensis Distant, 1910, 5 (8): 142, Holotype ♂. – Kathmandu, Nepal.

Material examined: 1♂, 27.vii.2022, Thatipudi reservoir; 1♂, 24.vii.2022, Adidavaram Cheruvu, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh (New record), Arunachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Sikkim, and Uttar Pradesh (Chandra et al. 2020). **Elsewhere:** Bangladesh, China, Japan, Myanmar, Nepal, North Korea, Russia, South Korea, Taiwan, Thailand and Vietnam (Chandra et al. 2020).

Neogerris parvulus (Stål, 1859) (Figure 3.E)

Gerris parvula Stål, 1859, 265: 107, Holotype ♂. – Naturhistoriska Riksmuseet.

Material examined: 1♂, 5.xii.2021, Guntivada, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Arunachal Pradesh, Assam, Odisha, Pondicherry, Tamil Nadu, Telangana, Uttar Pradesh and West Bengal (Chandra et al. 2020). **Elsewhere:** Bangladesh, China, Iran, Japan, Java, Malay Peninsula, Myanmar, New Guinea, Oman, Philippines, Pakistan, Singapore, Sri Lanka, Solomon Islands, Taiwan and Vietnam (Chandra et al. 2020).

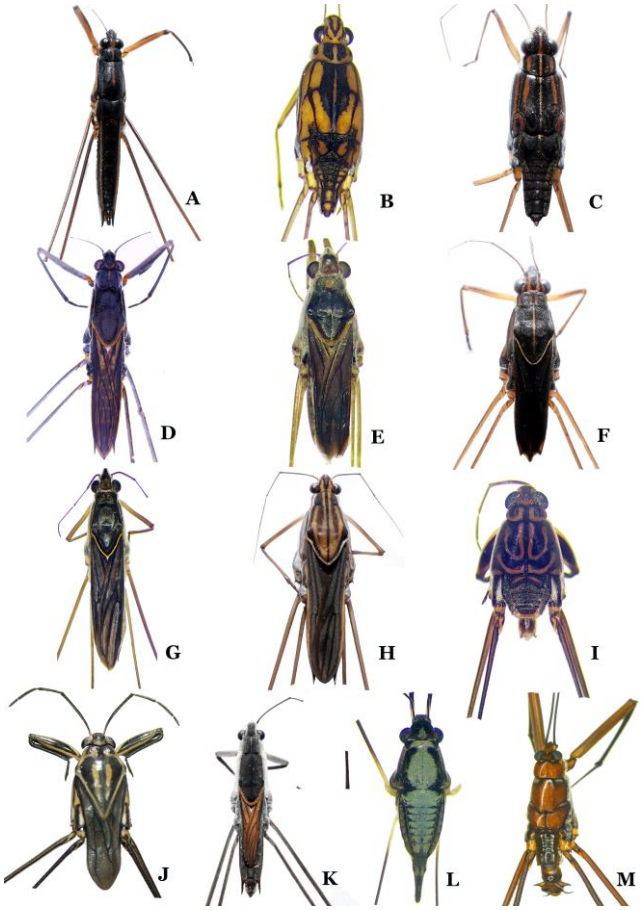

Figure 3. A. *C. Productus* (Spinola, 1840); B. *A. Kumari* (Distant, 1910); C. *O. Rhexenor* Kirkaldy, 1903; D. *A. Adelaidis* (Dohrn, 1860); E. *N. Parvulus* (Stal, 1859); F. *L. Fossarum fossarum* (Fabricius, 1775); G. *L. Nitidus* (Mayr, 1865); H. *L. Fluviorum* (Fabricius, 1798); I. *M. Communis* Distant, 1910; J. *M. Communoides* Chen & Nieser 1993; K. *Gerris nepalensis* Distant, 1910; L. *R. Kraepelini* Breddin, 1905; M. *P. Agriodes* Schmidt, 1926.

Limnogonus (Limnogonus) fossarum* subsp. *Fossarum (Fabricius, 1775) (Figure 3.F)

Cimex fossarum Fabricius, 1775, 727: 105, Holotype ♂. – Zoological Museum, University of Copenhagen.

Material examined: 1♀, 22.xii.2021, Bairampally; 2♂, 20.xii.2021, Bolghatpally; 15♂, 21♀, 21.xii.2021, Nadimpally; 1♀, 3.x.2020, Octopus view point; 1♂, 3♀, 15.vii.2021, Rampa waterfalls; 6♂, 3♀, 3.x.2020, Mannanur; 18♂, 11♀, 31.xii.2020, pond near AP Secretariat; 4♂, 3♀, 25.ii.2023, Thullur; 1♂, 25.ii.2023, pond near AP High Court; 2♂, 3♀, 22.xii.2020, Gambheeram gadda reservoir; 1♀, 12.xii.2020, Pushkar ghat; 6♂, 3♀, 19.vii.2022, Meghadri gadda reservoir; 5♂, 4♀, 24.vii.2022, Adidavaram Cheruvu; 1♂, 1♀, 21.ii.2023, Gosthani River, Coll. Dr. Deepa and Somesh.

Distribution: India: Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chandigarh, Chhattisgarh, Delhi, Goa, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Odisha, Pondicherry, Punjab, Rajasthan, Tamil Nadu, Telangana and West Bengal (Chandra et al. 2020). **Elsewhere:** Bangladesh, China, Hong Kong, Indonesia, Japan, Malay Peninsula, Myanmar, Philippines, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam (Chandra et al. 2020).

Limnogonus* (*Limnogonus*) *nitidus (Mayr, 1865) (Figure 3.G)

Hydrometra nitida Mayr, 1865, 443: 105, Holotype ♂. – Narurhistorisches Museum Wien.

Material examined: 2♂, 1♀, 31.xii.2020, pond near AP Secretariat; 6♂, 3♀, 15.xi.2021, Ananthavaram; 1♀, 15.xi.2021, Thullur; 2♀, 15.xi.2021, pond near AP high Court; 2♂, 2♀, 4.xii.2021, Bhupathipalem reservoir; 9♂, 4.xii.20221, Pala Kalwa; 4♂, 9♀, 5.xii.2021, Guntivada; 2♂, 22.xii.2020, Gambheeram gadda reservoir; 2♂, 1♀, 19.vii.2022, Meghadri gadda reservoir; 4♂, 21.xii.2021, Pichakuntla Cheruvu; 5♂, 3♀, 22.xii.2021, Bairampally; 3♀, 21.xii.2021, Nadimpally; 2♂, 1♀, 24.xii.2021, Mallelatheertham waterfalls; 2♂, 3.x.2020, Octopus view point; 8♂, 11♀, 15.vii.2021, Rampa waterfalls, Coll. Dr. Deepa and Somesh.

Distribution: India: Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chandigarh, Chhattisgarh, Delhi, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Odisha, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand, Uttar Pradesh, Telangana and West Bengal (Chandra et al. 2020). **Elsewhere:** Bangladesh, Bhutan, China, Indonesia, Laos, Maldives, Malaysia, Myanmar, Nepal, Singapore, Sri Lanka, Thailand and Vietnam (Chandra et al. 2020).

Limnometra fluviorum (Fabricius, 1798) (Figure 3.H)

Cimex fluviorum Fabricius, 1798, 2: 177, Lectype ♂. – Museum of Natural History, London.

Material examined: 2♂, 3♀, 14.ii.2020, 7♂, 9♀, 24.xii.2021, Mallelatheertham waterfalls; 7♂, 5♀, 12.ii.2020, 3♀, 10.viii.2021, Saleshwaram; 1♂, 1♀, 22.ix.2020, Maisamma loddi; 3♂, 3♀, 5.xii.2021, Guntivada; 1♂, 1♀, Mulliguda; 1♀, 30.vii.2022, Kintukuru base camp; 3♂, 3♀, 24.vii.2022, Adidavaram Churuvu; 3♀, 19.vii.2022, Mudasarlova reservoir, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Puducherry, Tamil Nadu, Telangana and West Bengal (Chandra et al. 2020). **Elsewhere:** Reunion Islands, Sri Lanka (Chandra et al. 2020).

Tenagogonus nicobarensis Andersen, 1964 (Figure 4.A-D)

Tenagogonus nicobarensis Andersen, 1964, 32: 321–334, Holotype ♂. – Andaman Islands, India.

Material examined: 1♂, 15.xi.2019, Stream near Kakru Nelivada Road, Vijianagram, 18°11'51.72"N, 83°21'29.52"E, Coll. Dr. Boni AL; 7♂, 5♀, 30.vii.2022, Kintukuru Base camp, 17°29'58.56"N, 81°35'5.28"E; 4♂, 5♀, 31.vii.2022, GM Vallasa, 17°35'5.64"N, 81°38'33"E, Alluri Sitharama Raju, Andhra Pradesh, Coll. Dr. Deepa and Somesh.

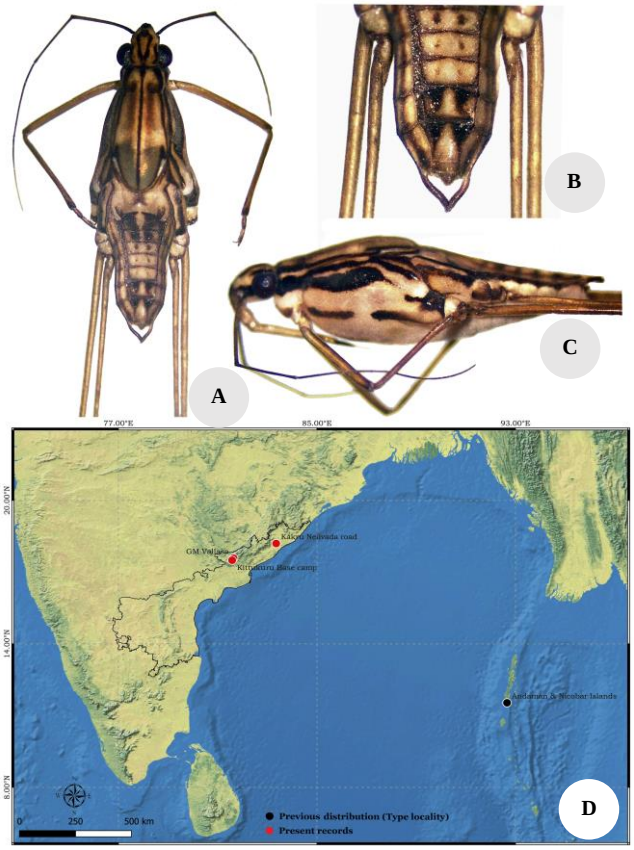

Figure 4. A-C. *Tenagogonus nicobarensis* Andersen, 1964; A. Male (habitus), dorsal view, B. Terminal abdominal segment of female, dorsal view, C. Male (habitus), lateral view; D. Global distribution with present record

Diagnosis: Average male body length in apterous form 6.67 mm, and female 7.14 mm. Body colour creamy white on the ventral and yellowish brown on the dorsal side (Figure 4.A). Head with four black stripes. Mesopleuron with two stripes, the outer one being wider. The black band on the lateral area of mesosternum. Male devoid of lateral processes of seventh sternum (connexival spines) and females with long connexival processes (Figure 4.B). A male ninth sternum has two sheath-like structures on its anterior surface below a broad longitudinal depression.

Distribution: India: Andaman & Nicobar Islands (Jehamalar and Chandra 2013a), Andhra Pradesh (New record).

Remark: In previous studies, *T. Nicobarensis* was only reported from its type locality on the Andaman Islands and a few Nicobar groups of Islands and later on, it was further reported from South Andaman Island but lacks its distribution in the Great Nicobar Islands (Jehamalar and Chandra 2013a, 2020). We have collected this species from the fast-flowing rocky streams along with another species group, *L. Fluviorum* Fabricius, 1798. They were scattered together in the stream near the base camp at Kintukuru and on the roadside of a small stream at Kakru Nelivada road. This species is endemic to the Indian subcontinent, as previously reported only from the Andaman and Nicobar Islands, however its range is now being expanded to the Indian mainland as well.

Subfamily Halobatinae Matsuda, 1960

Metrocoris communis **(**Distant, 1910) (Figure 3.I)

Euodus communis Distant, 1910, 151: 112, Holotype ♂. – Museum of Natural History, London.

Material examined: 3♂, 1♀, 21.xii.2021, Pichakuntla Cheruvu; 7♂, 8♀, 24.xii.2021, Mallelatheertham waterfalls; 2♀, 18.iii.2019, Ramanapenta; 1♂, 25.i.2018, Saleshwaram; 1♂, 5.xii.2021, Kondavada; 8♂, 11♀, 7.xii.2021, 3♂, 2♀, 30.vii.2022, Kintukuru base camp; 4♂, 3♀, 5.xii.2021, Guntivada; 2♂, 28.vii.2022, Mulliguda; 1♀, 31.vii.2022, GM Vallasa; 5♂, 3♀, 27.vii.2022, Thatipudi reservoir, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh (New record), Chhattisgarh, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Telangana and Uttar Pradesh (Chandra et al. 2020). **Elsewhere:** Afghanistan, Iran, Iraq and Oman (Chandra et al.2020).

Metrocoris communoides Chen and Nieser, 1993 (Figure 3.J)

Metrocoris communoides Chen & Nieser, 1993, 19 (2): 51, Holotype ♂. – Tamil Nadu, India.

Material examined: 1♂, 20.xii.2021, Umamaheshwaram temple, Coll. Dr. Deepa and Somesh.

Distribution: India: Himachal Pradesh, Odisha, Tamil Nadu (Basu et al. 2015), Madhya Pradesh (Chandra et al. 2020) and Telangana (Chandra et al. 2021).

Remark: It is an endemic species to the Indian subcontinent, described from Tamil Nadu and distributed mainly in Deccan peninsular region.

Ventidius **(*Ventidius*)** ***aquarius*** Distant, 1910 (Figure 5.A-C)

Ventidius aquarius Distant, 1910, 156-158, Holotype ♂. – Travancore, Kerala.

Material examined: 3♂, 31.vii.2021, Coffee plantation, 17°35'21.84"N, 81°40'37.92"E; 1♂, 30.vii.2022, Kintukuru Base camp, 17°29'58.56"N, 81°35'5.28"E; 4♂, 3♀, 05.xii.2021, Stream near Guntivada, 17°39'11.88"N, 81°42'50.4"E; 2♂, 3♀, 05.xii.2021, Stream near Kondavada, 17°31'29.37"N, 81°39'18.71"E; 4♂, 5♀, 07.xii.2021, stream near Kittukuru base camp, 17°29'58.56"N, 81°35'17.16"E; Alluri Sitharama Raju, Andhra Pradesh, Coll. Dr. Deepa and Somesh.

Diagnosis: The average male body length 3.45 mm and for females its 3.66 mm. The entire body is conspicuously bright yellowish or light greenish, with prominent dark stripes. Brown to blackish eyes with a brown inner rim. Pronotum is likewise yellowish, with dark lateral lines on the anterior and posterior margins. A single black, tiny rod-shaped structure formed just before the fifth abdominal segment, and the dorsal section of the body was covered with black patterns at the margin. In macropterous form, the dorsal half of the body has a black "T"-shaped structure. The intersegmental morphology between the meso and metanotum is distinct, and the mesonotum is inflated. Parameres are small, symmetrical, cucumber-shaped, and with a blunt apex.

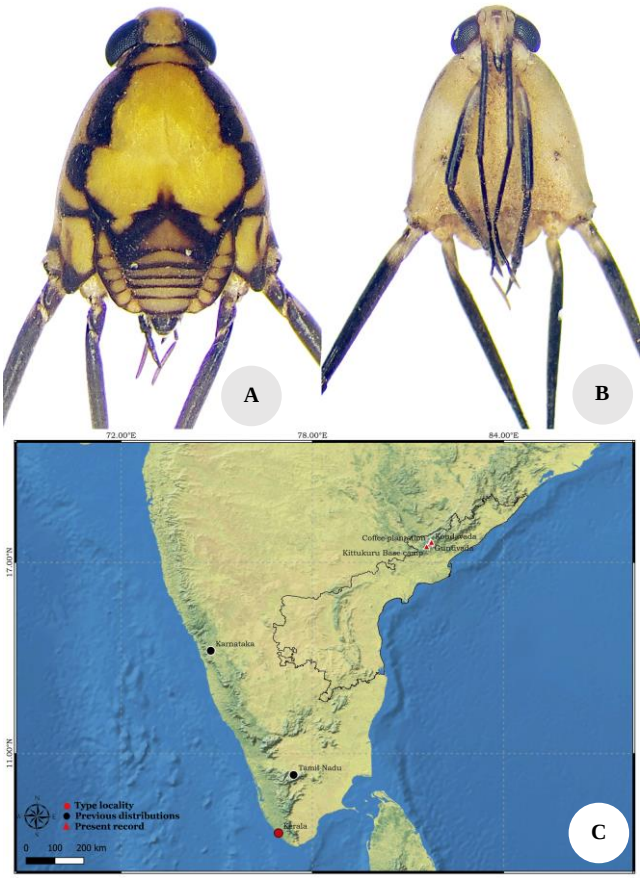

Figure 5. A-B. *Ventidius aquarius* Distant, 1910; Male habitus (A. Dorsal view, B. Ventral view); C. Distribution throughout India.

Distribution: India: Andhra Pradesh (New record); Karnataka, Kerala and Tamil Nadu (Thirumalai 2002). **Elsewhere:** Sri Lanka (Thirumalai 2002).

Remark: This species was collected from a moderately flowing rocky stream inside the Papikonda National Park. At three locations, i.e. Kittukuru base camp, a small stream near Guntivada, and stream near Kondavada, we have collected this species along with *M. Communis*. All of the collection sites were small, rocky streams with ankle-deep or less water in the month of December and knee-high or higher water in the month of July. But in July, we found this species in an area with very shallow water.

Subfamily Ptilomerinae Bianchi, 1896

Ptilomera* (*Ptilomera*) *agriodes Schmidt, 1926 (Figure 3.M)

Ptilomera agriodes Schmidt, 1926, 15 (1): 63, Holoype ♂. – Tiruchirappali, India.

Material examined: 9♂, 7♀, 14.ii.2020, Mallelatheertham waterfalls; 9♂, 10♀, 10viii.2021, Saleshwaram; 2♀, 15.vii.2021, Rampa waterfalls; 4♂, 3♀, 1.viii.2022, 9♂, 4.xii.20221, Pala Kalwa; Jala Tharangini waterfalls; 1♂, 19.vii.2021, Pamulamaredi; 4♂, 2♀, 18.vii.2021, Ijjaluru; 2♀, 18.vii.2021, Tiger club; 11♂, 14♀, 5.xii.2021, Guntivada; 4♂, 7.xii.2021, Anampally; 2♂, 2♀, 7.xii.2021, Koyalagudam; 2♂, 5♀, 30.vii.2022, Kintukuru base camp; 1♂, 5.xii.2021, Mulliguda; 18♂, 15♀, 28.vii.2022, Sivalingapuram; 10♂, 8♀; 1.viii.2022, Amrutadhara waterfalls; 11♂, 15♀, 27.vii.2022, Thatipudi reservoir, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh (New record), Chhattisgarh, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Tamil Nadu and Telangana (Chandra et al. 2020).

Remark: This is an endemic species to the Indian subcontinent with wide distribution throughout India.

Subfamily Rhagadotarsinae Lundblad, 1933

Rhagadotarsus (Rhagadotarsus) kraepelini Breddin, 1905 (Figure 3.L)

Rhagadotarsus kraepelini Breddin, 1905, 137: 97, Holotype ♂. – Zoologisches Museum, Universität Hamburg.

Material examined: 2♂, 15.xi.2021, Ananthavaram; 2♂, 4♀; 13.viii.2021, 3♂, 4♀, 23.xii.2021, Vatavarlapally, Coll. Dr. Deepa and Somesh.

Distribution: India: Andhra Pradesh, Arunachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Puducherry, Tamil Nadu, Telangana and West Bengal (Chandra et al. 2020). **Elsewhere:** South China, Palau, Papua New Guinea, Philippines, Indonesia, Malaysia, Myanmar, Singapore, Sri Lanka, Taiwan, Thailand and Vietnam (Chandra et al. 2020).

Subfamily Trepobatinae Polhemus & Polhemus, 1994

Naboandelus signatus Distant, 1910 (Figure 6.A-C)

Naboandelus signatus Distant, 1910, 5 (8): 150, Holotype ♂, ♀. – Indian Museum, Kolkata.

Material examined: 2♂, 1♀, 27.vii.2022, Thatipudi reservoir, 18°10'35.4"N, 83°11'52.08"E, Alluri Sitharama Raju, Andhra Pradesh, Coll. Dr. Deepa and Somesh.

Diagnosis: First antennal segment longer than head; female abdomen about as long as pronotum and mesonotum together, slightly longer in males; middle legs much longer than hind legs; lateral margins of head ochraceous or stramineous; pronotum short and transverse with a large central yellow spot; anterior margin truncate but posterior margin moderately convex; apex of pronotum convex.

Distribution: India: Andhra Pradesh (New record); Chandigarh, Karnataka, Madhya Pradesh, Pondicherry, Tamil Nadu, Tripura, Uttar Pradesh and West Bengal (Chandra et al. 2020). **Elsewhere:** Myanmar and Vietnam (Chandra et al. 2020).

Remark: This species was collected along with two other Gerridae i.e. *C. Productus* Spinola, 1840 and *M. Communis* Distant, 1910 skating over the surface of the lake. The collection site is located at the foothills of the Ananthagiri Hill ranges of Andhra Pradesh at a distance of nearly 70 km from Visakhapatnam city.

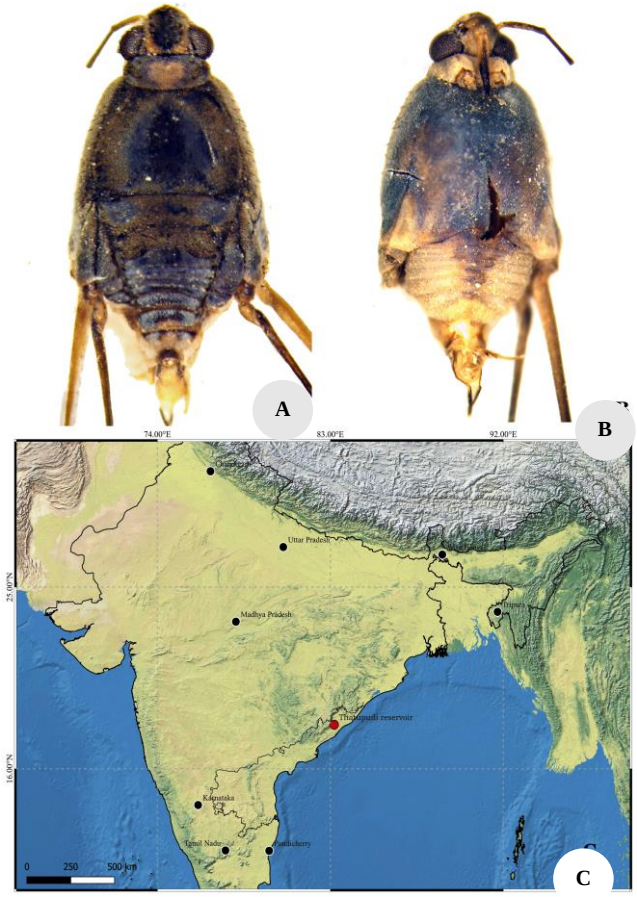

Figure 6. A-B. *Naboandelus signatus* Distant, 1910; Male habitus (A. Dorsal view, B. Ventral view); C. Distribution throughout India

Discussion

The family Gerridae, comprising semi-aquatic beetles commonly known as water striders, has been studied in the Eastern Ghats of Telangana and northern Andhra Pradesh. A total of 659 specimens have been collected from the aforementioned collection locations, and during this study, a total of sixteen species from the thirteen genera and seven subfamilies of the family Gerridae were identified. Moreover, nine species will be added to the state fauna of Andhra Pradesh: *O. Rhexenor*, *C. Productus*, *G. Nepalensis*, *N. Signatus*, *A. Kumari*, *P. Agriodes*, *M. Communis*, *V. Aquarius*, and *T. Nicobarensis*. The *P. Agriodes* was the most abundant species compared to the other 15 species that were identified, with *L. Fossarum fossarum* and *M. Communis* coming in second and third, respectively (Figure 3) (Karuthapandi and Jaiswal 2021). There have been specimens of these three species found at almost every collection site. The least common species from Andhra Pradesh were *N. Signatus* and *N. Parvulus*, only collected each of these species from one location in Andhra Pradesh. Another species *M. Communoides* had been collected from a single collection location as Mallelatheertham waterfalls in Telangana. Species list according to the all collection locations have been discussed in Table 2. *M. Communoides* is an endemic species reported from Tamil Nadu, India, and latter extended its distributional range to Madhya Pradesh, Odisha and Telangana (Chandra et al. 2020). There was a greater species diversity in collections locations that were undisturbed by humans or any other nuisance as opposed to disturbed locations like lakes or waterfalls where disturbance was more due to tourism.

The *T. Nicobarensis* was first described from the Andaman Islands, by Andersen (Andersen 1964). Jehamalar and Chandra (2013a,b) reviewed this genus from India and documented three species, in which *T. Nicobarensis* is restricted to the Andaman Islands. Earlier studies by Jehalamar and Chandra (2020) suggested the reported 5 species from India, *T. Nicobarensis* and *T. Venkataramani* Jehamalar and Chandra, 2013 are exclusively distributed in the Andaman and Nicobar Islands, *T. Ceylonensis* Hungerford and Matsuda, 1962 distributed in the southern India and *T. Kuiterti* Hungerford and Matsuda, 1958 and *T. Aruli* Jehamalar and Chandra, 2020 exclusively from Meghalaya. Additionally, we are expanding *T. Nicobarensis* range into Eastern Ghats of the state of Andhra Pradesh. This species was only found in an isolated region in Papikonda National Park, in a swiftly moving rocky stream with water that fluctuates in temperature from 17 to 22 degree Celsius, depending on the season. From the previous records, it is clear about the preferred habitat of this species (Jehamalar and Chandra 2013, 2020), in mainly hilly small rocky streams at an altitude of 12 meters to 1045 meters above sea level.

The *V. Aquarius* was described by Distant in the year 1910 from Travancore in the Trivandrum district of Kerala. Later, the same species was reported from the original site by Thirumalai and also extended its distribution range in the Western Ghats of Tamil Nadu (Thirumalai 1986, 1999). The taxonomic revision of the oriental genus *Ventidius* was then undertaken by Chen and Zettel (1999), and also extended the distribution of *V. Aquarius* at Jog falls in the state of Karnataka as well as its type locality (Jehamalar and Chandra 2020). The *V. Aquarius* is the only species among the reported four species of this genus that has been documented from southern India (Thirumalai 2002), and we are expanding its range to include the Eastern Ghats. Prior to this study, this species was reported only from the three states of Kerala, Karnataka and Tamil Nadu, though many studies have been undertaken in the parts of Indian region (Thirumalai 1999, 2002, Thirumalai and Sharma 2008; Jehamalar and Chandra 2013a, 2013b, 2016, 2020), but there had been no record of this species from all of the study localities.

During the survey period, *N. Signatus*, a species that is rarely collected, was also found and collected from a single location in Andhra Pradesh. There are extremely few records from past research on the status of this species. According to earlier records, it is thought to have a rare distribution range that includes Pondicherry, one union territory, and four states: Karnataka, Tamil Nadu, Uttar Pradesh, and West Bengal (Bal and Basu 1994; Thirumalai 1999, 2002). The distribution of this species was only mentioned in Kolkata, West Bengal, and Burma (now Myanmar) by Bal and Basu (1994). Later, Thirumalai

(2002) worked on the Gerridae family and expanded this species range to include four more states mentioned above. Following that, Chandra et al. 2012 added another distribution from a single location in Sehore District of Madhya Pradesh. The *N. Signatus* is the only species from India that has been identified till date in this genus. We are expanding its distribution to include the Eastern Ghats even though it was previously documented from the Southern Indian region's Western Ghats (Thirumalai 2002).

The family Gerridae from the Eastern Ghats in northern Andhra Pradesh and Telangana has been evaluated for the first time in this publication. Comprehensive faunal research with a focus on this group, related with freshwater bodies, is necessary to highlight the real richness of aquatic and semi-aquatic Hemipterans throughout the Eastern Ghats and to aid in the protection of their natural habitat resources.

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