

Aquatic beetles (Dytiscidae, Gyrinidae, Haliplidae, Hydrophilidae, Noteridae) of the Papikonda National Park from the Eastern Ghats, Andhra Pradesh, India

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ABSTRACT: The study documents 53 species of aquatic coleoptera belonging to 20 genera and 5 families (Dytiscidae, Gyrinidae, Haliplidae, Hydrophilidae and Noteridae) from Papikonda National Park, Andhra Pradesh, India for the first time. *Hydrobiomorpha spinicollis nordica* Mouchamps, 1959, *Lacconectus fulvescens* Motschulsky, 1855 and *Peschetius nilssoni* (Sheth, Ghate, Dahanukar and Hájek, 2021), are recorded for the first time from the state of Andhra Pradesh, India. Among the reported 53 species, five species, *Cybister rugulosus* (Redtenbacher, 1844), *L. regimbarti* Brancucci, 1986, *P. nilssoni* *P. toxophorus* Guignot, 1942 and *Gyrinus convexusculus* Macleay, 1871, have been noted as endemic to India. The most common and widespread species in the national park are *Hydroglyphus flammulatus* (Sharp, 1882), *Hydaticus discindens* Walker, 1858 and *Sternolophus acutipenis* (Nasserzadeh and Komarek, 2017). The study showed that temporary pools are holding more species than permanent water bodies. The zoogeographical distribution of all the species is also given.

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KEY WORDS: Faunistics, freshwater ecosystem, Papi hills, new records, endemic species, distributional records

INTRODUCTION

Beetles belong to the largest animal order Coleoptera, with more than 400,000 known species globally (Grove and Stork, 2001). The majority of the coleopterans are terrestrial, even though a great number are adapted to aquatic life. Aquatic beetles occur in almost all aquatic habitats except oceans. The diversity of aquatic beetles can be rich in lentic

habitats such as lakes, reservoirs, tanks, ponds and pools. Globally, more than 13000 species of aquatic beetles have been described, making them one of the most successful and adapted groups in the aquatic ecosystem (Short, 2017). So far, 786 species belonging to 137 genera, 17 families, and three suborders have been documented from India (Chandra *et al.*, 2017; Sheth *et al.*, 2018, 2020, 2021; Gupta *et al.*, 2024). Among these, the family

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Dytiscidae has the highest number of species, followed by Hydrophilidae, Gyrinidae, Noteridae, and Haliphilidae. Although diverse, state level documentation is still limited, with only 55 species of aquatic beetles recorded from Andhra Pradesh, India (Shankar *et al.*, 2023; Mukhopadhyay 2007; Mukhopadhyay and Ghosh, 2007; Ghosh and Nilsson, 2012) highlighting a considerable gap in regional biodiversity assessment.

MATERIALS AND METHODS

Papikonda National Park is located in the Eastern Ghats hill range of Papi Hills in the district of Alluri Sitaramaraju, Andhra Pradesh. It covers an area of about 1,012.86 km² and lies between 18°49'20"N to 19°18'14"N - 79°54'13"E to 83°23'35"E (Gujja *et al.*, 2006). The river Godavari passes through the national park, providing habitat for many aquatic fauna and flora (Rahmani *et al.*, 2016). The forest is moist deciduous to dry deciduous (Champion and Seth, 1968). The exploration and documentation of aquatic beetles from Papikonda National Park are limited, hence the present study aims to document the diversity of aquatic beetles in Papikonda National Park, Andhra Pradesh, India.

Aquatic beetles were collected from different habitats in Papikonda National Park, including temporary pools, ponds, streams and reservoirs (Figs. A, B, Table 1). An aquatic D-shaped net and common strainer were used to collect the aquatic beetles, which were subsequently preserved in 70 percent ethanol. The specimens were observed, dissected, and photographed with a Leica M205A (Germany). Combine ZP software used to stack several images to prepare the final image. Male genitalia were chosen for species identification. Original descriptions and reliable identification keys were followed to identify the species (Vazirani, 1968, 1984; Gustafson and Miller, 2015, 2017; Sheth *et al.*, 2018; Sheth *et al.*, 2021; Jaiswal *et al.*, 2021, 2022 a, b, 2023; Shankar *et al.*, 2023). Identified specimens were registered and deposited in the National Zoological Collections of the Zoological Survey of India, Freshwater Biology Regional Centre, Hyderabad, Telangana, India.

RESULTS AND DISCUSSION

A total of 53 species were recorded from the Papikonda National Park, Andhra Pradesh, India. The family Dytiscidae (30 species) comprises the highest number of species, followed by Hydrophilidae (13 species), Gyrinidae (6 species), Noteridae (3 species), and Haliphilidae (1 species). Three species namely, *Hydrobiomorpha spinicollis nordica* Mouchamps, 1959, *Lacconectus fulvescens* Motschulsky, 1855 and *Peschetius nilssoni* (Sheth, Ghate, Dahanukar and Hájek, 2021) are recorded for the first time from Andhra Pradesh and five species from the current collections, namely: *Cybister rugulosus* (Redtenbacher, 1844), *Lacconectus regimbarti* Brancucci, 1986, *Peschetius nilssoni* (Sheth, Ghate, Dahanukar and Hájek, 2021), *Peschetius toxophorus* Guignot, 1942 and *Gyrinus convexiusculus* Macleay, 1871 are noted as endemic species to India. The most common and widespread species in national park are *Hydroglyphus flammulatus* (Sharp, 1882), *Hydaticus discindens* Walker, 1858, *Sternolophus acutipenis* (Nasserzadeh and Komarek, 2017). Some species have been noted as rare, for example: *Laccophilus ceylonicus* Zimmermann, 1919, *Peschetius nilssoni* (Sheth, Ghate, Dahanukar and Hájek, 2021), *Hyphydrus renardi* Severin, 1890, *Hydaticus luczonicus* Aubé, 1838, *Cybister rugulosus* (Redtenbacher, 1844), *Dineutus (Cyclous) unidentatus* Aubé, 1838, *Coelostoma bhutanicum* Jayaswal, 1972.

Family: Dytiscidae Leach, 1815;

Subfamily: Copelatinae Branden, 1885

Genus: Copelatus Erichson, 1832

1. *Copelatus mysorensis* Vazirani, 1970 (Figs. 1, 54)

Material examined: 1 ♂, 2 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2459; 1 ♀, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2567; 1 ♂, Pond near Kintukuru Base Camp, 17°29'58.56"N, 81°35'5.28"E, 30.vii.2022, FBRC/ZSI/INS/3288, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Telangana], Sri Lanka, Thailand) (Ghosh and Nilsson, 2012; Sheth *et al.*, 2018; Shankar *et al.*, 2023; Nilsson and Hájek, 2024a).

2. *Copelatus sociennus* Balfour-Browne, 1952 (Figs. 2, 55)

Material examined: 1 ♂, Pond near Kintukuru Base Camp, 17°29'58.56"N, 81°35'5.28"E, 30.vii.2022, FBRC/ZSI/INS/3289; 1 ♂, 3 ♀, Pond near Gumpenagandi, 17°45'58.68"N, 81°46'31.44"E, 19.vii.2021, FBRC/ZSI/INS/3853, S. Shankar and Jaiswal, D leg.

Distribution: Oriental region (India [Andhra Pradesh, Telangana], Sri Lanka); Palaearctic Region (China, India [Uttarakhand], Nepal) (Ghosh and Nilsson, 2012; Sheth *et al.*, 2018; Shankar *et al.*, 2023; Nilsson and Hájek, 2023).

Genus: *Lacconectus* Motschulsky, 1855

3. *Lacconectus fulvescens* Motschulsky, 1855 (Figs. 3, 56)

Material examined: 5 ♂, 6 ♀, Stream near Kondavada, 17°28'1.56"N, 81°42'30.24"E, 5.xii.2021, FBRC/ZSI/INS/3833, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Assam, Manipur, Meghalaya, Odisha, Tamil Nadu, West Bengal], Indonesia, Malaysia, Myanmar); Palaearctic Region (India [Sikkim]) (Ghosh and Nilsson, 2012; Nilsson and Hájek, 2024a).

Remarks: Recorded for the first time from Andhra Pradesh.

4. *Lacconectus regimbarti* Brancucci, 1986 (Figs. 4, 57)

Material examined: 1 ♂, 1 ♀, Pond near Thurruru, 17°28'1.56"N, 81°42'30.24"E, 7.xii.2021, FBRC/ZSI/INS/3836, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Kerala, Tamil Nadu] (Ghosh and Nilsson,

2012; Nilsson and Hájek, 2024a)

Subfamily: Dytiscinae Leach, 1815

Genus: *Cybister* Curtis, 1827

5. *Cybister convexus* Sharp, 1882 (Figs. 5, 58)

Material examined: 1 ♂, Pond near Thurruru, 17°38'19.32"N, 81°44'16.8"E, 7.xii.2022, FBRC/ZSI/INS/3837, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Assam, Telangana, Manipur, Meghalaya, Uttar Pradesh, West Bengal]); Palaearctic Region (China, India [Sikkim]) (Ghosh and Nilsson, 2012; Shankar *et al.*, 2023; Nilsson and Hájek, 2024a).

6. *Cybister rugulosus* (Redtenbacher, 1844) (Figs. 6, 59)

Material examined: 1 ♂, Pond near Gumpenagandi, 17°45'58.68"N, 81°46'31.44"E, 19.vii.2021, FBRC/ZSI/INS/3957, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Jharkhand, Madhya Pradesh, Maharashtra, West Bengal]); Palaearctic Region (India [Jammu and Kashmir]) (Ghosh and Nilsson, 2012; Nilsson and Hájek, 2024a).

7. *Cybister tripunctatus lateralis* (Fabricius, 1798) (Figs. 7, 60)

Material examined: 1 ♂, 1 ♀, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 14.VII.2021, FBRC/ZSI/INS/2450; 2 ♂, 4 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.VII.2021, FBRC/ZSI/INS/2460; 1 ♀, Pond near GM Vallasa, 17°35'21.12"N, 81°38'56.04"E, 31.VII.2022, FBRC/ZSI/INS/3286, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, Bhutan, India [Andaman and Nicobar Islands, Andhra Pradesh, Assam, Delhi, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal], Myanmar, Sri Lanka); Palaearctic Region (Azerbaijan, Afghanistan, Arab

Emirates, Bhutan, China, Cyprus, India [Himachal Pradesh, Jammu and Kashmir, Sikkim, Uttarakhand], Iran, Iraq, Japan, Kyrgyzstan, Mongolia, Nepal, Pakistan, Russia, Syria, Tajikistan, Turkmenistan, Turkey, Uzbekistan) (Ghosh and Nilsson, 2012; Jaiswal *et al.*, 2022a; Nilsson and Hájek, 2024a).

Genus: *Eretes* Castelnau, 1833

8. *Eretes griseus* (Fabricius, 1781) (Figs. 8, 61-61a)

Material examined: 1 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2458; 1 ♂, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2565; 1 ♂, Pond near Kintukuru Base Camp, 17°29'58.56"N, 81°35'5.28"E, 30.vii.2022, FBRC/ZSI/INS/3287; 1 ♀, Stream near Maredmalli coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3308, S. Shankar and Jaiswal, D leg.

Distribution: Afrotropical Region (Botswana, Kenya, Namibia, Sudan, South Africa, Zimbabwe); Nearctic Region (Mexico, USA); Neotropical Region (Ecuador, Peru, Puerto Rico, Venezuela); Oriental Region (Bangladesh, India [Andhra Pradesh, Assam, Bihar, Goa, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal], Myanmar, Thailand, Sri Lanka); Palaearctic Region (Afghanistan, Algeria, Canary Islands, Cyprus, Egypt, India [Himachal Pradesh, Sikkim, Uttarakhand, Iran, Kazakhstan, Qatar, Nepal, Pakistan [Quetta], Saudi Arabia, Tajikistan, Turkey, Turkmenistan, United Arab Emirate, Yemen) (Miller, 2002; Ghosh and Nilsson, 2012; Nilsson and Hájek, 2023).

Remarks: The genus *Eretes* Laporte, 1833 was revised by Miller (2002), who recognized four species worldwide. Among them, *Eretes griseus* (Fabricius, 1781) is reported from India. Prior to this revision, earlier authors had recorded two species, *E. sticticus* and *E. griseus*, from the country (Ghosh and Nilsson, 2012). However, Miller

(2002) confirmed that only a single species, *E. griseus*, occurs in India.

Genus: *Hydaticus* Leach, 1817

9. *Hydaticus discindens* Walker, 1858 (Figs. 9, 63)

Material examined: 1 ♀, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 19.xi.2019, FBRC/ZSI/INS/2079; 4 ♂, 2 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2456; 2 ♂, 5 ♀, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 4.xii.2021, FBRC/ZSI/INS/2735; 3 ♀, Pond near Thurruru, 17°28'1.56"N, 81°42'30.24"E, 7.xii.2021, FBRC/ZSI/INS/2657; 1 ♂, 1 ♀, Jalatarangini Waterfall, 17°37'13.08"N, 81°39'39.24"E, 1.viii.2022, FBRC/ZSI/INS/3295; 3 ♂, Stream near Maredmalli coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3332, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Odisha, Tamil Nadu, Telangana], Sri Lanka); Palaearctic Region (Bhutan) (Ghosh and Nilsson, 2012; Wewalka, 2016; Nilsson and Hájek, 2023).

10. *Hydaticus luczonicus* Aubé, 1838 (Figs. 10, 64)

Material examined: 1 ♂, Pond near Kintukuru Base Camp, 17°29'58.56"N, 81°35'5.28"E, 30.vii.2022, FBRC/ZSI/INS/3291, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Cambodia, Bhutan, India [Andaman and Nicobar Islands, Andhra Pradesh, Bihar, Delhi, Goa, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Odisha, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal], Indonesia, Laos, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Thailand, Vietnam); Palaearctic Region (India [Himachal Pradesh, Uttarakhand]) (Ghosh and Nilsson, 2012; Nilsson and Hájek, 2023).

11. *Hydaticus ricinus* Wewalka, 1979 (Figs. 11, 65)

Material examined: 1 ♂, Pond near, Kutrawada, 17°40'4.8"N, 81°44'12.12"E, 23.xi.2019, FBRC/

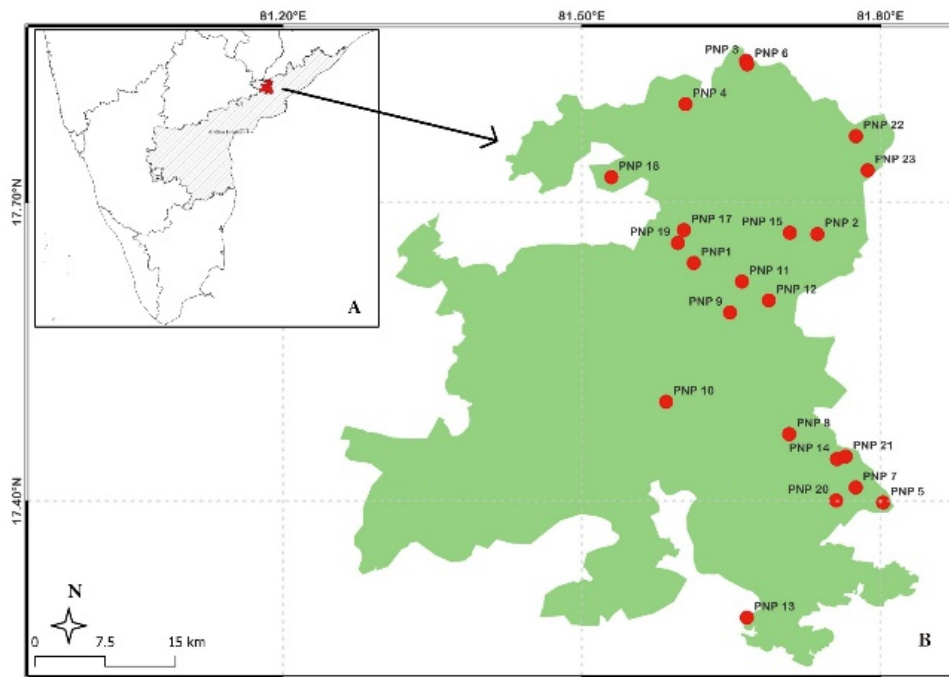


Fig. A - Papikonda National Park in Andhra Pradesh, India; B- Showing survey locations

ZSI/INS/2074; 3 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2463; 1 ♂, 1 ♀, Jalatarangini Waterfall, 17°37'13.08"N, 81°39'39.24"E, 1.viii.2022, FBRC/ZSI/INS/3294; 3 ♂, 7 ♀, Stream near Maredmali coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3331; 1 ♂, 4 ♀, Pond near Bhupathipalem Reservoir, 17°26'31.3"N, 81°45'23.2"E, 14.VII.2021, FBRC/ZSI/INS/3825, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Brunei, Cambodia, India [Andhra Pradesh, Assam, Dadra and Nagar Haveli, Gujarat, Maharashtra, Odisha, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal], Indonesia, Laos, Malaysia, Myanmar, Singapore, Sri Lanka, Thailand, Vietnam); Palearctic Region (Afghanistan, Bhutan, China, India [Arunachal Pradesh, Himachal Pradesh, Uttarakhand], Nepal, Pakistan [Khyber Pakhtunkhwa, Sindh]) (Ghosh and Nilsson, 2012; Mustafa and Zubair, 2015; Jaiswal *et al.*, 2022a; Nilsson and Hájek, 2023).

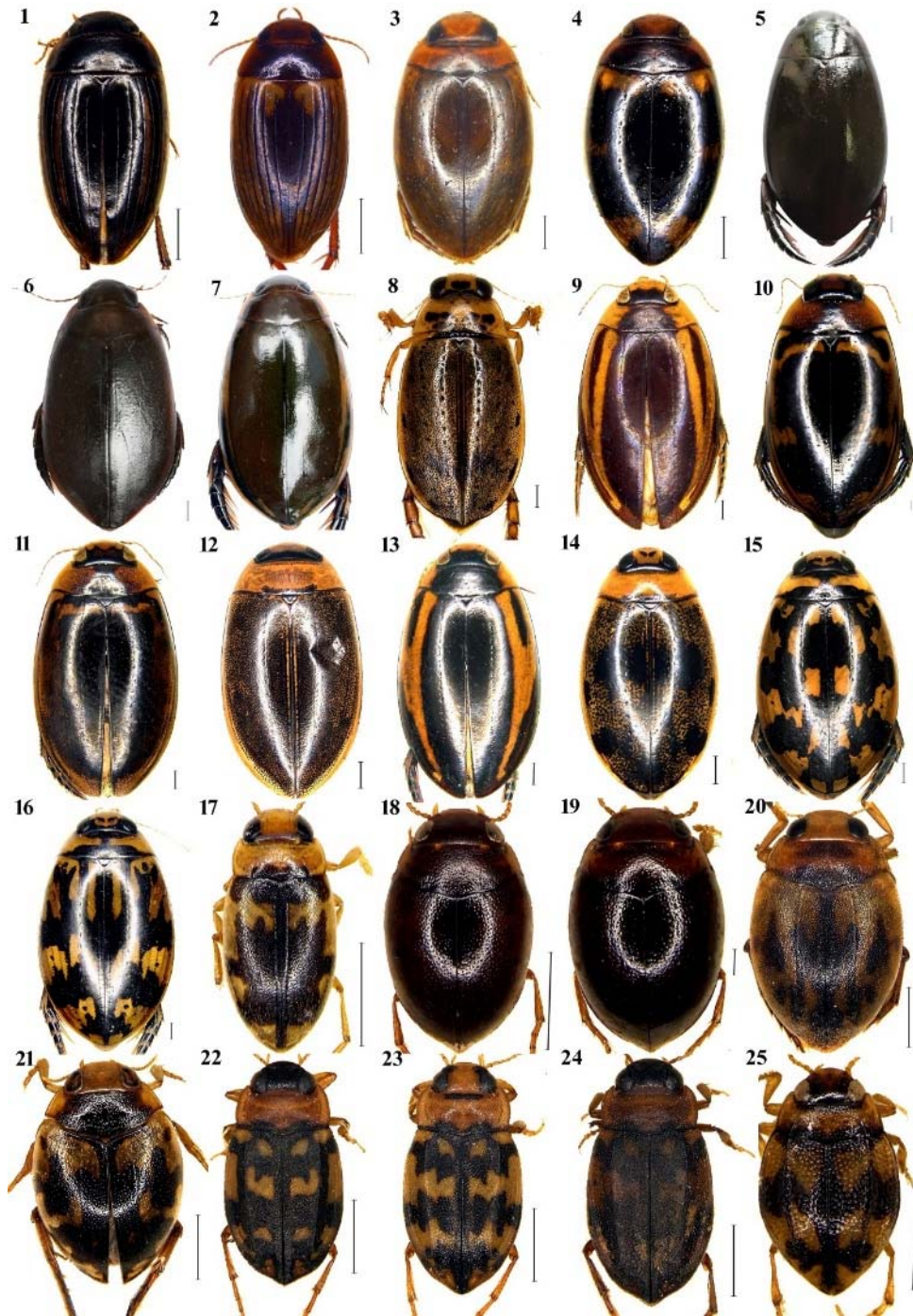
12. *Hydaticus bipunctatus* Wehncke, 1876. (Figs. 12, 62)

Material examined: 1 ♂, Stream near Maredmali coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3336, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Bihar, Dadra and Nagar Haveli, Delhi, Goa, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Sikkim, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal], Indonesia, Laos, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam); Palearctic Region (Bhutan, China, India [Assam, Arunachal Pradesh, Himachal Pradesh, Sikkim, Uttarakhand], Japan, Nepal, Oman, Taiwan) (Ghosh and Nilsson, 2012; Wewalka, 2020, Jaiswal *et al.*, 2022a, Nilsson and Hájek, 2023).

13. *Hydaticus vittatus vittatus* (Fabricius, 1775) (Figs. 13, 66)

Material examined: 1 ♂, 3 ♀, Pond near Chilakavidhi, 17°43'55.2"N, 81°47'13.92"E, 19.xi.2019, FBRC/ZSI/INS/2077; 2 ♀, Pond near Boduluru, 17°50'18.6"N, 81°39'58.32"E, 20.xi.2019, FBRC/ZSI/INS/2078, S. Shankar and



Figs. 1-25 General habitus of aquatic beetles collected from Papikonda National Park. (1). *Copelatus mysorensis*; (2). *C. sociennus*; (3). *Lacconectus fulvescens*; (4). *L. regimbarti*; (5). *Cybister convexus*; (6). *C. rugulosus*; (7). *C. tripunctatus lateralis*; (8). *Eretes griseus*; (9). *Hydaticus bipunctatus*; (10). *H. discindens*; (11). *H. luczonicus*; (12). *H. ricinus*; (13). *H. vittatus vittatus*; (14). *Rhantaticus congestus*; (15). *Sandracottus dejeanii*; (16). *S. festivus*; (17). *Hydroglyphus flammulatus*; (18). *Hydrovatus acuminatus*; (19). *H. seminarius*; (20). *Hyphyrus intermixtus*; (21). *H. renardi*; (22). *Peschetius nilssoni*; (23). *P. quadricostatus*; (24). *P. toxophorus*; (25). *Yola consanguinea*. (Scale= 1mm)

Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, Cambodia, India [Andaman and Nicobar Islands, Andhra Pradesh, Pradesh, Assam, Bihar, Gujarat, Jharkhand, Kerala, Lakshadweep, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Pondicherry, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal], Indonesia, Laos, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam); Palaearctic Region (Bhutan, China, India [Himachal Pradesh, Jammu and Kashmir, Sikkim, Uttarakhand], Japan, South Korea, Nepal, Taiwan) (Ghosh and Nilsson, 2012; Wewalka, 2020; Nilsson and Hájek, 2023).

Genus: *Rhantaticus* Sharp, 1882

14. *Rhantaticus congestus* (Klug, 1832) (Figs. 14, 67)

Material examined: 2 ♂, 1 ♀, Pool near GM Vallasa, 17°35'5.64"N, 81°40'37.92"E, 19.vii.2021, FBRC/ZSI/INS/3841, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, India [Andhra Pradesh, Delhi, Jharkhand, Madhya Pradesh, Maharashtra, Manipur, Odisha, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal], Philippines); Palaearctic Region (China, India [Arunachal Pradesh, Himachal Pradesh, Uttarakhand], Egypt, Japan, Nepal, Saudi Arabia, Taiwan) (Ghosh and Nilsson, 2012).

Genus: *Sandracottus* Sharp, 1882

15. *Sandracottus dejeanii* (Aube, 1838) (Figs. 15, 68)

Material examined: 1 ♀, Pond near, Kutrawada, 17°40'4.8"N, 81°44'12.12"E, 19.xi.2019, FBRC/ZSI/INS/2075; 1 ♂, 1 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2469, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Goa, Gujarat, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Telangana, Tamil Nadu, Uttar Pradesh, West Bengal]); Palaearctic Region (India [Arunachal Pradesh, Himachal Pradesh, Sikkim], Iran,

Pakistan) (Ghosh and Nilsson, 2012; Jaiswal *et al.*, 2022a).

16. *Sandracottus festivus* (Illiger, 1801) (Figs. 16, 69)

Material examined: 1 ♂, 4 ♀, Pond near, Kutrawada, 17°40'4.8"N, 81°44'12.12"E, 15.xi.2019, FBRC/ZSI/INS/2076, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Nagaland, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal], Indonesia, Myanmar, Vietnam); Palaearctic Region (China, India [Himachal Pradesh, Sikkim, Uttarakhand], Japan, South Korea) (Ghosh and Nilsson, 2012; Jaiswal *et al.*, 2020, Nilsson and Hájek, 2023).

Subfamily: *Hydroporinae* Aubé, 1836

Genus: *Hydroglyphus* Motschulsky, 1853

17. *Hydroglyphus flammulatus* (Sharp, 1882) (Figs. 17, 70)

Material examined: 1 ♂, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2462; 6 ♂, 12 ♀, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2566; 1 ♂, 2 ♀, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/3056; 2 ♂, 6 ♀, Pond near Kintukuru Base Camp, 17°29'58.56"N, 81°35'5.28"E, 30.vii.2022, FBRC/ZSI/INS/3290; 1 ♂, 5 ♀, Stream near Maredmali coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3333; 2 ♀, Polavaram, 17°16'58.08"N, 81°39'57.24"E, 29.iii.2023, FBRC/ZSI/INS/3715; 1 ♂, 1 ♀, Pond near Bhupathipalem Reservoir, 17°26'31.3"N, 81°45'23.2"E, 14.vii.2021, FBRC/ZSI/INS/3826; 5 ♂, 3 ♀, Pond near Bhupathipalem Reservoir, 17°26'31.3"N, 81°45'23.2"E, 13.vii.2021, FBRC/ZSI/INS/3852, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, Cambodia, India [Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Kerala, Madhya Pradesh, Maharashtra, Manipur, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Tripura, Uttar Pradesh,

West Bengal], Myanmar, Indonesia, Sri Lanka, Thailand, Vietnam); Palaearctic Region (China, India [Himachal Pradesh, Jammu and Kashmir, Sikkim, Uttarakhand], Iran, Japan, Nepal, Pakistan [Khyber Pakhtunkhwa, Sindh], South Korea, Taiwan) (Ghosh and Nilsson, 2012; Mustafa and Zubair, 2015; Nilsson and Hájek, 2023; 2024a).

Genus: *Hydrovatus* Motschulsky, 1853

18. *Hydrovatus acuminatus* Motschulsky, 1859 (Figs. 18, 71)

Material examined: 1 ♂, 1 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2468; 2 ♂, 3 ♀, Bupathipalem Reservoir, Rampachodavaram, 17°26'42.72"N, 81°45'59.04"E, 14.vii.2021, FBRC/ZSI/INS/2810; 1 ♂, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/3057, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Cambodia, India [Andaman and Nicobar Islands, Andhra Pradesh, Assam, Delhi, Jharkhand, Kerala, Odisha, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal], Indonesia, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand, Vietnam); Palaearctic Region (China, Egypt, Iran, Iraq, Israel, Japan, Libya, Nepal, Oman, Pakistan [Balochistan], Saudi Arabia, South Korea, Syria, Taiwan, Turkey, Yemen); Afrotropical Region (Chad, Comoros, Democratic Republic of the Congo, Ethiopia, Gambia, Ghana, Guinea Bissau, Kenya, Madagascar, Malawi, Mauretania, Mauritius, Mozambique, Nigeria, Senegal, Somalia, South Africa, Seychelles, Sudan, Tanzania, Uganda) (Biström, 1997, Ghosh and Nilsson, 2012, Nilsson and Hájek, 2024a).

19. *Hydrovatus seminarius* Motschulsky, 1859 (Figs. 19, 72)

Material examined: 6 ♂, 11 ♀, Pond near Peddur, 17°24'48.6"N, 81°46'30.72"E, 16.xii.2021, FBRC/ZSI/INS/2813; 2 ♀, Pond near Ijjaluru, 17°39'32.76"N, 81°35'47.4"E, 18.vii.2021, FBRC/ZSI/INS/3843, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, India [Andaman and Nicobar Islands, Andhra Pradesh, Assam, Gujarat, Jharkhand, Kerala, Odisha, Rajasthan, Tamil Nadu, West Bengal], Indonesia, Laos, Malaysia, Myanmar, Sri Lanka, Thailand, Vietnam); Palaearctic Region (Bhutan, China, Japan, Nepal, Pakistan, Taiwan) (Ghosh and Nilsson, 2012).

Genus: *Hyphydrus* Illiger, 1802

20. *Hyphydrus intermixtus* (Walker, 1858) (Fig. 20, 73)

Material examined: 1 ♂, Stream near Pamuleru Vagu, 17°40'09.8"N, 81°42'32.4"E, 15.xii.2021, FBRC/ZSI/INS/3832, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Gujarat, Kerala, Maharashtra, Rajasthan, Tamil Nadu], Sri Lanka) (Ghosh and Nilsson, 2012)

21. *Hyphydrus renardi* Severin, 1890 (Figs. 21, 74)

Material examined: 2 ♂, 1 ♀, Pond near Chilakavidhi, 17°43'55.2"N, 81°47'13.92"E, 19.vii.2021, FBRC/ZSI/INS/3854, S. Shankar and Jaiswal, D leg.

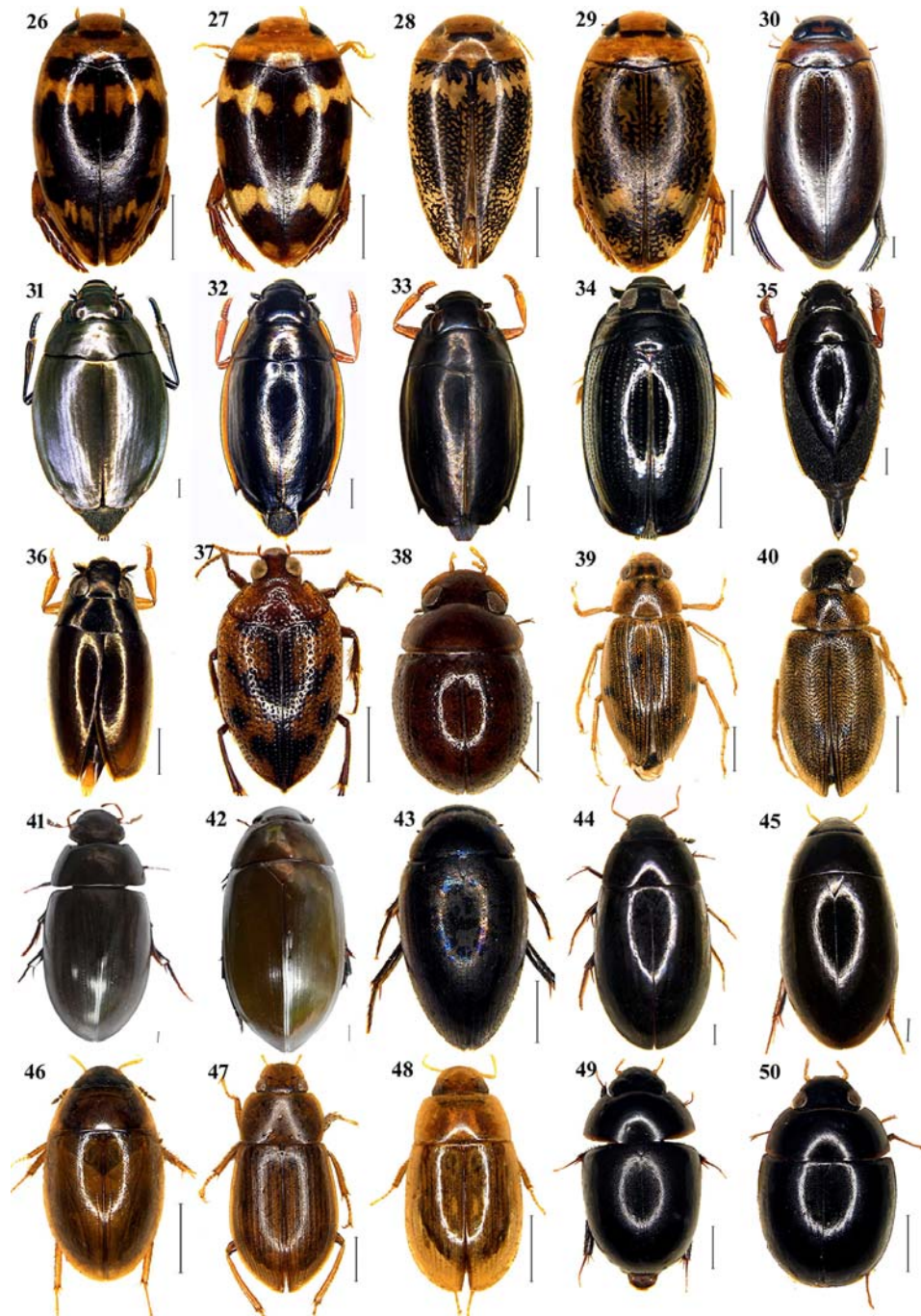
Distribution: Oriental Region (Bangladesh, Bhutan, India [Andhra Pradesh, Assam, Bihar, Gujarat, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Odisha, Rajasthan, Sikkim, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand, West Bengal], Myanmar, Nepal, Pakistan, Sri Lanka); Palaearctic Region (India [Himachal Pradesh, Jammu and Kashmir, Sikkim, Uttarakhand], Nepal, Pakistan) (Ghosh and Nilsson, 2012; Jaiswal *et al.*, 2022a).

Genus: *Peschetius* Guignot, 1942

22. *Peschetius nilssoni* Sheth, Ghate, Dahanukar and Hájek, 2021 (Figs. 22, 75)

Material examined: 1 ♂, 1 ♀, Pond near Chilakavidhi, 17°43'55.2"N, 81°47'13.92"E, 19.vii.2021, FBRC/ZSI/INS/3856, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra



Figs. 26-50 General habitus of aquatic beetles collected from Papikonda National Park. (26). *Laccophilus anticatus anticatus*; (27). *L. ceylonicus*; (28). *L. parvulus parvulus*; (29). *L. sharpi*; (30). *Rhantus taprobanicus*; (31). *Dineutus (Cyclous) indicus*; (32). *D. (C.) spinosus*; (33). *D. (C.) unidentatus*; (34). *Gyrinus convexiusculus*; (35). *Patrus discifer*; (36). *Patrus limbatus*; (37). *Haliphus (Liaphlus) arrowi*; (38). *Amphiops mater*; (39). *Berosus indicus*; (40). *B. pulchellus*; (41). *Hydrobiomorpha spinicollis nordica*; (42). *Hydrophilus olivaceus*; (43). *Regimbartia attenuate*; (44). *Sternolophus acutipenis*; (45). *S. rufipes*; (46). *Enochrus esuriens*; (47). *Helochares anchoralis*; (48). *H. pallens*; (49). *Coelostoma bhutanicum*; (50). *C. horni* (Scale= 1mm)

Pradesh, Madhya Pradesh, Maharashtra, Rajasthan]) (Sheth *et al.*, 2021).

Remarks: Recorded for the first time from the state of Andhra Pradesh, Endemic to India.

23. *Peschetius quadricostatus* (Aube, 1838) (Figs. 23, 76)

Material examined: 1 ♂, 2 ♀, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2452; 2 ♂, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2470; 1 ♀, Pond near Thurruru, 17°28'1.56"N, 81°42'30.24"E, 7.xii.2021, FBRC/ZSI/INS/2660, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Bihar, Goa, Gujarat, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Telangana, Rajasthan Uttar Pradesh, West Bengal]); Palaearctic Region (India [Himachal Pradesh], Iran, Nepal) (Ghosh and Nilsson, 2012; Jaiswal *et al.*, 2021; Nilsson and Hájek, 2024a).

24. *Peschetius toxophorus* Guignot, 1942 (Figs. 24, 77)

Material examined: 2 ♀, Bhupathipalem Reservoir,

Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2451, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Bihar, Gujarat, Jharkhand, Karnataka, Kerala, Maharashtra, Odisha, Tamil Nadu, Telangana]) (Ghosh and Nilsson, 2012; Jaiswal *et al.*, 2021; Sheth *et al.*, 2021; Nilsson and Hájek, 2024a).

Remarks: Species is endemic to India.

Genus: *Yola* Gozis, 1886

25. *Yola consanguinea* (Régimbart, 1892) (Figs. 25, 78)

Material examined: 1 ♂, Pond near Bhupathipalem Reservoir, 17°26'31.3"N, 81°45'23.2"E, 14.vii.2021, FBRC/ZSI/INS/3828, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Gujarat, Jharkhand, Maharashtra, Odisha, Telangana]), Palaearctic Region (Nepal) (Ghosh and Nilsson, 2012; Nilsson and Hájek, 2024a).

Subfamily: Laccophilinae Gistel, 1856

Genus: *Laccophilus* Leach, 1815



Figs. 51-53 General habitus of aquatic beetles collected from Papikonda National Park. (51). *Canthydrus laetabilis*; (52). *C. luctuosus*; (53). *Neohydrocoptus subvittulus* (Scale= 1mm)

26. *Laccophilus anticatus anticatus* Sharp, 1890 (Figs. 26, 79)

Material examined: 1 ♂, 1 ♀, Pond near Peddur, 17°24'48.6"N, 81°46'30.72"E, 16.xii.2021, FBRC/ZSI/INS/3958, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, India [Andhra Pradesh, Assam, Bihar, Delhi, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Manipur, Odisha, Puducherry, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal], Bangladesh, Indonesia, Sri Lanka); Palaearctic Region (India [Uttarakhand], Pakistan) (Ghosh and Nilsson, 2012; Nilsson and Hájek, 2024a).

27. *Laccophilus ceylonicus* Zimmermann, 1919 (Figs. 27, 80)

Material examined: 2 ♂, Pond near Chilakavidhi, 17°43'55.2"N, 81°47'13.92"E, 19.vii.2021, FBRC/ZSI/INS/3855, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andaman and Nicobar Islands, Andhra Pradesh, Karnataka, Kerala, Maharashtra, Nagaland, Odisha, Telangana, West Bengal], Myanmar, Sri Lanka) (Ghosh and Nilsson, 2012; Hájek and Brancucci, 2015).

28. *Laccophilus parvulus parvulus* Aubé, 1838 (Figs. 28, 81)

Material examined: 1 ♂, 1 ♀, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2455; 1 ♂, 3 ♀, Pond near Boduluru, 17°50'18.6"N, 81°39'58.32"E, 5.xii.2021, FBRC/ZSI/INS/2736, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, India [Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Delhi, Goa, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Odisha, Puducherry, Rajasthan, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal], Indonesia, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand, Vietnam); Palaearctic Region (Bhutan, China, India [Arunachal Pradesh, Himachal Pradesh, Sikkim,

Uttarakhand], Nepal, Pakistan) (Ghosh and Nilsson, 2012; Nilsson and Hájek, 2023a).

29. *Laccophilus sharpi* Régimbart, 1889 (Figs. 29, 82)

Material examined: 2 ♂, Pond near Kintukuru Base Camp, 17°29'58.56"N, 81°35'5.28"E, 30.vii.2022, FBRC/ZSI/INS/3292; 1 ♂, Stream near Maredmalli coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3337; 1 ♂, 1 ♀, Pond near Bhupathipalem Reservoir, 17°26'31.3"N, 81°45'23.2"E, 14.vii.2021, FBRC/ZSI/INS/3829; 1 ♀, Pond near Pamugandi, 17°24'1.44"N, 81°45'19.8"E, 17.vii.2021, FBRC/ZSI/INS/3851, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Haryana, Jharkhand, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Puducherry, Rajasthan, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal], Indonesia, Myanmar, Philippines, Sri Lanka, Vietnam); Palaearctic Region (China, Hong Kong, India [Himachal Pradesh, Jammu and Kashmir, Sikkim, Uttarakhand], Iran, Iraq, Japan, Nepal, Pakistan [Balochistan], Saudi Arabia, South Korea, Taiwan, Yemen); Australian Region (Australia) (Ghosh and Nilsson, 2012; Jaiswal *et al.*, 2022a; Nilsson and Hájek, 2023).

Subfamily: Colymbetinae Erichson, 1837

Genus: *Rhantus* Dejean, 1833

30. *Rhantus taprobanicus* Sharp, 1890 (Figs. 30, 83)

Material examined: 1 ♂, Stream near Lakkavaram Bridge, 17°43'30.7"N, 81°31'47.5"E, 20.xii.2021, FBRC/ZSI/INS/3840, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Bihar, Delhi, Gujarat, Jharkhand, Karnataka, Maharashtra, Manipur, Meghalaya, Puducherry, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal], Sri Lanka);

Palearctic Region (India [Himachal Pradesh, Jammu and Kashmir, Sikkim, Uttarakhand], Nepal, Pakistan) (Ghosh and Nilsson, 2012).

Family: Gyrinidae Latreille, 1810;

Subfamily: Gyrinae Latreille, 1810

Genus: *Dineutus* Macleay, 1825

Subgenus: *Dineutus (Cyclous)* Gustafson and Miller, 2017

31. *Dineutus (Cyclous) indicus* Aube, 1838 (Figs. 31, 84)

Material examined: 13♂, 20♀, Amruthadara Waterfall, 17°38'20.04"N, 81°36'45"E, 14.xi.2019, FBRC/ZSI/INS/2071; 4♀, Pond near, Kutrawada, 17°40'4.8"N, 81°44'12.12"E, 15.xi.2019, FBRC/ZSI/INS/2073; 1♂, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2461; 3♂, 8♀, Pond near Thurruru, 17°28'1.56"N, 81°42'30.24"E, 7.xii.2021, FBRC/ZSI/INS/2658; 1♂, 1♀, Stream near Maredmalli coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3307.

Distribution: Oriental Region (India [Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Odisha, Puducherry, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal]); Palearctic Region (India [Himachal Pradesh, Jammu and Kashmir], Pakistan) (Vazirani, 1984; Jaiswal *et al.*, 2023).

32. *Dineutus (Cyclous) spinosus* Fabricius, 1781 (Figs. 32, 85)

Material examined: 1♂, 2♀, Pond near Tiger Camp, 17°40'19.56"N, 81°36'9.36"E, 20.ix.2021, FBRC/ZSI/INS/3834, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, India [Andhra Pradesh, Assam, Bihar, Manipur, Meghalaya, Odisha, Tamil Nadu, Telangana, Uttar Pradesh, West Bengal], Malaysia, Myanmar, Thailand, Vietnam); Palearctic Region (Pakistan [Sindh]) (Vazirani, 1984; Mustafa and Zubair, 2015; Jaiswal *et al.*, 2023).

33. *Dineutus (Cyclous) unidentatus* Aubé, 1838 (Figs. 33, 86)

Material examined: 1♂, 1♀, Stream near Lakkavaram Bridge, 17°43'30.7"N, 81°31'47.5"E, 20.xii.2021, FBRC/ZSI/INS/3839, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Burma, India [Andhra Pradesh, Bihar, Madhya Pradesh, Kerala, Meghalaya, Odisha, Rajasthan, Tamil Nadu], Indonesia, Malaysia, Sri Lanka, Thailand) (Vazirani, 1984; Jaiswal *et al.*, 2023).

Genus: *Gyrinus* Geoffroy, 1762

34. *Gyrinus convexiusculus* Macleay, 1871 (Figs. 34, 87)

Material examined: 1♂, 1♀, Stream near Lakkavaram Bridge, 17°43'30.7"N, 81°31'47.5"E, 20.xii.2021, FBRC/ZSI/INS/3838, S. Shankar and Jaiswal, D leg.

Distribution: Australian (Australia); Oriental Region (India [Andhra Pradesh, Assam, Bihar, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Puducherry, Nagaland, Telangana, West Bengal]) (Vazirani, 1984; Jaiswal *et al.*, 2022a).

Genus: *Patrus* Aubé, 1838

35. *Patrus discifer* (Walker, 1859) (Figs. 35, 88)

Material examined: 9♂, 16♀, Stream near Pamuleru Vagu, 17°40'09.8"N, 81°42'32.4"E, 21.xi.2019, FBRC/ZSI/INS/2086, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Bihar, Kerala, Madhya Pradesh, Maharashtra, Tamil Nadu, West Bengal], Sri Lanka) (Vazirani, 1984).

36. *Patrus limbatus* Régimbart, 1883 (Figs. 36, 89)

Material examined: 1♂, 3♀, Amruthadara Waterfall, 17°38'20.04"N, 81°36'45"E, 14.xi.2019, FBRC/ZSI/INS/2082; 14♂, 19♀, Stream near Maredmalli coffee plantation, 17°36'5.04"N,

Table 1. Sampling locations of aquatic beetles from Papikonda National Park (PNP), (District - Alluri Sitaramaraju, Andhra Pradesh) from the Eastern Ghats of India

Location	Sampling location	Latitude	Longitude
PNP1	Amruthadara Waterfall	17°38'20.04"N	81°36'45"E
PNP2	Pond near Kutrawada	17°40'4.8"N	81°44'12.12"E
PNP3	Bhupathipalem Reservoir, Rampachodavaram	17°50'31.56"N	81°39'54.36"E
PNP4	Pond near Koyalagugam	17°47'54.6"N	81°36'15.48"E
PNP5	Stream near Palakaluwa	17°23'53.88"N	81°48'9.72"E
PNP6	Pond near Boduluru	17°50'18.6"N	81°39'58.32"E
PNP7	Pond near Peddur	17°24'48.6"N	81°46'30.72"E
PNP8	Pond near Thurruru	17°28'1.56"N	81°42'30.24"E
PNP9	Pool near GM Vallasa	17°35'21.12"N	81°38'56.04"E
PNP10	Pond near Kintukuru Base Camp	17°29'58.56"N	81°35'5.28"E
PNP11	Jalatarangini Waterfall	17°37'13.08"N	81°39'39.24"E
PNP12	Stream near Maredmalli coffee plantation	17°36'5.04"N	81°41'16.44"E
PNP13	Polavaram	17°16'58.08"N	81°39'57.24"E
PNP14	Pond near Bhupathipalem Reservoir	17°26'31.3"N	81°45'23.2"E
PNP15	Stream near Pamuleru Vagu	17°40'09.8"N	81°42'32.4"E
PNP16	Stream near Kondavada	17°28'1.56"N	81°42'30.24"E
PNP17	Pond near Tiger Camp	17°40'19.56"N	81°36'9.36"E
PNP18	Stream Lakkavaram Bridge	17°43'30.7"N	81°31'47.5"E
PNP19	Pond near Ijjaluru	17°39'32.76"N	81°35'47.4"E
PNP20	Pond near Pamugandi	17°24'1.44"N	81°45'19.8"E
PNP21	Pool near Rampachodavaram	17°26'40.56"N	81°45'54.36"E
PNP22	Pond near Gumpenagandi	17°45'58.68"N	81°46'31.44"E
PNP23	Pond near Chilakavidhi	17°43'55.2"N	81°47'13.92"E

81°41'16.44"E, 13.xi.2019, FBRC/ZSI/INS/2085; 2 ♂, 5 ♀, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 13.vii.2021, FBRC/ZSI/INS/2529; 1 ♀, Palakaluwa, 17°23'53.88"N, 81°48'9.72"E, 4.xii.2021, FBRC/ZSI/INS/3824, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Odisha, Tamil Nadu, Telangana, Uttar Pradesh],

Sri Lanka); Palaearctic Region (India [Himachal Pradesh] (Vazirani, 1984; Jaiswal *et al.*, 2022a).

Family: Haliplidae Aubé, 1836;

Subfamily: Haliplinae Aubé, 1836

Genus: *Haliplus* Latreille, 1802

37. *Haliplus* (*Liaphlus*) *arrowi* Guignot, 1936 (Figs. 37, 90)

Material examined: 1 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2466; 1 ♂, 1 ♀, Stream near Pamuleru Vagu, 17°40'09.8"N, 81°42'32.4"E, 15.xii.2021, FBRC/ZSI/INS/3835, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, India [Andhra Pradesh, Bihar, Maharashtra, Tamil Nadu, Uttar Pradesh, West Bengal], Laos, Myanmar); Palaearctic Region (Nepal, Pakistan) (Vazirani, 1984; Vondel, 1991; Sheth *et al.*, 2016).

Family: Hydrophilidae Latreille, 1802;

Subfamily: Hydrophilinae Latreille, 1802

Genus: *Amphiops* Erichson, 1843

38. *Amphiops mater* Sharp, 1873 (Figs. 38, 91)

Material examined: 4 ♂, 6 ♀, Pond near Chilakavidhi, 17°43'55.2"N, 81°47'13.92"E, 19.vii.2021, FBRC/ZSI/INS/3857, S. Shankar and Jaiswal, D leg.

Distribution: Australian (Australia); Oriental Region (Bangladesh, India [Andhra Pradesh, Delhi, Manipur, Sikkim, Telangana, West Bengal], Malaysia, Philippines, Sri Lanka, Vietnam); Palaearctic Region (China, India [Himachal Pradesh, Jammu and Kashmir], Iran, Japan, Nepal, South Korea) (Mukhopadhyay, 2015; PrzewoŹny, 2022).

Genus: *Berosus* Leach, 1817

39. *Berosus indicus* (Motschulsky, 1861) (Figs. 39, 92)

Material examined: 3 ♂, 7 ♀, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2449; 4 ♂, 1 ♀, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2564; 3 ♂, 2 ♀, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/3053; 1 ♂, 4 ♀, Polavaram, 17°16'58.08"N, 81°39'57.24"E, 29.iii.2023, FBRC/ZSI/INS/3713; 3 ♂, 2 ♀, Pond near Pamugandi, 17°24'1.44"N, 81°45'19.8"E,

17.vii.2021, FBRC/ZSI/INS/3847, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Bihar, Goa, Kerala, Jharkhand, Madhya Pradesh, Maharashtra, Manipur, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal]); Palaearctic Region (India [Jammu and Kashmir, Himachal Pradesh, Sikkim], Pakistan [Khyber Pakhtunkhwa, Sanghar]). (Mukhopadhyay, 2015; Mustafa and Zubair, 2015; Jaiswal *et al.*, 2022a).

40. *Berosus pulchellus* Macleay, 1825 (Figs. 40, 93)

Material examined: 4 ♂, 8 ♀, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2563; 3 ♀, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/3054; 4 ♀, Pond near Kintukuru Base Camp, 17°29'58.56"N, 81°35'5.28"E, 30.vii.2022, FBRC/ZSI/INS/3293; 3 ♂, 9 ♀, Stream near Maredmalli coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3334; 2 ♂, Polavaram, 17°16'58.08"N, 81°39'57.24"E, 29.iii.2023, FBRC/ZSI/INS/3714; 1 ♂, 1 ♀, Pond near Pamugandi, 17°24'1.44"N, 81°45'19.8"E, 17.vii.2021, FBRC/ZSI/INS/3848, S. Shankar and Jaiswal, D leg.

Distribution: Australian (Australia); Oriental Region (Bangladesh, India [Andhra Pradesh, Assam, Bihar, Delhi, Haryana, Kerala, Karnataka, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Nagaland, Punjab, Odisha, Puducherry, Rajasthan, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal], Indonesia, Malaysia, Myanmar, Philippines, Sri Lanka, Thailand, Vietnam); Palaearctic Region (China, Hong Kong, India [Jammu and Kashmir, Himachal Pradesh, Sikkim], Iran, Japan, Nepal, Taiwan) (Mukhopadhyay, 2015; PrzewoŹny, 2022; Jaiswal *et al.*, 2022a).

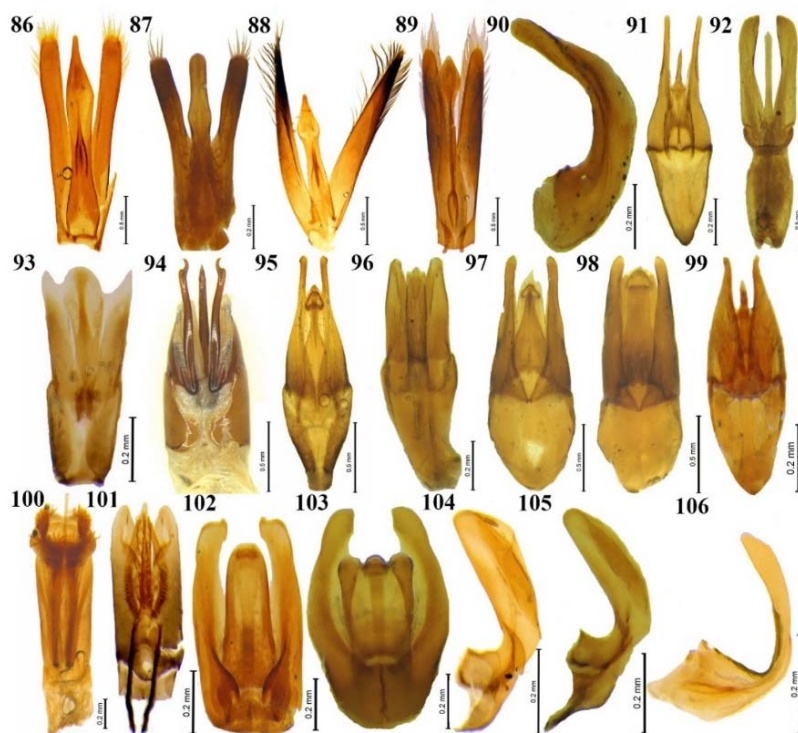
Genus: *Hydrobiomorpha* Blackburn, 1888

41. *Hydrobiomorpha spinicollis nordica* Mouchamps, 1959 (Figs. 41, 94)

Material examined: 2 ♂, 2 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E,



Figs. 54-85 Male genitalia of aquatic beetles collected from Papikonda National Park. (54). *Copelatus mysorensis*; (55). *C. sociennus*; (56). *Laconectus fulvescens*; (57). *L. regimbarti*; (58). *Cybister convexus*; (59). *C. rugulosus* (60). *C. tripunctatus lateralis*; (61- 61a). *Eretes griseus*; (62). *Hydaticus bipunctatus*; (63). *H. discindens*; (64). *H. luczonicus*; (65). *H. ricinus*; (66). *H. vittatus*; (67). *Rhantaticus congestus*; (68). *Sandracottus dejeanii*; (69). *S. festivus*; (70). *Hydroglyphus flammulatus*; (71). *Hydrovatus acuminatus*; (72). *H. seminarius*; (73). *Hyphydrus intermixtus*; (74). *H. renardi*; (75). *Peschetius nilssoni*; (76). *P. quadricostatus*; (77). *P. toxophorus*; (78). *Yola consanguinea*; (79). *Laccophilus anticatus anticatus*; (80). *L. ceylonicus*; (81). *L. parvulus parvulus*; (82). *L. sharpi*; (83). *Rhantus taprobanicus*; (84). *Dineutus (Cyclous) indicus*; (85). *D. (C.) spinosus*



Figs. 86-106 Male genitalia of aquatic beetles collected from Papikonda National Park. (86). *Dineutus*; (*C.*) *unidentatus*; (87). *Gyrinus convexiusculus*; (88). *Patrus discifer*; (89). *Patrus limbatus*; (90). *Haliphus* (*Liaphlus*) *arrowi*; (91). *Amphiops mater*; (92). *Berosus indicus*; (93). *B. pulchellus*; (94). *Hydrobiomorpha spinicollis nordica*; (95). *Hydrophilus olivaceus*; (96). *Regimbartia attenuata*; (97). *Sternolophus acutipenis*; (98). *S. rufipes*; (99). *Enochrus esuriens* (100). *Helochares anchoralis*; (101). *H. pallens*; (102). *Coelostoma bhutanicum*; (103). *C. horni*; (104). *Canthydrus laetabilis*; (105). *C. luctuosus*; (106). *Neohydrocoptus subvittulus*

15.vii.2021, FBRC/ZSI/INS/2465; 1 ♀, Pond near Ijjaluru, 17°39'32.76"N, 81°35'47.4"E, 18.vii.2021, FBRC/ZSI/INS/3858, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Chhattisgarh, Maharashtra, Madhya Pradesh, Odisha], (Bhutan, Nepal); Palaearctic Region (India [Himachal Pradesh]) (Ghosh *et al.*, 2021; Sonali *et al.*, 2025).

Genus: *Hydrophilus* Geoffroy, 1762

42. *Hydrophilus olivaceus* Fabricius, 1781 (Figs. 42, 95)

Material examined: 1 ♂, 2 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E,

22.xi.2019, FBRC/ZSI/INS/2080, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Maharashtra, Tamil Nadu, Telangana, West Bengal]); Palaearctic Region (Tonkin) (Mukhopadhyay, 2015; Jaiswal *et al.*, 2022a).

Genus: *Regimbartia* Zaitzev, 1908

43. *Regimbartia attenuata* (Fabricius, 1801) (Figs. 43, 96)

Material examined: 1 ♂, Palakaluwa, 17°23'53.88"N, 81°48'9.72"E, 4.xii.2021, FBRC/ZSI/INS/3822; 1 ♂, 2 ♀, Pond near Ijjaluru, 17°39'32.76"N, 81°35'47.4"E, 18.vii.2021, FBRC/ZSI/INS/3844, S. Shankar and Jaiswal, D leg.

Distribution: Australian (Australia); Oriental Region (India [Andhra Pradesh, Maharashtra, Manipur, Meghalaya, Punjab, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal], Indonesia, Philippines, Sri Lanka); Palaearctic Region (China, India [Jammu and Kashmir, Sikkim], Japan) (PrzewoŹny, 2022; Mukhopadhyay, 2015).

Genus: *Sternolophus* Solier, 1834

44. *Sternolophus acutipenis* (Nasserzadeh and Komarek, 2017) (Figs. 44, 97)

Material examined: 1 ♀, Pond near Tiger Camp, 17°40'19.56"N, 81°36'9.36"E, 22.xi.2019, FBRC/ZSI/INS/2088; 1 ♂, 1 ♀, Pond near Ijjaluru, 17°39'32.76"N, 81°35'47.4"E, 26.xi.2019, FBRC/ZSI/INS/2089; 2 ♂, 2 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2457; 1 ♂, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2568; 1 ♂, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 4.xii.2021, FBRC/ZSI/INS/2734; 1 ♀, Pond near Thurruru, 17°28'1.56"N, 81°42'30.24"E, 7.xii.2021, FBRC/ZSI/INS/2659; 1 ♂, 1 ♀, Stream near Maredmalli coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3338, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Madhya Pradesh, Tamil Nadu], Indonesia, Myanmar, Thailand, Vietnam); Palaearctic Region (China) (Nasserzadeh and Komarek, 2017).

45. *Sternolophus rufipes* (Fabricius, 1792) (Figs. 45, 98)

Material examined: 1 ♂, 1 ♀, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2448; 1 ♂, 2 ♀, Pond near Koyalagudem, 17°47'54.6"N, 81°36'15.48"E, 15.vii.2021, FBRC/ZSI/INS/2464; 2 ♀, Stream near Maredmalli coffee plantation, 17°36'5.04"N, 81°41'16.44"E, 16.vii.2021, FBRC/ZSI/INS/3309; 1 ♂, Pond near Ijjaluru, 17°39'32.76"N, 81°35'47.4"E, 18.vii.2021, FBRC/ZSI/INS/3842, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bhutan, Cambodia,

India [Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Punjab, Tamil Nadu, Telangana, Tripura, Uttar Pradesh, West Bengal], Indonesia, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Vietnam); Palaearctic Region (China, Hong Kong, India [Himachal Pradesh, Jammu and Kashmir, Sikkim], Japan, Nepal, Pakistan [Khyber Pakhtunkhwa, Sindh], Taiwan, South Korea) (Mustafa and Zubair, 2015; Nasserzadeh and Komarek 2017; Shankar *et al.*, 2023).

Remarks: The species of genus *Sternolophus* share overlapping morphological characters, male genitalia and spine on metaventricle were used for distinguishing the species within the genus. *S. acutipenis* has a sharp carina in apical portion of male median lobe whereas in *S. rufipes* carina in apical portion absent, both paramere and median lobe almost equal.

Subfamily: Enochrinae Short and Fikáček, 2013

Genus: *Enochrus* Thomson, 1859

46. *Enochrus esuriens* (Walker, 1858) (Figs. 46, 99)

Material examined: 1 ♀, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2453; 1 ♂, 1 ♀, Pond near Bhupathipalem Reservoir, 17°26'31.3"N, 81°45'23.2"E, 14.vii.2021, FBRC/ZSI/INS/3831, S. Shankar and Jaiswal, D leg.

Distribution: Australian (Australia); Oriental Region (India [Andhra Pradesh, Manipur, West Bengal], Indonesia, Myanmar, Philippines, Sri Lanka, Vietnam); Palaearctic Region (China, India [Himachal Pradesh, Jammu and Kashmir, Sikkim], Pakistan [Khyber Pakhtunkhwa, Sindh]) (Mukhopadhyay, 2015; Mustafa and Zubair, 2015; PrzewoŹny, 2022).

Subfamily: Acidocerinae (Zaitzev, 1908)

Genus: *Helochaers* Mulsant, 1844

47. *Helochaers anchoralis* Sharp, 1890 (Figs. 47, 100)

Material examined: 1 ♂, Palakaluwa, 17°23'53.88"N,

81°48'9.72"E, 4.xii.2021, FBRC/ZSI/INS/3823; 1♂, 3♀, Pond near Ijjaluru, 17°39'32.76"N, 81°35'47.4"E, 18.vii.2021, FBRC/ZSI/INS/3845, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andhra Pradesh, Assam, Bihar, Telangana, West Bengal]); Palaearctic Region (Pakistan [Khyber Pakhtunkhwa, Sindh]) (Mukhopadhyay, 2015; Mustafa and Zubair, 2015; PrzewoŹny, 2022).

48. *Helochares pallens* (MacLeay, 1825) (Figs. 48, 101)

Material examined: 1♂, 1♀, Bhupathipalem Reservoir, Rampachodavaram, 17°50'31.56"N, 81°39'54.36"E, 14.vii.2021, FBRC/ZSI/INS/2454; 3♂, 1♀, Pond near Bhupathipalem Reservoir, 17°26'31.3"N, 81°45'23.2"E, 14.vii.2021, FBRC/ZSI/INS/3830, S. Shankar and Jaiswal, D leg.

Distribution: Afrotropical (Egypt); Oriental Region (India [Andhra Pradesh, Assam, Bihar, Telangana, West Bengal], Indonesia, Philippines); Palaearctic Region (China, Syria, Tonkin) (Mukhopadhyay, 2015; PrzewoŹny, 2022).

Genus: *Coelostoma* Brulle, 1835

49. *Coelostoma bhutanicum* Jayaswal, 1972 (Figs. 49, 102)

Material examined: 1♂, 2♀, Pond near Pamugandi, 17°24'1.44"N, 81°45'19.8"E, 17.vii.2021, FBRC/ZSI/INS/3849, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bhutan, India [Andhra Pradesh, Kerala, Telangana, Meghalaya, Rajasthan], Japan, Nepal); Palaearctic Region (China, Taiwan) (Sheth *et al.*, 2020; Jaiswal *et al.*, 2022a).

50. *Coelostoma horni* Regimbart, 1902 (Figs. 50, 103)

Material examined: 3♂, 1♀, Stream near Palakaluwa, 17°23'53.88"N, 81°48'9.72"E, 4.xii.2021, FBRC/ZSI/INS/2704; 1♀, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/3055, S. Shankar and Jaiswal, D leg.

Distribution: Afrotropical (South Africa); Oriental Region (Bhutan, India [Andaman Islands, Andhra Pradesh, Tamil Nadu, Telangana], Indonesia, Nepal, Sri Lanka, Thailand, Vietnam); Palaearctic Region (China, India [Sikkim], Oman, Saudi Arabia, Yemen) (PrzewoŹny, 2022; Jaiswal *et al.*, 2022a).

Family: Noteridae Thomson, 1860;

Subfamily: Noterinae Thomson, 1860

Genus: *Canthydrus* Sharp, 1882

51. *Canthydrus laetabilis* (Walker, 1858) (Figs. 51, 104)

Material examined: 1♂, Pool near Rampachodavaram, 17°26'40.56"N, 81°45'54.36"E, 14.vii.2021, FBRC/ZSI/INS/3846, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Bangladesh, India [Andhra Pradesh, Bihar, Gujarat, Maharashtra, Meghalaya, Telangana, West Bengal], Myanmar, Nepal, Sri Lanka); Palaearctic Region (India [Sikkim, Uttarakhand], Nepal, Pakistan) (Nilsson, 2011; Mukhopadhyay, 2015; Jaiswal *et al.*, 2022b; Nilsson and Hájek, 2024b).

52. *Canthydrus luctuosus* (Aubé, 1838) (Figs. 52, 105)

Material examined: 1♂, 4♀, Pond near Pamugandi, 17°24'1.44"N, 81°45'19.8"E, 17.vii.2021, FBRC/ZSI/INS/3850, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (Cambodia, India [Andhra Pradesh, Bihar, Maharashtra, Odisha], Indonesia, Sri Lanka, Vietnam); Palaearctic Region (Iran, Iraq, Saudi Arabia, Syria) (Nilsson, 2011; Mukhopadhyay, 2015; Nilsson and Hájek, 2024b).

Genus: *Neohydrocoptus* Satô, 1972

53. *Neohydrocoptus subvittulus* (Motschulsky, 1859) (Figs. 53, 106)

Material examined: 1♂, 1♀, Pond near Bhupathipalem Reservoir, 17°26'31.3"N, 81°45'23.2"E, 14.vii.2021, FBRC/ZSI/INS/3827, S. Shankar and Jaiswal, D leg.

Distribution: Oriental Region (India [Andaman and Nicobar Islands, Andhra Pradesh, Assam, Bihar, Odisha, West Bengal], Indonesia, Malaysia, Myanmar, Sri Lanka, Vietnam); Palearctic Region (China, Japan, Nepal, Pakistan) (Nilsson, 2011; Mukhopadhyay, 2015; Nilsson and Hájek, 2024b).

The study reports altogether 53 species for the Andhra Pradesh raising the number to 57 for the state. In this study 46 species were found in pools and ponds, 24 were found in both streams and ponds, 10 species occurred in reservoirs, and 6 species in streams in the Papikonda National Park. It appears that ponds and temporary pools hold a richer diversity compared with streams and it corroborates earlier studies (Kulkarni *et al.*, 2015; Sheth *et al.*, 2019). Studies on the aquatic beetle fauna of India's protected areas remain limited. Jaiswal *et al.* (2022a) documented 41 species from Kawal Tiger Reserve, Telangana, followed by 39 species from Satkosia Gorge Wildlife Sanctuary, Odisha, 35 from Sundarban Biosphere Reserve, West Bengal (Mitra, 2017), and 34 from Baisipalli Wildlife Sanctuary, Odisha. Other records include 21 species from Renuka Wildlife Sanctuary, Himachal Pradesh (Ghosh and Hedge, 2013b); 18 from Sandi Bird Sanctuary, Uttar Pradesh (Ghosh, 2011); and 13 from Suraha Tal Wildlife Sanctuary (Ghosh *et al.*, 2010). Dudhwa Tiger Reserve, Uttar Pradesh, reported 11 species (Ghosh and Hegde, 2013a), while Asan Wetland Conservation Reserve (Uttarakhand), Govind Sagar Wildlife Sanctuary (Himachal Pradesh), and Karnala Bird Sanctuary (Maharashtra) each reported nine (Mukhopadhyay and Ghosh, 2003; Ghosh, 2015; Ghosh and Hedge, 2015). In West Bengal, Buxa Tiger Reserve and Binsar Wildlife Sanctuary each yielded four species (Nandi *et al.*, 2004; Ghosh *et al.*, 2018; Ghosh *et al.*, 2011). The lowest diversity was reported from Keibul Lamjao National Park, Manipur, with only two species (Takhelmayum and Gupta, 2015). More recently, 42 species were recorded from Koundinya Wildlife Sanctuary, Andhra Pradesh (Shankar *et al.*, 2023). In contrast, the present study reports 53 species from Papikonda National Park, Eastern Ghats, Andhra Pradesh, representing the highest diversity recorded from any protected area in India to date. This study reveals that most of the non-

endemic aquatic beetles which are reported in this study have a wide range of distribution, with a geographical range that covers both Oriental and Palearctic Regions. However, the present study on the aquatic beetles of the Papikonda National Park is a primary study to comprehend the diversity of aquatic beetles, and it may be helpful in the future prospective to understand the diversity of aquatic beetles in the National Park as well as to help better management of the ecosystem.

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